



Liliane de Araújo Silva Hobeica

Design *with* floods: turning threats into opportunities for/in urban projects

**PhD thesis in Territory, Risk and Public Policies, supervised by
Professor Lúcio Cunha and Professor José António Bandeirinha, and submitted to
the Institute for Interdisciplinary Research of the University of Coimbra**

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Abstract

Design *with* floods: turning threats into opportunities for/in urban projects.

The regeneration of urban riverfronts has been consolidated as a trend in the post-industrial world to comprehensively tackle the lack of urbanity in these areas. Yet, many of them are prone to fluvial floods, thus bringing safety issues also to the fore. The demand to redevelop flood-prone areas within urban-regeneration interventions comes across the limits of traditional flood-management initiatives, which aim to eliminate contingencies in the relationships between cities and rivers, while often disregarding the roles of these to improve the quality of the urban realm. Moreover, relying solely on flood-defence strategies may hinder the recognition of floods as a hybrid sociocultural and natural subject, which, paradoxically, may positively account for structuring the urban landscape and the related sense of place. An emergent perspective spearheaded by spatial design – ‘design and floods’ – seeks to deal with floods through a more accommodating framework, which intends to surpass the usual vision of floods only as ‘technical problem’ longing for a ‘technical solution’. Therefore, considering that spatial design may act as a flood-adaptation tool to manage the vulnerability of built structures, what are the possible design stances towards floods that may foster effective adaptation? This research sought to understand how flood risk has been integrated into urban-regeneration projects, trying to grasp baseline conditions, strategies and mechanisms that may contribute to the adaptation of riverine spaces. Following a constructivist standpoint, in which fluvial floods are conceived as a designed condition, a multiple-case study was carried out, comprising three different European flood-prone urban projects: the Polis Programme around the Mondego River (in Coimbra, Portugal), the Scheldt Quays Master Plan (in Antwerp, Belgium) and the Plan Guide Bastide Brazza Nord, a neighbourhood by the Garonne River (in Bordeaux, France). The underlying contexts, design processes and actual outputs of these three cases were reconstituted through the lenses of floods. Despite the uniqueness of each case, our analyses suggest that the ‘design and floods’ approach presupposes handling flood adaptation in a wider sense, focusing not only on cities’ materiality (in their occasional flood experiences) but also on human mentalities. Accordingly, design practices are defied to manage and negotiate at once the physical and the sociocultural dimensions of flood risk, in contexts in which fluctuating conditions and multiple interests abound. Moreover, a process-oriented design perspective seems more attuned with the hybrid character of floods than an outcome-centred one, a condition that engenders an additional challenge for designers since their prevailing disciplinary cultures are often product (object) oriented. Based on these reflections, we propose a scale to measure the intensity of the interactions between safety and urbanity, which goes from ‘tolerating floods’ to ‘accommodating floods’ and finally to the ‘welcoming floods’ stage, thus echoing diversified design stances towards floods. The more positive ‘design *with* floods’ stance can ultimately be attained when both design and fluvial floods are synergistically blended into a single whole, while problem-solving and sense-making approaches are merged to provide a safe and enriched urban realm, without attempting to eliminate fluvial floods *per se*, accepted in all their complexity.

Keywords: urban regeneration, fluvial floods, flood-risk adaptation, spatial design, riverine urban projects.

Resumo

Projetar *com* as inundações: transformando ameaças em oportunidades para/em projetos urbanos.

A regeneração de frentes urbanas ribeirinhas tem sido consolidada como uma tendência no mundo pós-industrial para abordar de modo abrangente a falta de urbanidade nessas áreas. Contudo, muitas destas são propensas a inundações fluviais, tornando também relevantes questões ligadas à segurança. A demanda atual por reocupar áreas propensas a inundações no âmbito de intervenções de regeneração urbana esbarra-se nos limites das iniciativas tradicionais de gestão das inundações, que buscam eliminar contingências nas relações entre cidades e rios, muitas vezes desconsiderando os papéis que estes podem desempenhar para uma melhor qualidade do ambiente urbano. Ademais, uma confiança excessiva nas estratégias defensivas contra as inundações pode dificultar o reconhecimento destas enquanto fenômenos híbridos (ao mesmo tempo socioculturais e naturais), que paradoxalmente podem contribuir de maneira positiva para a estruturação da paisagem urbana e do sentido de lugar. Uma perspectiva emergente orientada pelo projeto em diferentes escalas – ‘projeto e inundações’ – procura lidar com esse fenômeno de modo mais integrado, pretendendo ultrapassar a visão usual das inundações apenas como um ‘problema técnico’ requerendo uma ‘solução técnica’. Assim, considerando que o projeto pode funcionar como um meio de adaptação às inundações na gestão da vulnerabilidade das estruturas construídas, quais as possíveis posturas projetuais frente às inundações que podem promover uma adaptação efetiva? Esta pesquisa procurou entender como o risco de inundação tem sido integrado em projetos de regeneração urbana, tentando abarcar condições, estratégias e mecanismos de base que possam contribuir para a adaptação de espaços ribeirinhos. Seguindo o paradigma construtivista, no qual as inundações fluviais são entendidas como uma condição preconcebida, realizámos um estudo de casos múltiplos, composto por três projetos urbanos europeus suscetíveis a inundações fluviais: o Programa Polis em torno do Rio Mondego (em Coimbra, Portugal), o *master plan* para o cais ao longo do Rio Escalda (em Antuérpia, Bélgica) e o *plan guide* para Bastide Brazza Nord, um bairro margeando o Rio Garona (em Bordéus, França). Os contextos, processos projetuais e produtos efetivos dos três casos foram reconstituídos sob o prisma das inundações. Apesar da singularidade de cada caso, nossas análises sugerem que uma abordagem de ‘projeto e inundações’ deve considerar a adaptação às inundações num sentido mais amplo, concentrando-se não apenas na materialidade das cidades que vivenciam inundações ocasionalmente, mas também nas mentalidades humanas. Assim, as práticas projetuais são incitadas a gerir e negociar juntamente as dimensões física e sociocultural do risco de inundação, em contextos nos quais proliferam condições pouco estáveis e interesses múltiplos. Também, as práticas projetuais centradas no processo, diferentemente daquelas centradas no produto final, parecem mais sintonizadas com o caráter híbrido das inundações, condição que engendra um desafio adicional para os projetistas, uma vez que as culturas disciplinares predominantes são geralmente focadas na produção de objetos. Com base nessas reflexões, propomos uma escala para medir a intensidade das interações entre segurança e urbanidade, contemplando três estágios: ‘tolerância das inundações’, ‘acomodação das inundações’ e, finalmente, ‘boas-vindas às

inundações’, expressando assim posturas projetuais diversificadas em relação a estes fenómenos. A postura mais positiva de ‘projeto *com* inundações’ pode finalmente ser atingida quando projeto e inundações fluviais são sinergicamente amalgamados num todo único, ao passo que abordagens de resolução de problemas e de atribuição de sentido são unidas para prover um ambiente urbano seguro e rico, sem tentar eliminar as inundações fluviais em si mesmas, as quais são aceitas em toda sua complexidade.

Palavras-chave: regeneração urbana, inundações fluviais, adaptação ao risco de inundação, projeto (*design*), projeto urbano ribeirinho.

Résumé

Concevoir *avec* les inondations : vers la transformation de menaces en opportunités à travers les projets urbains.

Le renouvellement de zones urbaines riveraines en perte d'urbanité s'est consolidé comme une tendance dans le monde postindustriel. Pourtant, bon nombre de ces zones sont susceptibles aux inondations fluviales, soulevant ainsi également des questions de sécurité. La demande actuelle de réaménagement de zones inondables dans le cadre d'interventions de renouvellement urbain se heurte aux limites des initiatives traditionnelles de gestion des inondations, qui cherchent à éliminer les contingences dans les relations entre les villes et les rivières, en négligeant souvent les rôles que ces dernières peuvent avoir dans l'amélioration de la qualité du milieu urbain. Par ailleurs, s'appuyer uniquement sur des stratégies de défense contre les inondations empêche la reconnaissance des inondations en tant que sujets hybrides, à la fois socioculturels et naturels, qui peuvent paradoxalement contribuer de façon positive à la structuration du paysage urbain et de l'esprit du lieu. Une perspective émergente guidée par la conception spatiale – 'conception et inondations' – s'efforce de gérer les inondations à travers un cadre plus holistique, qui vise à dépasser la vision habituelle des inondations uniquement en tant que 'problème technique' nécessitant d'une 'solution technique'. Ainsi, partant de l'idée que la conception spatiale peut servir d'outil d'adaptation aux inondations pour gérer la vulnérabilité des structures bâties, quelles positions peuvent être prises par la conception des projets envers les inondations pour favoriser une adaptation efficace ? Cette étude a cherché à comprendre comment le risque d'inondation est actuellement intégré dans les projets de renouvellement urbain, en essayant de saisir les conditions, stratégies et mécanismes de base pouvant contribuer à l'adaptation des espaces riverains. En accord avec le paradigme constructiviste, selon lequel les inondations fluviales sont comprises comme une condition conçue, une étude de cas multiples a été menée, comprenant trois projets urbains européens en zones inondables : le Programme Polis autour du Mondego (à Coimbra, Portugal), le plan pour les quais de l'Escaut (à Anvers, Belgique) et le plan guide pour Bastide Brazza Nord, un quartier au bord de la Garonne (à Bordeaux, France). Les contextes, les processus de conception et les produits finaux de ces cas ont été reconstitués sous l'angle des inondations. Bien que chaque cas soit unique, nos analyses suggèrent qu'une approche 'conception et inondations' doit considérer l'adaptation aux inondations dans un sens plus large, en mettant l'accent non seulement sur la matérialité des villes (affectées occasionnellement par ces événements) mais aussi sur les mentalités humaines. De ce fait, les pratiques de conception sont mises au défi de gérer et de négocier à la fois les dimensions physiques et socioculturelles du risque d'inondation, dans des contextes marqués par des conditions instables et des intérêts multiples. De plus, une perspective de conception axée sur le processus semble plus adaptée au caractère hybride des inondations que celle axée sur le produit, ce qui requiert un effort supplémentaire de la part des concepteurs, habitués à une culture disciplinaire souvent centrée sur l'objet (en tant que produit). Partant de ces réflexions, nous proposons une échelle permettant de mesurer l'intensité des interactions entre sécurité et urbanité, qui comporte trois degrés : 'tolérer les inondations', 'accommoder les inondations' et enfin 'accueillir les inondations', reflétant ainsi des choix

de conception diversifiés envers ces phénomènes. La position la plus positive, de ‘conception *avec* les inondations’, peut finalement s’accomplir lorsque projet et inondations fluviales sont combinés de manière synergique, alors que les approches orientées vers la résolution de problèmes et vers l’attribution de sens sont associées pour offrir un milieu urbain sûr et enrichi, sans chercher à éliminer les inondations fluviales en soi, acceptées dans toute leur complexité.

Mots-clés : renouvellement urbain, inondations fluviales, adaptation au risque d’inondation, conception spatiale (*design*), projets urbains riverains.

Abbreviations

A'urba	Agence d'Urbanisme Bordeaux Métropole Aquitaine (Bordeaux Métropole Aquitaine Urbanism Agency) (France)
ACCU-A	Architect-Client-Contractor-User-Authorities analysis strategy
AIA	American Institute of Architects (USA)
ANT	Actor-Network Theory
APA	Agência Portuguesa do Ambiente (Portuguese Environmental Agency)
BALaT	Belgian Art Links and Tools
BMC	Biblioteca Municipal de Coimbra (Municipal Library of Coimbra) (Portugal)
CCIAM	Centre for Climate Change Impacts Adaptation and Modelling of the Faculty of Sciences of the University of Lisbon (Portugal)
CEPRI	Centre Européen de Prévention du Risque d'Inondation (European Centre for Flood Risk Prevention)
CES	Centro de Estudos Sociais da Universidade de Coimbra (Centre for Social Studies of the University of Coimbra) (Portugal)
CIAUD	Centro de Investigação em Arquitetura, Urbanismo e Design da Faculdade de Arquitetura de Universidade de Lisboa (Research Centre on Architecture, Urbanism and Design of the Faculty of Architecture of the University of Lisbon) (Portugal)
CIRAC	Cartas de Inundação e Risco de cheias em cenários de Alterações Climáticas (Floods and flood risk maps in climate change scenarios) (Portugal)
CMC	Câmara Municipal de Coimbra (Municipality of Coimbra) (Portugal)
CNB	Construction Navale Bordeaux
CNRS	Centre National de la Recherche Scientifique (National Centre for Scientific Research) (France)
CUB	Communauté Urbaine de Bordeaux (renamed Bordeaux Métropole in January 2015) (the metropolitan administration of Greater Bordeaux) (France)
DCT-FCTUC	Departamento de Ciências da Terra da Faculdade de Ciências e Tecnologia da Universidade de Coimbra (Department of Earth Sciences of the Faculty of Sciences and Technology of the University of Coimbra) (Portugal)
DEC-FCTUC	Departamento de Engenharia Civil da Faculdade de Ciências e Tecnologia da Universidade de Coimbra (Department of Civil Engineering of the Faculty of Sciences and Technology of the University of Coimbra) (Portugal)
DEFRA	Department for Environment, Food and Rural Affairs (UK)
DRAOTC	Direção Regional do Ambiente e do Ordenamento do Território da Região Centro (regional administration of the Centre Region for environment and territorial planning) (Portugal)
DRCC	Direção Regional de Cultura do Centro (regional administration of the Centre Region for culture) (Portugal)
EDP	Energias de Portugal
ENSAVT	École d'Architecture de la Ville et des Territoires à Marne-la-Vallée (Marne-la-Vallée school of architecture and urbanism) (France)
EU	European Union
FAUFBA	Faculdade de Arquitetura da Universidade Federal da Bahia (Faculty of Architecture of the Federal University of Bahia) (Brazil)
FAUL	Faculdade de Arquitetura da Universidade de Lisboa (Faculty of Architecture of the University of Lisbon) (Portugal)
FAUP	Faculdade de Arquitetura da Universidade do Porto (Faculty of Architecture of the University of Oporto) (Portugal)
FEUC	Faculdade de Economia da Universidade de Coimbra (Faculty of Economics of the University of Coimbra) (Portugal)
GBA	Gonçalo Byrne Arquitectos
GIS	Geographical Information System
GSA	Global Structure Plan for Antwerp

ICE	Institution of Civil Engineers (UK)
IGESPAR	Instituto de Gestão do Património Arquitectónico e Arqueológico (Institute for the Management of the Architectural and Archaeological Heritage) (Portugal)
IGOT-UL	Instituto de Geografia e Ordenamento do Território da Universidade de Lisboa (Institute of Geography and Territorial Planning of the University of Lisbon) (Portugal)
INAG	Instituto da Água (national water authority) (Portugal)
IPPAR	Instituto Português do Património Arquitectónico (Portuguese Institute for Architectural Heritage)
IPPC	Instituto Português do Património Cultural (Portuguese Institute for Cultural Heritage)
IRGC	International Risk Governance Council
ISEG-UL	Instituto Superior de Economia e Gestão da Universidade de Lisboa (ISEG School of Economics and Management of the University of Lisbon) (Portugal)
ISOCARP	International Society of City and Regional Planners
IUAV	Università Iuav di Venezia (IUAV School of Architecture of Venice) (Italy)
KCAP	Kees Christiaanse Architects and Planners
LAE	Landscape Architecture Europe Foundation
LiFE	Long-term Initiatives for Flood-risk Environments
MAOT	Ministério do Ambiente e do Ordenamento do Território (Ministry of Environment and Territorial Planning) (Portugal)
MAS	Museum aan de Stroom (Museum on the River)
MDP	Michel Desvigne Paysagiste
MIT	Massachusetts Institute of Technology (USA)
MSCV	Mosteiro de Santa Clara-a-Velha (Monastery of Santa Clara-a-Velha)
MVCC	Mercês Vieira e Camilo Cortesão Arquitectos Associados
PADD	Projet d'Aménagement et de Développement Durable (Territorial Design and Sustainable Development Plan) (France)
PAPI	Programme d'Action de Prévention des Inondations (Flood Prevention Action Programme) (France)
PCP	Process-Context-Product analysis strategy
PDM	Plano Diretor Municipal (Municipal Land-Use Plan) (Portugal)
PHEC	Plus Hautes Eaux Connues (Highest Known Water Levels) (France)
PLU	Plan Local d'Urbanisme (Local Urbanism Plan) (France)
PPRI	Plan de Prévention des Risques d'Inondation (Flood-Risk Prevention Plan) (France)
REN	Reserva Ecológica Nacional (national ecological reserve) (Portugal)
RIBA	Royal Institute of British Architects (UK)
s-RSA	Strategic Spatial Structure Plan (Antwerp, Belgium)
SNIRH	Sistema Nacional de Informação de Recursos Hídricos (Portugal)
SUDS	Sustainable Urban Drainage System
U&U	Urbanism and Urbanization International PhD Seminar
UE	Unidade de Execução (implementation unit within the Coimbra Polis)
UFM	Urban Flood Management
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNIFACS	Universidade Salvador (Salvador University) (Brazil)
UNISDR	United Nations Office for Disaster Risk Reduction
W&Z	Waterwegen en Zeekanaal nv (Waterways and Sea Channels) (Belgium)
YTAA	Youssef Tohmé Architects and Associates
ZAC	Zone d'Aménagement Concerté (Special Development Zone) (France)
ZFU	Zone Franche Urbaine (Urban Free Zone) (France)

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Part I: **Background**

the prime and primordial architecture is geography

a primeira e primordial arquitetura é a geografia

Paulo Mendes da Rocha, *A cidade para todos*

1 General introduction

The decision to pursue urban regeneration in a flood-prone area has frequently been blamed as inconsistent with the usual requirements to deal with flood risk; nevertheless, this choice may sometimes be the best option or even the only one if other less manageable risks (or other threats) are also present. Moreover, the countering of urban sprawl and the existence of obsolete riverine areas in valuable central locations, for example, are good reasons behind the reoccupation of “bad places” (hazardous or polluted derelict sites), in many European cities nowadays (Viganò, 2012). In the particular case of floodable areas, such re-appropriations always imply some degree of risk acceptance, as well as the necessity of adaptation to it, which may thus entail changing the perspective towards floods: from a strict defensive approach – the one which has prevailed up to now – to an accommodating one.

For different reasons, this transformation opens new horizons for urban-regeneration projects in such locations: first, fluvial floods and safety become as legitimate issues subject to design as other territorial (environmental) concerns. Accordingly, floods should be viewed not simply as a negative process to be avoided but as a more neutral (or even positive) idiosyncrasy of some riverine settings to be managed within urban areas. Likewise, the needed positive stance may bring to the fore other attributes related to fluvial dynamics that can enhance the urban experience, through the broadening of aesthetics and meaning intentions attached to a given riverine intervention. In this way, flood-risk management mechanisms should not be carried out as merely ancillary technical devices but as integral components adding to the richness of the urban realm.

The linkages between flood-risk management and urban planning (that is, large-scale land-use regulations) are generally well explored, several manuals having been issued on this combined theme – see for instance the World Bank’s seminal guide on cities and floods (Jha *et al.*, 2012). The same can be said about the relationships between flood-risk management and the design of isolated buildings (RIBA, 2009; CEPRI, 2009; 2010). In contrast, the intermediate scale of flood-prone urban projects, understood as medium-scale intra-urban interventions that constitute actual city fragments, are still to be further investigated, although some commendable exceptions can be recognized. One of the few initiatives focusing on this scale is the recent report of the European Centre for Flood Risk Prevention (CEPRI), reviewing some technical principles that could be applied in urban-regeneration projects in view of the reduction of their vulnerability to riverine floods (CEPRI, 2015). Similarly to other guides that tackle the flood issue at different scales, the CEPRI’s publication demonstrates that technical solutions do exist to safely build in floodable zones; therefore, ‘how to’ adapt in very concrete terms is in principle well known.

Yet, the ‘how come’ question at a higher level – that is, the underlying conditions of the design process that foster the proper reconversion of a degraded floodable urban area into a

regenerated liveable and safe one –, is poorly addressed (or not at all). This point was indeed recognized by the CEPRI itself, for whom the technical, economic and legal aspects of adapting new or regenerated neighbourhoods have gradually been disentangled, whereas “wide-ranging reflections about the operationalization of an urbanism that effectively incorporates flood risk are still struggling to emerge” (CEPRI, 2015, p. 4). This condition has been characterizing the recent European trend of redeveloping flood-prone urban areas, which can be described as a “radical and silent change in the paradigm of urban development as regards natural risks” (Guevara Viquez *et al.*, 2017, p. 1). In the framework of such mindset evolution, design appears as a key instrument to convert a known constraint into a renewed resource (Bonnet, 2016). Mostly through the possibility it offers to combine “multiple points of view and several scales at once” (Guevara Viquez *et al.*, 2017, p. 2), design can actually be a timely means for the exploration of urban redevelopment alternatives that take risks into account without the resort to the simpler (yet unsustainable) preventive mechanisms. The major objective of this thesis was hence to explore the ‘how come’ issue of flood adaptation through design within urban-regeneration initiatives.

The aforementioned gap between the regional scale and the building one could be related to the fact that up to now flood-risk management has been dealt with mainly through a defensive approach, either using hard-engineering structures (often located far from actual floodable urban areas and thus outside people’s daily perception) or limiting the occupation of flood-prone areas. As a general rule, resorting to one of these two measures does not encourage proactive and localized approaches, nor the recognition of the intrinsic intertwining natural-cultural trait of floods. At the same time, when it comes to large flood-management schemes, another trend is becoming manifest: multiple functions (such as civic amenities and ecological services) are being incorporated into such facilities as a means to increase their value, while keeping their primary focus as highly performing flood-defence mechanisms. This move is well exemplified by the Dutch “Ruinte voor de Rivier” (“Room for the River”) programme of the 1990s, which has targeted floodplain restoration (that is, giving space back to river fluctuations), accompanied by the improvement of the quality of the resulting space, open whenever possible to people’s appropriation (Klijn *et al.*, 2013).

Nevertheless, the goal of these interventions, mostly located in peri-urban or rural environments, is actually flood management *per se*, and not urban regeneration. The integration of flood-risk concerns into contemporary urban projects calls for a different perspective, one that takes into consideration the concentration of people and valuable assets in restricted areas (where uses may be both intense and conflicting), while acknowledging wider potential social and environmental repercussions of river fluctuations. Moreover, urban floodable spaces sometimes constitute a great portion of a city, and in these cases they cannot be simply left aside as non-territories, or be entirely converted into green parks to give room for the rivers.

Hypothetical illustrations of such an unattainable conservative approach are provocatively presented in Figure 1 and Figure 2, using two European capitals as examples. In these two cases, most of the floodable urban areas are indeed already densely occupied, including by old and new emblematic monuments and amenities, such as the Praça do Comércio and the

Centro Cultural de Belém, in Lisbon, or the Louvre Museum and the National Library in Paris. Furthermore, Lisbon and Paris themselves also exemplify the rediscovery (and hence the regeneration) of the riverscape by contemporary cities as a prime asset to reinforce their qualities, which calls for a re-evaluation of current defensive practices towards more adaptive approaches.

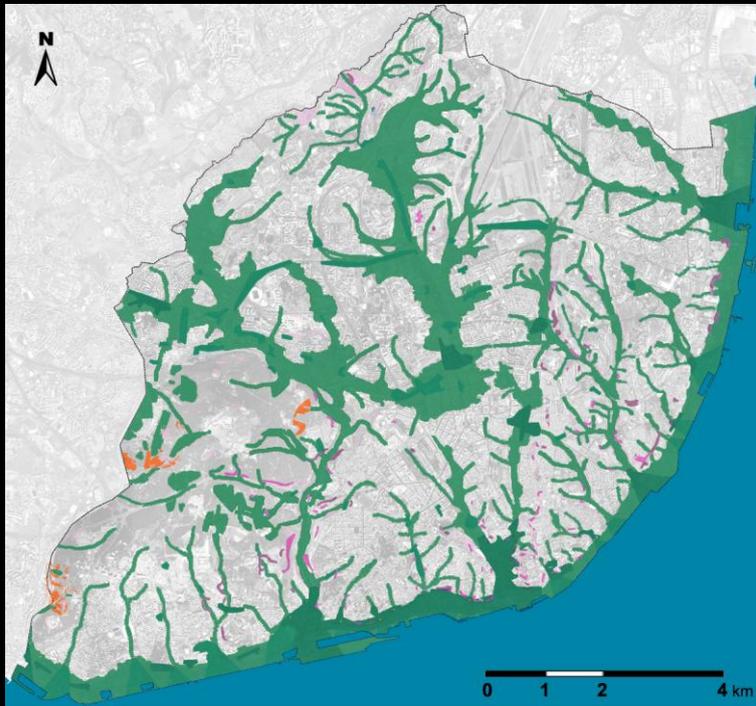


Figure 1: Utopian reconversion of Lisbon’s flood-prone areas into non-territories or green areas
 In green, segments of the consolidated city that would have to be set apart to give room for the Tagus River, as well as for minor watercourses and rainwater
 Source: CML (2012) (modified by the author)

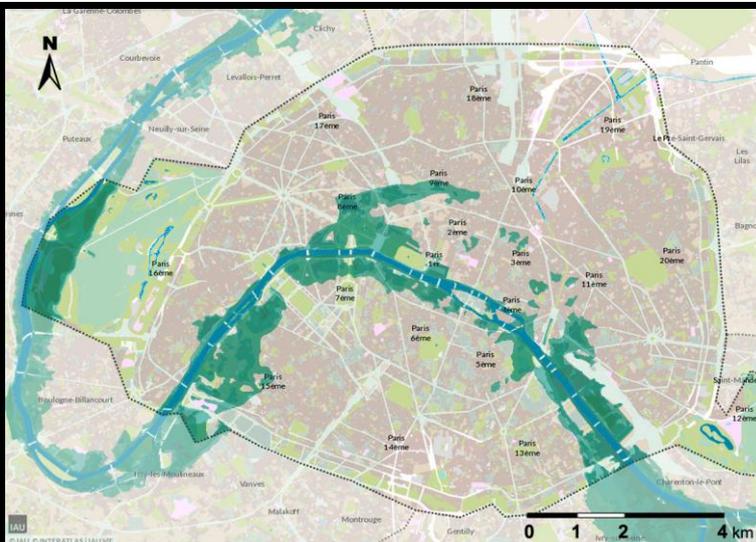


Figure 2: Utopian reconversion of Paris’s flood-prone areas into space for the Seine River
 In green, segments of the consolidated city that would have to be set apart to give room for the Seine River
 Source: IAU (2014), © IAU & Interatlas IAU ÎdF (modified by the author)

The need for more adaptive approaches is even heightened if one considers the uncertain prospects associated to climate change, which generally anticipate more flood events throughout most of the European continent (due to the concentration of the rainy season in a shorter period and, for estuarine cities, due to sea-level rise) (Bates *et al.*, 2008). While the repercussions of climate change definitely require mitigation actions, they also call for being positively anticipated, which in the case of fluvial floods implies taking a more

holistic point of view that appropriately acknowledges the interlinkages between the involved sociocultural and natural processes.

Following a master dissertation in risk sciences, during which the potential antagonisms between the ‘sustainable’ compact-city model and flood-risk management were examined, the theme we chose to trail in the PhD in Territory, Risk and Public Policies is the possible interlinkages between flood-prone territories and urban-regeneration initiatives. This study thus sought to explore – in the sense of understanding more than explaining – the possible conciliation of the redevelopment of riverine areas and their adaptation to fluvial floods, considering that spatial design may act as an integration tool. Yet, we argue that not only can urban redevelopment and flood risk be harmonized through spatial design, but our amalgamated sense of nature and culture (Latour, 1993), two wider domains closely linked to floods, can be positively affected as well.

In spite of my primary professional background in architecture and urbanism, the topic of this research can hardly be included among traditional architecture studies and their usual focus on outstanding buildings and their designers. With some laudable exceptions¹, most architects would not associate this research to a truly architectural scholarship work. This fact is perhaps the main reason why the more comprehensive concept of spatial design ended up having a central role in the research, instead of architecture *tout court* (or architecture of the city, or even urbanism). In her claim that architecture should be inscribed in the wider domain of design studies as a means to acknowledge its belonging to “the broader realm of material – spatial – culture” (2009, pp. 174 and 179), the architect Jilly Traganou (associate professor at the Parsons School of Design) cleverly recognized that

approaches to architecture that pay attention to what appears as para- or exo-architectonic concerns are often considered to be of value primarily to scholars in the humanities or social studies, rather than to architects [since these concerns are mostly considered as having] no contribution to the formation of ‘good’ design.

The present research could thus be included among such “para- or exo-architectonic concerns”, as it primarily deals with a marginal topic that could quite easily be seen as having “no contribution to the formation of ‘good’ design”. Nevertheless, our claim here is that this seemingly irrelevant topic can be maximized and indeed make a difference for ‘good design’, valued not only in terms of functional performance but also of aesthetical and sense-making attributes. Therefore, our research subject is situated in the disciplinary fringes of geography and spatial design or, better saying, in the intersection between them (just like the architects, most geographers would not straightforwardly recognize here a contribution to their scientific field).

These considerations inevitably bring to the fore the issue of articulating knowledge in terms of multidisciplinary, interdisciplinarity and transdisciplinarity, already raised in the

¹ The professionals linked to the following entities and programmes would be among the outliers: the Master of Design Studies (Risk and Resilience track) at the Harvard Graduate School of Design; the Urban Risk Lab of the MIT School of Architecture and Planning; the Cambridge University Centre for Risk in the Built Environment, associated to the Department of Architecture; and the postgraduate specialization programme in Sustainable Urban Design and Planning for Climate-Proof Cities of the Università Iuav di Venezia.

early 1970s by the psychologist Jean Piaget. Although often used interchangeably, these terms actually represent three different degrees of interaction between disciplines: multidisciplinary refers to parallel disciplinary contributions to answer a research problem, without any feedback between disciplines, while interdisciplinarity refers to the effective collaboration between disciplines that are ultimately enriched by the involved exchanges. In its turn, transdisciplinarity implies, more than interactions, the integration between disciplines at a higher level, transcending their traditional boundaries. In accordance with this terminology proposed by Piaget (1972), our research clearly followed an interdisciplinary track.

In fact, the strong interrelationships between geography and design, both having space as a central interest, motivated our choice of the epigraph of this first part of the thesis (“Background”): “the prime and primordial architecture is geography”, by the architect-urbanist Paulo Mendes da Rocha (2000b, p. 172). Through this sentence, Rocha (2000b) acknowledges that geographical materiality is the foundation from which the architectural practice unfolds, but also that spatial design (when considering that this wider domain embraces architecture and urbanism altogether) indeed produces new geographies, giving shape and meaning to the evolving human world. At the same time, the understanding of geography adopted here is of a broad discipline that (at least ideally) deals with both nature and culture in a unitary mode, as supported for instance by the texts assembled by the geographers Noel Castree and Bruce Braun (2001).

As stated by Rocha, it is part of design’s remit to reveal “a virtue of nature that would be lost without the consistency of the mind’s transforming power” (2000b, p. 176). Consequently, comprehensive and sensible spatial interventions should comprise a necessary reinterpretation and reconfiguration of the (physical and human) geography, as a means to express deeper human aspirations (more than simple needs), and eventually generate transcended meaning. As hybrid sociocultural and natural phenomena, fluvial floods constitute a timely topic to illustrate the unitary nature of physical and human geography, as well as the enlargement outlook of design’s sphere of action. In this vein, in order to be effectively managed, fluvial floods call for conceptualizations that highlight such holistic dimension, as epitomized by the term “andscape” proposed by the landscape architect Martin Prominski (2014).

Following a constructivist perspective (named either ‘constructivism’ or ‘constructionism’) that acknowledges floods as a designed condition, we took as the research problem the issue of ‘flood adaptation through design’, particularly in the context of the redevelopment of flood-prone riverine areas in urban-regeneration projects. Through an exploratory approach, the study ultimately tackled the following research questions:

- What are the critical elements that can make possible the full integration of fluvial floods in the design of urban-regeneration projects?
- What are the possible (design) stances towards floods as regards adaptation?
- What are the special roles (if any) played by the design activity when dealing with the regeneration of flood-prone urban areas?
- Who are the key stakeholders in the process of designing flood-prone urban projects and which roles are fulfilled by them?

In line with these questions, the retained research objectives were:

- To grasp baseline conditions, strategies and mechanisms that can actively foster flood adaptation through design in riverine urban-regeneration projects;
- To verify how fluvial floods are portrayed within design processes and outputs in urban-regeneration projects;
- To characterize spatial design as a flood-adaptation tool; and finally
- To recognize which stakeholders and related disciplines have been enablers of an inclusive ‘design and floods’ perspective.

Case study was adopted as the research method, since it allows gaining a comprehensive view of the targeted urban project, thanks to its simultaneous attention to “the complex relationships between context, product and process that govern every design [endeavour]” (Foqué, 2010, p. 174). Such comprehensive perspective inherent to conducting case studies makes them one of the prevalent strategies for carrying out research in the spatial-design realm (AIA, 2001; Till, 2005; Groat & Wang, 2013). The research design finally contemplated a multiple-case study composed of three cases:

- The set of projects within the urban-regeneration programme Coimbra Polis, around the Mondego River in Coimbra (Portugal), having two particular units of analysis: the Parque Verde do Mondego and the requalification of the Monastery of Santa Clara-a-Velha;
- The master plan for the Scheldt Quays, along the Scheldt River in Antwerp (Belgium); and
- The *plan guide* for Bastide Brazza Nord, a floodable neighbourhood bordering the Garonne River in Bordeaux (France).

After carefully reviewing these three cases and extracting some major lessons from them, both in isolation and in an aggregate manner, the research suggested that far from being solely a technical issue related to the management of a hazardous territorial process, adaptation to floods through design within urban-regeneration initiatives is deeply entrenched in the sociocultural domain. These connections are revealed in terms of both the contextual conditioning factors and the envisioned outputs. More explicitly, adaptation to floods through design can only be successfully achieved when the hybridity inherent to floods is recognized. In fact, only the human dimensions of floods can be designed (even if these are related to the anthropic modification of the hazardous event itself), for storms and sea surges as fluvial floods’ triggering factors cannot be consciously manipulated, in the short and medium terms.

Moreover, adaptation to floods through design can only be successfully achieved when the envisioned outputs include gains in terms of urbanity, in addition to safety; that is, the same multifunctional reasoning present in the Dutch “Room for the River” programme is fundamental to holistically and compatibly integrate floods into urban-regeneration projects. Yet, the openness needed to support such understanding and the ensuing predisposition to actively live with floods may not be among the default characteristics of the prevailing flood-risk culture, which may thus not sufficiently encourage or support fluvial-flood adaptation through design (‘design *with* floods’). In this sense, we hope that these conclusions, as well as the insights raised throughout the following text, can modestly contribute to widening the mindsets, regarding design as a

flood-adaptation tool, of both public agencies dealing with territorial planning and management, and spatial designers.

This necessary (but surely not sufficient) condition to ‘design *with* floods’ would require enlarged horizons that go in two complementary directions. For the professionals dealing with flood-risk management, an effort is needed to go beyond the idea of protection and defence, towards integrating other urban concerns in their practices, since the emphasis on disaster prevention does not seem to favour a more inclusive and adaptive approach vis-à-vis floods. For the stakeholders dealing with the quality and vitality of the urban environment, floods should be seen as more than an issue requiring a definitive technical solution. Therefore, the main intended contribution of the thesis is humbly assimilated to the one that fluvial floods themselves can have: a sensitization role that could hopefully foster better adaptation through design, within urban-regeneration projects. And although the topic dealt with is seldom included among traditional architecture and geography research, we also wish that this thesis possibly encourages architects and geographers (practitioners and scholars alike) to trail interdisciplinary paths, which boldly reconfigure and enrich (rather than dissolve) our professional remits within today’s society and challenges.

The present document is structured in three comprehensive parts. Part I – “Background” – covers the research’s overall context and comprises two other chapters besides this introductory one. Chapter 2 addresses the theoretical basis of the research (the so-called ‘state of the art’), focusing particularly on the rationales for the regeneration of floodable riverine urban areas. To this end, we present the challenges involved in such operations in order to give new life to declining areas and revamp a city’s ambience and image, while not increasing the number of exposed assets and/or their vulnerability to floods. We argue that urban regeneration should ideally be carried out in an integrated manner, in which overall urban-life enhancement (urbanity) and flood protection (safety) are combined into a single goal. Chapter 2 also covers the thesis’s main underlying concepts and trends regarding risk sciences and flood risk in particular. Fluvial floods are then understood as a hybrid, a complex territorial phenomenon in which natural and human processes intertwine, often in an unconscious manner.

The physical and social dimensions of flood risk are explored, to support the standpoint that despite being considered a simple risk (that is, without major uncertainties and ambiguities), its (mostly concealed) social dimension makes it increasingly complex, as presently illustrated by the drawbacks of centuries of flood-defence practices. The traditional flood-management strategies centred on prevention are then examined, after which we introduce flood adaptation as a more sensible alternative to deal with the inevitable possibility of sporadically undergoing river overflows. In order to more effectively support ‘living with floods’, design is presented as a flood-adaptation tool, based on the perspective that if riverine spaces are consciously and collectively conceived in a way that they accept the hybrid floods, safety can ideally be enhanced in tandem with urbanity. Fluvial floods are then understood as a potential emergent topic among architecture’s expanded sphere of action, for which we use across the thesis the more generic and wide-ranging term ‘spatial design’. We afterwards review the concept of

“andscape” (Prominski, 2014), which is recognized as a suitable mindset to deal, through design, with the contingencies and the hybridity inherent to fluvial floods.

Chapter 3 covers the overall purpose and design of the research, including its epistemological and methodological aspects, notably the strategies and procedures for the selection of the cases and for data gathering and analysis. It details the thesis’s retained research questions, objectives and scope (the delimitations outside which our reflections do not hold), and considers the major implications of having chosen the constructivist paradigm. These considerations are complemented by a general presentation of the case-study method, including its strengths and weaknesses, followed by the introduction of the architect Richard Foqué’s approach for case studies in architecture, composed of the Process-Context-Product (PCP) and the Architect-Client-Contractor-User-Authorities (ACCU-A) analysis strategies, which appropriately fit into our research questions. Chapter 3 also contains, in its concluding section, an initial characterization of the three selected cases.

Part II – “Stages” – is devoted to the three studied cases, the actual arenas in which the vicissitudes of ‘design and floods’ were explored, each of them dealt with in a dedicated chapter. Accordingly, Chapter 4 presents and discusses the Polis Programme in Coimbra, Chapter 5 the Scheldt Quays Master Plan in Antwerp and Chapter 6 the *plan guide* for Bastide Brazza Nord in Bordeaux. These three chapters share the same structure, derived from Foqué’s PCP method, and contain in their final section a review of the major lessons underlying each urban project as regards dealing with floods through design.

Part III – “Foreground” – encompasses the aggregated original output of the research, namely its main analyses, discussions and conclusions. Chapter 7 comprises a cross-case synthesis and analysis of the three studied urban projects; the main themes emerged within each of them are categorized according to the focus of our four research questions (‘background’, ‘stance towards floods’, ‘spatial design’ and ‘spatial designers’). This exercise is followed by the delineation of some possible ‘answers’ to the research questions, which are related to ‘design and floods’ more than to our three specific cases. In line with the adopted constructivist perspective, the research ‘answers’ do not intend to determine any rule for properly designing flood-adapted urban-regeneration projects, but more modestly to congregate and pinpoint some lessons learnt that may favour combining safety and urbanity in these projects; for this reason, a speculative tone is kept throughout the articulation of the research ‘answers’.

The insights raised through the research then lead us to propose a scale of flood adaptation through design, which intends to qualify the different degrees of integration of fluvial floods based on the intensity of the interactions between the two major dimensions of flood-adapted urban projects. Finally, Chapter 8 gathers the main conclusions and possible contributions, implications and recommendations related to ‘design *with* floods’, while opening new horizons to further explore the challenges involved in adapting urban-regeneration projects through design.

2 The redevelopment of flood-prone riverine urban areas

2.1 Chapter introduction

Urban regeneration intends to be a shared planning strategy, involving several contemporary urban challenges (e.g. social, image-related, economic, environmental ones) in an inclusive manner. In post-industrial European cities, ‘blue’ and ‘green’ elements have gained special attention in regeneration operations, thanks to their contribution to the quality of the urban setting, as well as to the fact that substantial parts of the derelict (or suboptimally used) land and structures to be recovered lie in riverside central areas. Instilling new life into these spaces has contributed not only to give an impetus to urban development, but also to the maintenance (or strengthening) of the cultural identity of some riverine cities, as illustrated by the interventions around the Liffey (in Dublin) or the Loire (in Nantes) (see Figure 3 and Figure 4). Despite the augmented sense of urbanity conveyed by them, urban-regeneration interventions in riverside zones contain, in principle, an inconsistency, since the intensification of occupancy in these specific locations, if not properly dealt with as an additional challenge, may indeed contribute to an increase of flood risk. And the occurrence of ‘unpredictable’ floods – if not previously and adequately taken into account – can easily degenerate a regenerated riverside zone, thereby undermining at least part of the benefits initially envisioned with a given spatial intervention.



Figure 3: Urban intervention in Dublin, along the Liffey River

Source: CCCB (2002), © Barry Mason



Figure 4: Memorial to the Abolition of Slavery in Nantes, by the Loire River

Source: GSD (2015)

In fact, floods in the urban setting are old and ubiquitous phenomena; even in the absence of major rivers, many cities experience floods from other sources, such as deficient drainage systems, high water tables (ground-water floods) or sea surges (tidal floods). Nevertheless, riverine territories have always been attractive locations for human settlements, and have witnessed the flourishing of urban civilizations for thousands of years. Due to location advantages related to, *inter alia*, transport ways, proximity of fertile arable land, easy access to drinking water or defensive reasons, many cities were established close to a waterbody, being thus, in principle, subject to flood events from time to time. Even so, the underlying benefits have outweighed the downsides of dealing with these events, a balance that has always been at least intuitively done. Throughout the evolution of the urbanization process, cities have gradually learnt to adjust to such phenomena by means of human-made interventions shaping riverine spaces (Mumford, 1961), in such a way that these spaces have established themselves as a fundamental trait of urban identity, constituting remarkable permanent elements – yet, dynamic ones – in the urban setting. For instance, riverbanks and their immediate surroundings have been the privileged sites of some of the most impressive urban landmarks, such as the United Kingdom Parliament in London, the Kremlin in Moscow and the Ponte Vecchio in Florence. In some cities, rivers have almost the status of ‘urban monuments’ *per se*, as it is the case of the Seine in Paris, the Amstel in Amsterdam or the Danube in Budapest.

Not only are urban rivers a prime identity factor for riverine cities, but they are also innately linked to their urban development. In this sense, floods have indeed been important events in the course of the urban history, either through the damage generated by them (and the related recovery needs), or through the opportunities of urban upgrading uncovered after them. The most spectacular urban flood events have been registered since the Middle Ages, due to heightened exposure, especially in the case of the larger cities, yet with no known record of large-scale permanent relocation caused by more or less recurrent disasters of this nature (Vale & Campanella, 2005). In fact, floods are a fundamental part of the memory of riverine cities, as rightly recognized by some of these through the maintenance of flood marks in the public space, in their most susceptible locations (see Figure 5).



Figure 5: The public space as a reminder of exceptional floods from the past

Here, two flood marks are showcased in an emblematic central location of Burgos (Spain): the levels attained by the waters of the Arlanzón Rivers on 11 June 1874 and on 5 June 1930

Source: author's archives (7 May 2017)

Earlier settlements indeed benefitted from the riverside location to enhance their sense of urbanity but also took a preventive approach as regards safety, choosing the best places in terms of protection from both natural hazards and human-driven ones. Even if cities were traditionally associated with a sense of safety countering the wild external environment (Mumford, 1961), many of the most praised timeless cities and human settlements display a symbiotic integration with their sites, as captured by the expression *genius loci* (Norberg-Schulz, 1979). With the surge of the urban phenomenon, meaning the massive increment and concentration of people and assets in cities, the extension of these settlements would no longer be restricted to the most suitable sites (due to the reduced availability of adequate options), which has led to greater human and material losses when floods occur.

With the development of hydraulics from the 17th century on, the manipulations of river spaces were intensified in such a way that urban watercourses started to be seen mostly as simple infrastructures, and they were profoundly ‘adjusted’ (straightened, deepened, buried and/or deviated). They lost hence much of their intrinsic fluctuating nature in order to provide urban societies with further safety and other economic benefits (Saraiva, 1999). In fact, according to the historian Lewis Mumford (1961), fighting against nature more generally (which includes dealing with floods) has been an important driver for cities’ development. However, the existing close linkages between human beings and rivers have been gradually cut along with the sophistication of the ‘technological adjustments’ needed, an indirect consequence that was then not at all perceived as a negative development outcome. As synthesized by the landscape architect Heike Langenbach (2007, p. 77), the “technological possibilities of flood defence systems have changed cities’ relationships to their rivers in terms of geography, topography and mentality.”

The downsides of such disconnection have only recently been widely acknowledged, for example through the contested environmental impacts of river-training interventions², the degradation of water quality mostly related to the industrial past, and the increasing unpredictability of what used to be the ‘natural water cycle’. The rediscovery of the urban riverscape and its contribution to the city dwellers’ quality of life, ongoing since the 1970s, is also one feature towards a better connection between cities and rivers. In fact, a marked ambiguity continues to surround urban watercourses: despite being perceived as “a fount of vitality for city dwellers” (Dreiseitl, 2012, p. 5), these are at the same time at the origin of fear and damage, as regards the situations when flood risk materializes.

Instead of being dissimulated, either through disregarding rivers as an important dynamic urban element or through ignoring flood risk as a probable nuisance, such ambiguity needs to be further discussed and brought to the fore to be better understood and to potentiate the full integration of watercourses in the urban setting. Therefore, the current urban-regeneration trend that targets riverine spaces, many of which are prone to floods, calls for new accompanying flood-management approaches not exclusively focused on safety through defensive lenses, and for urban-development initiatives that embrace flood processes

² The expression ‘river training’ generally refers to the “[e]ngineering works built in or along a river in order to direct the flow, or to lead it into a prescribed channel, or to increase the water depth for navigation and other uses” (WMO/UNESCO, 2012, p. 291).

instead of getting rid of them as a purely technical issue. This change of perspective is increasingly important if one also considers the flood prospects associated to climate change, the adaptation to which many cities are already taking into consideration in their planning activities.

In this chapter, based on the literature review, the conceptual foundation herewith applied to frame the current redevelopment of flood-prone riverine urban areas will be examined. In the following section (“The challenges of regenerating flood-prone riverine urban spaces”), urban regeneration and the ensuing need to deal with intra-urban floodable areas will be introduced; in Section 2.3 (“Understanding flood risk”), the focus then shifts to general characteristics of flood risk. In Section 2.4 (“Dealing with flood-prone urban spaces”), two contrasting perspectives to face fluvial floods are presented: flood defence and flood adaptation. Section 2.5 (“Spatial design as a flood-adaptation tool”) contains the conceptualization of design (and spatial design) used herein and further develops its attributes that may have an implication within urban flood-management initiatives; hence, spatial design is eventually invoked as a means to foster a broader flood-adaptive approach, centred on the concept of “andscape” (Prominski, 2014). Finally, Section 2.6 (“Chapter summary and final remarks”) schematically recapitulates the main issues raised in this chapter, paving thus the way for the research questions and objectives presented in the subsequent chapter.

2.2 The challenges of regenerating flood-prone riverine urban spaces

Urban regeneration has become both a catchword and an urban-strategy trend since the last quarter of the 20th century; its aspired urban transformations mimic the very essence of cities themselves. In fact, despite the great inertia of the built environment, cities – “the human invention *par excellence*” (Lévi-Strauss, 1955, p. 127) – are dynamic systems that evolve and alter their scope and atmosphere, while some basic hard structures remain as long-lasting elements (their monuments) (Rossi, 1966). Such elements are responsible for keeping cities’ identity and sense of place, even if (or especially when) the overall urban arrangement changes to absorb human and technological advancements. In this sense, cities are always in the process of gradually adjusting themselves to renewed circumstances, through the so-called mechanisms of “autonomous adaptation” (Zevenbergen *et al.*, 2010, p. 15), adding therefore new uses and meanings to such enduring structures.

Regardless of the occurrence of disasters from time to time, occasionally leading to huge devastations, cities have their own recovery processes, as widely witnessed throughout the urban history (Vale & Campanella, 2005; Diefendorf, 2009). In fact, as stated by the sociologist Frank Furedi (2006, p. 75), cities and communities faced by hazards “have demonstrated a capacity to adapt, improvise and overcome adversity”, which makes them endure despite the recurrence of such situations. As a contemporary feature of the post-industrial world, urban regeneration refers to intentionally organized initiatives to boost new life into some segments of a city when their intrinsic vitality has given signs of decline through, for example, the degradation of traditional housing complexes or the

abandonment of waning industrial sites. In this context, it can be defined as “comprehensive and integrated vision and action [geared towards the pursuit of] a lasting improvement in the economic, physical, social and environmental condition of an area that has been subject to change” (Roberts & Sykes, 2000, p. 17). Thanks to its usually inclusive scope, urban regeneration can also be seen as an opportunity to foster a more sustainable urban development and enhance overall urban life, tackling at the same time diverse and interrelated issues such as uncontrolled urban expansion, pollution, energy consumption or socioeconomic revitalization.

One of the main goals of urban-regeneration initiatives is to counteract the negative impacts of cities’ industrial past³, in terms of both image and quality of life, two highly valued assets in the current context of competition among post-industrial cities. The reinforcement of such features intends to support the idea of contemporary cities as pleasant living environments, in opposition to the traditional industrial city. Involving much more than simply refurbishing buildings, regeneration operations often engender changes in either land use or land occupancy (or more commonly in both)⁴, and represent actual urban projects, in terms of fostering the revision of the structure and meaning of cities, also opening a window for facing new challenges. It is not by chance that in France, for example, urban regeneration (*renouvellement urbain*) is closely associated to the idea of ‘remaking the city on itself’ (*refaire la ville sur elle-même*) (CEPRI, 2015). The architect-urbanist Paola Viganò (the 2013 laureate of the French government’s “Grand Prix de l’Urbanisme”) even considers that cities are a renewable resource, in view of their inherent capacity to reinvent themselves (Viganò, 2013).

Standing “at the point where nature and artifice meet”, as remarkably defined by the anthropologist Claude Lévi-Strauss (1955, p. 127), cities have always been the privileged places where life unfolds in its full potential. One just needs to think about the intense and multifaceted social relations engendered in these agglomerations, or all the everlasting scientific and artistic ventures unleashed in urban settings: Venice, Paris and Vienna are perfect examples of the potential of cities to provide inspiring environments, which can be greatly synthesized by the term ‘urbanity’. Therefore, at stake in cities are not only technical issues related to life protection in a narrow sense or economic vitality, but also wider necessities of human beings that include experiencing life in its wholeness. Ideally, these more intangible needs should as well be tackled in urban-regeneration interventions, as they are one of the mainstays a plentiful existence.

Being strongly linked to the identity of riverine cities and to the lifestyle of their citizens, riverfronts play a special role in current urban-regeneration initiatives, in which the riverscape is being acknowledged as a prized amenity *per se*, in contrast with their purely

³ See Mumford (1956; 1961) for an incisive (yet very pessimistic) portrait of traditional industrial cities.

⁴ ‘Land use’ and ‘land occupancy’ are considered here having different meanings: the former usually refers to the main functions in a given plot or space (it is a qualifying variable), while the latter refers to the intensity of the land exploration by such use (a quantifying variable, related to density). For instance, the same building, settled on a fraction of land (land occupancy), can perform different functions (land use) during its lifetime. Derelict industrial sites exemplify land occupation without proper land use, while temporary activities in public spaces (such as fairs) are land uses that usually do not engender land occupancy.

infrastructural role during the industrial era. In some cases, the reintroduction in these locations of more valuable uses (such as housing) reawakens more traditional urban functions that had been replaced during the last century by industries and transport facilities. The architect-urbanist Han Meyer (1990, p. 91) presents a compelling argument, both symbolic and pragmatic, to justify the ongoing surge of riverside redevelopment:

The waterfront is a high spot in the urban landscape and also the most open part of the town, where the town is directly confronted with the extensive, fresh and unspoilt character of the river; in short an environment which can at least arouse the illusion of cleanliness and freshness in order to be able to compete with the green environment of the suburbs.⁵

In fact, current regeneration processes tend to focus on gradually engendered '*terrains vagues*' – in the sense proposed by the architect Ignasi de Solà-Morales (1995) – within consolidated urban areas; that is, they foster the reoccupation of spaces turned obsolete mainly by deindustrialization. Many of these brownfield sites that need to be brought back to urban life are located in riverine locations⁶, being thus potentially prone to floods. As judiciously recalled by Viganò (2012, p. 7),

[f]or the first time in the history of modern urbanism, (...) urban growth does not proceed on well-selected green fields, or in the best areas for settlement, but in those where a number of environmental and/or disaster risks have accumulated, often in relation to their industrial past. (...) Today, in the name of sustainable development, urban designers confront themselves with recovering and recycling more difficult and 'bad' areas, thus avoiding the consumption of more green fields. With this new cultural and pragmatic approach, the integration of risky areas into new forms of habitat also means an opportunity for innovative projects proposing strategies to address this condition, starting from a careful examination of the territory and its characteristics.

Therefore, these "bad places" (Viganò, 2012) are currently being explored as potential opportunities for urban regeneration, knowing that they may be 'bad' as regards the involved challenges (namely flood risk and pollution) and their most recent condition of abandonment and decline, but they are also 'excellent' places if other economic, landscape and social potentials are considered (Barroca, 2006; Barroca & Hubert, 2008). Besides their inherently attractive scenery and ambience, river spaces normally have unique advantages in terms of location, accessibility, installed infrastructure or amenities, which, if not properly recognized, can represent losses of gain in other urban terms, such as centrality and imagery. In this sense, some environmental concerns, in part linked to the mitigation of climate change (for instance the prevention of urban sprawl), have been pressing the redevelopment of such underused floodable urban areas. In fact, it is becoming increasingly consensual that, despite the apparent contradiction, urban redevelopment on floodable areas is often necessary (ICE, 2001; RIBA, 2007; Barker &

⁵ This ambiguous condition of riverfronts, being sometimes a last resource of inner-city wasteland to be explored by real-estate developments and at the same time a major area in connection to nature, makes their regeneration a sensitive issue. In fact, some authors have been criticizing the ordinary form and content of many current riverfront projects, when these are mostly driven by property speculation and economic maximization, to the detriment of local traits and environmental issues (Saraiva, 1999; Diedrich, 2011). These authors claim that the ultimate outputs of such flagship riverfront interventions do not really increase the value of the riverine setting in a wider sense.

⁶ It is interesting to note that in the pioneer riverfront regeneration cases, which involved the transformation of port areas (for instance in Baltimore, in Boston or in London), the floods' issue was barely mentioned, due mostly to the fact that in such controlled water environment, variations have never played a significant role.

Coutts, 2009; Jha *et al.*, 2011; Terrin, 2014; CEPRI, 2015; Bonnet, 2016). When facing no better alternatives for their development, even when the menace of floods is known, some riverine cities are pushed to “[flood] exposure as a forced choice” (Rossano, 2015, p. 20), which leaves no other options than to manage the flood hazard and/or the vulnerability to it. But this approach is not a novelty, as recalled by the economist Abhas Jha and his colleagues (2011, pp. 30-31):

It is possibly even desirable to expose large populations to areas of flood hazard if the population is equipped to deal with the hazard without danger of damage. Historically, this approach was common as the advantages and necessity of coastal and riverside living were seen to outweigh the risks associated with the occasional flood. Over time, the desire to control nature has led to lifestyles which are less flexible and receptive to flooding. In addition, demographics have contributed to a population which may be less aware, less adaptable and therefore suffer more from flooding.

It is also worth noting that floodable “bad places” may not necessarily be the ‘worst places’ for urban redevelopment; for instance, multi-risk zones, such as polluted unstable soils around airports or Seveso-type industrial units, would require a much more complex management to safely absorb multiple urban functions. In any case, when located in traditional compact settings⁷, flood-prone “bad places” suffer from a double pressure: on one hand, the ambition of pursuing urban redevelopment to instil new life into these large derelict urban sections; on the other, their need to be largely protected, through flood-management strategies. While enhancing urbanity is the main goal in the former case, safety is the focus of the latter; and dealing concomitantly with these two legitimate objectives requires a difficult balance between constraints and opportunities within riverine zones. For some flood-prone areas that had previously been occupied as integral liveable parts of a city (comprising thus major monuments and other valuable urban assets), simply banning further occupation or the extension of existing buildings would totally compromise their ambience and identity (Terrin, 2014; CEPRI, 2015). Besides, it should also be acknowledged that urban extensions on greenfield land, if not properly managed, can in themselves be a flood-risk factor as important as the densification of former brownfield sites (ICE, 2001; Zevenbergen *et al.*, 2010; Jha *et al.*, 2011).

As a synthesis of the prevailing context, the CEPRI (2015, p. 9) identified five major reasons to “address the issue of urbanization in floodable zones, particularly in the areas of urban regeneration”. First, one cannot overlook the fact that “there are already housing, neighbourhoods and even cities fully built in floodable zones and these continue to be legally built today” (CEPRI, 2015, p. 9). Therefore, it makes no sense to simply eradicate existing urban segments due to flood risk; at the same time, it also does not make sense to

⁷ The issue of dealing with floods in low density urbanizations (sprawl, in the form of peripheral urban extensions), even when duly authorized and abiding by the land-use requirements in force, may represent an extra (collective) burden for inhabitants and authorities. Economically speaking, these spaces do not gather enough people and assets to justify the introduction by the public sector of large and expensive engineered flood-defence schemes (which are normally associated with already existing dense urban fabrics that need to be kept safe). On the other hand, following the same reasoning that applies for example to achieving energy efficiency in buildings, dispersed urbanization has much more flexibility to adopt *ad hoc* flood mitigation or adaptation measures, which are not always applicable in consolidated urban centres due to the simple lack of space to put them into practice. Yet, these isolated measures can hardly have positive effects in terms of place-making, as integrated water-management strategies potentially have when applied in traditional public spaces.

carry on urban development as if flood risk were not a real threat. As proposed in a World Bank research paper on cities and flooding, when “it is fruitless to attempt to prevent greater urbanization, then it is all the more critical to plan and control the location and design of the built environment to mitigate against the increased risk of flooding” (Jha *et al.*, 2011, p. 45). Secondly, building in floodable zones today is often not only lawful but also implicitly encouraged (at least in France and the United Kingdom), since urban densification is being pursued as a reaction against sprawl and its associated contribution to climate change. The third argument is based on the fact that “the absolute protection philosophy has so far proven to be flawed” (CEPRI, 2015, p. 10), an issue to be further discussed in Section 2.3. The fourth point is related to the irreversibility attached to unsound development in flood-prone zones: in fact, due to the great inertia of the urban environment, the anticipation of stricter flood scenarios appears as a savvy planning option. Finally, the fifth reason is that climate-change challenges cities’ ability to cope with extreme events that are likely to increase in frequency and severity (Bates *et al.*, 2008).

Yet, besides all these justifications, regenerating urban riverfronts is not a simple task; flood proneness indeed represents only one feature of these ever-changing spaces, in which multiple stakes and conflicting demands often overlay. Therefore, the pragmatic approach of redeveloping flood-prone areas involves weighting existing site constraints and strengths against each other, while recognizing the (most of the time) sporadic and temporary character of flood events. In fact, more immediate and regular urban needs (like housing or job creation) tend to exert – justifiably, one could argue – high pressures on flood-prone areas, as the experience of daily challenges by local populations is far more direct than that of floods (Klijn *et al.*, 2013). In this vein, depending on the pursued management option, defending a city from floods can, as a backlash, lead to its stagnation through the constriction of sociocultural and economic potentials; on the other hand, boosting such potentials requires among others to ensure the minimum safety conditions for their physical endurance over time. Equating tangible and potential, short-term and long-term benefits and costs (including expected damage repairs) is thus a matter of choosing which urban priorities should take precedence, and involves a process of decision-making that in principle should concern several public authorities (in the fields of urban planning and design, infrastructure, civil defence etc.), but also the society at large.

Regarding such a delicate balance, it is interesting to note that the EU Flood Directive (EU, 2007), conceived to better prepare and protect the Community’s territory from floods, presents spatial planning and land use among the relevant aspects that should be taken into account when formulating the required flood-risk management plans – and not the other way round. That is, spatial planning, taken as a vector of overall European development, should not be restricted by flood-risk management endeavours (EU, 2007, p. 31). This unidirectional relationship may not be taken as incoherent if we consider that spatial planning deals with several day-to-day (social and spatial) demands (besides rivers’ variations), and that flood risk eventually represents just one-off contingencies, although with probable serious repercussions, when reasonably compared with other urban needs. Integrated flood-risk management should then pursue a “mature approach”, which “recognizes the limits and seeks to balance flood-risk priorities with other development goals” (Jha *et al.*, 2011, p. 45). The challenge is thus to promote liveable cities, with a

strong identity and a distinctive sense of place (their human face), along with a safe urban environment that does not compromise human life in its broadest sense.

In this context, the urban regeneration of riverine spaces conforms a timely opportunity to review current concepts and practices regarding dealing with fluvial floods. In fact, urban redevelopment should not be carried out ignoring floods' threat, but should ideally be pursued in an integrated manner, in which overall urban life enhancement (urbanity) and flood protection (safety) merge into a single goal. To follow this trail, instead of viewing the occupation of flood-prone zones as an intrinsic risk factor (related to higher urban densities and thus increased exposure) and solely as a problem, an effort is needed to conceptualize adapted urbanization as a solution to deal with flood risk (with the reduction of damage through actions on the vulnerability)⁸. Of course this cannot be attained straightforwardly, but some recent urban interventions already show an understanding of floods as an asset to be exploited.

This perspective is for example clearly expressed in the French pun "*atout risques*" (Bonnet, 2016), which refers to the recent rediscovery of the territories prone to risks, exploring thus the ambiguity of 'risk as an asset', on one hand, and 'everything is risky', on the other. Such pun also plays with the idea of risk as a chance, which may have either positive or negative outcomes, although the positive ones are often ignored when it comes to floods (for instance, the next section primarily explores floods as regards their negative effects). But floods can indeed be perceived and dealt with as an asset, as the actual experiences of some of the urban projects presented at the end of Section 2.5 already shows.

2.3 Understanding flood risk

In the previous section, some terms related to risk sciences were sparsely used when referring to floods, yet without specifying their actual understanding in the framework of this thesis. This section will particularly introduce floods, flood risk and other associated concepts, which are cornerstones to further develop, in Section 2.4, some alternatives for dealing with flood-prone spaces in urban-regeneration initiatives.

Flood risk is part of the wider water issues in the urban setting, which comprise not only excess and shortage situations but also the aesthetic, ludic, symbolic, ecological roles played by water in the city (Saraiva, 1999; Dreiseitl & Grau, 2005; Prominski *et al.*, 2012). Perhaps because of their destructive nature (and the corresponding institutional apparatus needed to deal with them), floods are nonetheless normally treated as a separate water subject. Significant evidence in this sense is given by the European Water Directive, issued in 2000, which barely mentions floods among other water issues such as availability, quality and supply (EU, 2000). A series of severe flood events in central and eastern Europe in 2002 (see Figure 6) was necessary to bring about a flood-specific

⁸ A similar reasoning was developed by the geographer Valérie November (2003), in her analyses of urban fires focused not only on their destructive vein but also on their key role in the restructuring of urban spaces and the creation of neighbourhoods.

communication from the Commission in 2004 (CEC, 2004; Brun, 2010), which was the basis of the EU Flood Directive, issued three years later (EU, 2007). The association of floods to harm and losses, to risk and disaster, is patent in the impressive images of cities under water during extraordinary events, such as the ones experienced in the United Kingdom in 2007, in the Balkans in 2014 and in northwestern Europe in 2016. However, when used figuratively outside the water context (for example, in the literature), the term ‘flood’ is generally associated with abundance, possibly in a positive sense of bonanza, a connotation that is perhaps related to the fertility traditionally brought by floods to agricultural fields (that is, to non-urban environments) (Cuny, 1991).



Figure 6: Impact of the August 2002 flood of the Vltava River in Prague

Source: Brun (2010, p. 23),
© CTK Photobank

In any case, it is also worth noting that the term ‘flood’ has an ambiguous use in English, which should be clarified from the outset. In the *International glossary of hydrology* (WMO/UNESCO, 2012, p. 124)⁹, ‘flood’ is defined as the “[r]ise, usually brief, in the water level of a stream or water body to a peak from which the water level recedes at a slower rate”; its equivalent terms in French and Spanish are, respectively, ‘*crue*’ and ‘*crecida*’. In this sense, and focusing particularly on rivers, floods would be linked to the seasonal variability of the streamflow itself. Yet, the standard use of the term ‘flood’ refers to such condition, but above all to the spillover of water onto the land along a stream, a process related to the territory nearby and not directly to the stream. To this second phenomenon, the same glossary attributes the term ‘flooding’ (or ‘inundation’): the “[o]verflowing by water of the normal confines of a watercourse or other body of water” or the “[a]ccumulation of drained water over areas which are not normally submerged” (‘*inondation*’, in French, and ‘*inundación*’, in Spanish)¹⁰ (WMO/UNESCO, 2012, p. 126).

⁹ Jointly issued by the World Meteorological Organization (WMO) and the United Nations Educational, Scientific and Cultural Organization (UNESCO), the printed version of this glossary is issued in 4 UN official languages (English, French, Spanish and Russian) (WMO/UNESCO, 2012); but an online version is also available in 11 languages (including Portuguese) (WMO/UNESCO, 2009).

¹⁰ In Portuguese, the first term is ‘*cheia*’, while the second one is ‘*inundação*’ (WMO/UNESCO, 2009).

Considering that only this last process is closely related to risk (the sometimes used expressions ‘*risque de crue*’, ‘*riesgo de crecida*’ and ‘*risco de cheia*’ are not really rigorous), and that the expression ‘flooding risk’ is much less used, it may be important in some instances to distinguish well the two phenomena. Therefore, the term ‘high waters’ will be used as of this point to refer to rivers’ water-rising process triggered by hydrometeorological events and the overall (natural and man-made) conditions of the river basin, while the term ‘flood’ will refer to the related territorial process, with sociocultural repercussions. Although obviously linked, these two processes do not refer to the same reference point (the river itself in the first case, the adjacent territory in the second). This distinction is in accordance with the flood concept stated in the EU Flood Directive¹¹, which indeed comprises a territorial process: “the temporary covering by water of land not normally covered by water” (EU, 2007, p. 29). Anyway, even if ‘high waters’ refers precisely to an intrinsic river process, this is highly influenced by the impacts of several human actions on the surrounding territory.

At the same time, the term ‘flood’ is concurrently used to name very different phenomena, even if all of them have rising water levels as an underlying feature. Not only are sources of floods diverse, but even within the same category of fluvial floods the involved water dynamics can be dissimilar, if we consider such features as the flow-propagation velocity or the overflow duration (Ramos & Reis, 2001). For instance, slow-onset floods develop after lengthy rainy seasons, at a reduced pace and with low flow velocities, usually allowing enough time for the issuing of alerts and evacuation, if needed. On the other hand, rapid-onset floods happen more suddenly and violently, following torrential rains, and their consequences are frequently much more harmful. Fluvial floods in estuarine cities present increased complexities due to the oceanic influences (daily tides and episodic sea surges), which normally play a more significant role than the river dynamics themselves.

Flash floods (also called ‘urban floods’ or ‘pluvial floods’) are not related to river dynamics, and usually occur in highly impermeable areas in which drainage systems are insufficient to deal with a concentrated water overload. Yet, they can equally happen for example as a result of abrupt failures of water retaining structures such as dams and dykes (Jha *et al.*, 2011), as well as in the course of past waterways that were buried or canalized, or along most-of-the-time dry watercourses (wadis). The predictability of floods and the possibility of having early-warning systems in place are highly dependent on these temporal characteristics and on the amount of water involved. Therefore, dealing with such different processes always requires a thorough understanding of their particular traits in a given location (for instance, in the case of riverine floods, the water-flow velocity depends

¹¹ It should be noted that, although important, this distinction is not consensual. For example, using his native language French, the geographer Jean-Noël Salomon (1997) defines ‘floods’ (‘*inondations*’) as consequences of important high-waters events (‘*crues*’), while Prominski and his colleagues, in the glossary of their book *River, space, design*, use both ‘flood’ and ‘high waters’ as synonyms to refer to the “[l]evel or discharge of a river that is markedly higher than the mean water level” (2012, p. 283). In the EU Flood Directive (2007) itself, only the French version is fully consistent in the use of both ‘*crue*’ and ‘*inondation*’; in the Spanish version, the term ‘*crecida*’ does not appear (‘*inundación*’ is used indistinctively, in the same manner as ‘flood’ in the English version), while in the Portuguese version, in spite of some attempts of consistency, the imprecise expression “*riscos de cheia e inundações*” is used.

on the size and morphology of the overall basin, while the extent of the floodplain can be predicted with some accuracy).

The term ‘flood’ is in many instances accompanied by the term ‘risk’, another concept that requires some introductory clarifications. In the first international attempt to elucidate and unify the terminology related to ‘natural disasters’, ‘risk’ was defined as “the expected number of lives lost, persons injured, damage to property and disruption of economic activity due to a particular natural phenomenon”¹² (UNDRO, 1980, p. 5). This definition stressed the understanding of risk as a potential or a threat, not a real tangible event; yet, when it materializes, a disaster (or at least a damaging episode) occurs. In order to assess and quantify risk, and ultimately to minimize the related disaster losses, the meeting participants agreed that data about natural hazards (their “probability of occurrence”), vulnerability (“the degree of loss to a given element at risk”) and elements at risk was then required (UNDRO, 1980, pp. 5 *et seq.*).

The main messages were: risks can be quantified, hazards should be controlled, and disasters must be prevented. In fact, this framework put forward a restricted natural-sciences hazard-based approach, in which hazard prediction and control were taken for granted, and the ‘elements at risk’ were presented as passive targets located in the wrong place. Since the 1980s, the concept of risk has been evolving, with the diversification of the ways it has been framed (White *et al.*, 2001; Pelling, 2001); for example, social considerations have been increasingly stressed, recognizing not only the more or less fragile nature of the ‘elements at risk’ but also their varying capacity to cope with adversities. In any case, the focus on risk’s main components – namely the hazardous event and its possible effects – has remained.

These two elements were kept, for example, in the current definition of risk adopted by the United Nations Office for Disaster Risk Reduction (UNISDR), despite its use of more general terms: “[t]he combination of the probability of an event and its negative consequences” (2009, p. 25). The definition stated in the EU Flood Directive also reflects this stance: “‘flood risk’ means the combination of the probability of a flood event and of the potential adverse consequences for human health, the environment, cultural heritage and economic activity associated with a flood event” (EU, 2007, p. 29). Even if the ‘elements at risk’ are clarified and detailed in this notion, nothing is referred to about their characteristics implying smaller or greater vulnerability to floods.

Because of the importance of this qualitative aspect for our research, flood risk was here split into three main components, being understood as a function of: the probability of occurrence of a particular flood hazard, the exposure to it and the vulnerability of the exposed people and assets to it. Considering that the scope of this thesis concerns only floods linked to river hydrodynamics, the hazard here refers to the phenomenon of high waters following abnormal hydrometeorological conditions; it is thus the rise of a river’s waters above their usual

¹² This definition emanated from an expert meeting promoted by the Office of the United Nations Disaster Relief Coordinator (UNDRO) in 1979, gathering engineers, geosciences experts and representatives of concerned UN agencies.

levels¹³. This idea of rivers as sources of hazard sharply contrasts with their praise as major contributors to pleasant landscapes and ambiances in the urban setting. In its turn, exposure refers in our risk understanding to the presence of “people, property, systems or other elements” (encompassing both infrastructures and related services) in an area prone to floods (UNISDR, 2009, p. 15); it is hence a binary variable, each asset taking a ‘yes’ or ‘no’ value. Within this component, one may refer to what is at stake or the quantity of exposed people and assets (i.e. the number of elements taking a ‘yes’ value), yet nothing can be said about their capacity to actually withstand the hazardous event.

The third risk component, vulnerability, refers precisely to the fragility of the exposed elements, their propensity to be damaged in the wake of a given hazard, and comprises their capacity to absorb, react and/or cope with disturbing events. Therefore, the degree of vulnerability can widely vary, in time and space, depending on several factors, mostly related to physical, social, economic, and environmental conditions (UNISDR, 2009). For this reason, the adopted flood-risk framework treats exposure and vulnerability as independent variables, even though these are commonly found in the literature as merged into a single concept – see for instance Cutter (1996), Cutter *et al.* (2003) or Cunha (2013).

One aspect is clearly missing in this understanding of vulnerability to floods: it relates to the value or strategic function of the exposed elements; for example, buildings such as hospitals or fire stations are considered critical (or highly sensitive) regardless of their robustness (UNISDR, 2004), a condition that derives from their instrumental value when a disaster strikes. In this sense, vulnerability concerns two domains, not always straightforwardly associated one to another: the fragility of an element exposed to floods – its proneness to be damaged or “the potential for loss” (Cutter *et al.*, 2003, p. 242) – and the relative value of such exposed asset (the potential amount of loss).

So what would be the best answer if one asked which of the following two assets, located in the same flood-prone zone, is more vulnerable: a derelict factory or a well-constructed (and also well-maintained) flood-adapted nursery? Depending on the specificities of the context in which the term is applied, ‘vulnerability’ may thus indicate either the (lack of) capacity of the exposed elements and their resources to deal with a flood situation or the actual value of the exposed items. The former is the most frequent sense when one refers for instance to the Bangladeshi context, while the latter is the embedded sense when one refers to the Dutch context.

It is also worth mentioning that since the expression ‘exposed elements’ encompasses both people and assets, there are indeed two vulnerabilities combined in one common concept, even if there is not always equivalence between the two. On one hand, the physical (or structural) vulnerability, related to the value and fragility of exposed physical structures (UNISDR, 2004), is a concept anchored in the land-use planning, engineering and architecture realms that is concerned with the material aspects of the built environment

¹³ According to the UNISDR terminology, ‘hazard’ is defined as a “dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage” (2009, p. 17).

(such as its characteristics and state) behind its proneness to harm. It comprises such factors as population density, remoteness of a settlement, design of and materials used in buildings (be them critical or ordinary infrastructures), date of construction and the effectiveness of maintenance (UNISDR, 2004).

On the other hand, the social vulnerability refers specifically to people and their collective organizations¹⁴ (Cutter, 1996; Cutter *et al.*, 2003; Cunha *et al.*, 2011; Mendes *et al.*, 2011). In order not to make the adopted flood-risk framework even more complex, but recognizing the existence of some imprecision, these two types of vulnerability were taken together. Despite the fact that the social vulnerability to floods is indeed related to the individual and social general conditions and preparedness, the proposed amalgamation herein may not be inadequate (this is, in fact, the actual use of the term by many authors¹⁵), since the focus of this research is on physical vulnerability. Anyway, it should be added that, for practicability reasons, most studies dealing with social vulnerability do not associate this trait to any specific hazard (for example Cutter (1996), Cunha *et al.* (2011) or Mendes *et al.* (2011)), although it can be studied on “an individual hazard basis”, as noticed by Cutter and colleagues (2003, p. 257). Thus, most of the time, a ‘general’ or ‘generic’ social vulnerability is presented¹⁶.

The adopted conceptualization of flood risk as composed of hazard, exposure and vulnerability clearly reflects the “risk triangle” model, devised by the economist David Crichton (1999) to support risk assessments by the insurance industry (see Figure 7): each edge of the proposed triangle represents one of the three risk components, and the resulting area quantifies the risk itself. In fact, risk quantification has always been one of the main tasks of the insurance industry, by proposing a private-led pragmatic approach, whereby risk drivers are monetized and made commensurable, to allow better risk-management decisions.

“If any one component or ‘side’ of the triangle is zero, then there is no risk”, Crichton stated (1999, p. 102); the simplicity of this model and the didactic character of its visual representation have prompted its adoption by several authors in different disciplinary fields, from geography to economics¹⁷. In their research paper on urban floods, Jha and colleagues (2011) complemented the “risk triangle” approach with another well-known flood-risk framework, formulated by the Institution of Civil Engineers (ICE): the “source-pathway-receptor” model (ICE, 2001, p. 16) (see Figure 8).

¹⁴ For the geographer Susan Cutter (2011), ‘exposure’ is lumped in with the physical vulnerability, while the term ‘vulnerability’ in fact refers to the social vulnerability.

¹⁵ See for example White (2010) or Kaźmierczak and Cavan (2011). Nonetheless, in the opposite direction, Cutter *et al.* (2003) consider that the social vulnerability is derived from both social and place inequalities.

¹⁶ An exception to this pattern is for example the study for the Portuguese municipality of Torres Novas, carried out by the geographers Lúcio Cunha and Cátia Leal (2012), in which a profile of vulnerability was acknowledged for each identified hazard.

¹⁷ For example, the “risk triangle” (Crichton, 1999) was used in the context of floods and urban planning by the geographer Iain White (2010, p. 97), who added a new concept, resilience, to each of the components as a lessening factor (although without duly explaining how to minimize the hazard and the exposure through resilience). A World Bank multidisciplinary team dealing with disaster risk management, led by the economist Abhas Jha, also adopted this approach in a research that explored different adaptive actions on each of the three risk components to reduce the overall flood risk in the urban setting (Jha *et al.*, 2011).

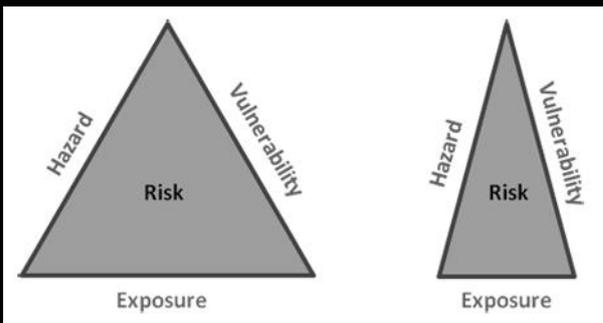


Figure 7: The “risk triangle” model

Positive or negative variations in any of the three risk components (the triangle’s sides) lead to a higher or lower risk (the triangle’s area)

Source: Crichton (1999, p. 103)

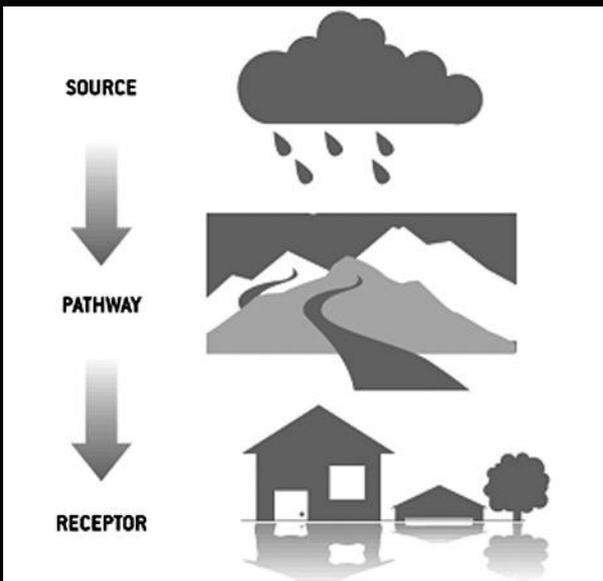


Figure 8: The ICE’s “source-pathway-receptor” flood-risk model

Source: ICE (2001, p. 16)

In this second model, the source is understood as “[t]he initial condition that can lead to a hazard and subsequent risk being realised” (such as precipitation or snowmelt), while the pathway is “[t]he means by which the source can impact a receptor” (which comprises portions of land and watercourses); finally, the receptor refers to “[t]he target which will be threatened by harm from the hazard” (including people and property) (ICE, 2001, p. 80). Despite duly stressing some of the dynamics inherent to floods, this model nevertheless fails to present flood risk in a more integrated manner, as the “risk triangle” does¹⁸. Also, the term ‘receptor’ can wrongly induce one to think about the exposed people and structures as passive agents facing floods, although the ICE clearly states that, in its model, the end-of-pipe (that is, the receptors) is the stage that can most be acted upon to reduce flood risk as a whole (ICE, 2001).

The flood-risk triangle conceptualization has some clear advantages. First, the three risk components are presented without any hierarchy between them (even if different strategies of risk management may value them in some way hierarchically): the physical

¹⁸ These two models were combined into a single one by the geographers Aleksandra Kaźmierczak and Gina Cavan, in their study on surface water flood risk in Greater Manchester. Hazard was linked to source (the cause of surface water flooding), exposure (referring to the “geographical location of a receptor”) to pathway, and vulnerability to receptors (2011, pp. 185-186). But such amalgamations may not always be so simple: sometimes receptors and pathway are so closely linked that they can hardly be distinguished (for instance, urban transport networks can be both pathways and receptors during floods).

hazardous event and the elements that may be subject to it are equally stressed. Secondly, this conceptualization highlights the fact that risk depends on the concomitant existence of all three components (a hazardous flood event is not enough to produce a disaster), and that when they are all present the impossibility of zero risk is clearly acknowledged. The flood-risk triangle makes it easy to visualize that actions aiming at flood-risk reduction may be pursued in any of the risk components, either in isolation or in combination. Thus, as stated by Crichton (1999, p. 102), “the insurance risk triangle is of value in helping those involved with disaster management understand how risk can be measured and also managed”.

Another positive aspect of this model is that it disentangles exposure from vulnerability; yet, for the sake of simplification, many authors either take exposure and vulnerability as synonyms (e.g. ICE (2001) and Burby *et al.* (2001)) or, instead, exposure as one feature of vulnerability (e.g. Cutter (1996), Pelling (2001), Saurí Pujol (2003) and Adger (2006)). As regards particularly flood risk, when exposure is inaccurately taken as a proxy of vulnerability, all exposed items are consequently taken as equally and fully vulnerable, which is a crude simplification. At best, this amalgam would represent the ‘worst case’, but this is not always the scenario taken as reference when conceiving flood-management strategies. In line with the standpoint taken by the architect Bruno Barroca (2006) and other authors, we consider that the vulnerability of a given element does not automatically result from its exposed condition: a building can be located in a flood-prone zone (that is, exposed to floods) but at the same time be well protected, meaning that its vulnerability is low or well managed. On the other hand, exposed elements in a given area usually have different degrees of vulnerability (CEPRI, 2015), based either on their relative importance or their sensitivity. Therefore, the lumping together of these two concepts prevents vulnerability from being recognized as a multifaceted attribute of riverside structures and tackled accordingly.

Despite these advantages, the flood-risk triangle model has some important shortcomings that should be highlighted from the outset if it is to be used outside the insurance realm. First, it may give the wrong impression that flood risk is more or less ‘static’ and can be easily delimited, since the triangular shape is well recognized for its formal stability. Also, by clearly separating the three risk components, it does not indicate any interlinkage between them, as if they were completely independent from each other (an issue that will be further developed in the next section). In the same vein, this framework does not draw attention to the fact that people are indeed directly involved in all the three components of flood risk (see Figure 9), as stressed above in the adopted definitions of flood hazard, flood exposure and vulnerability to floods¹⁹. Accordingly, people are not only among the ‘elements’ at stake as regards flood risk, but are also active inducers or modifiers of flood’s hazardous processes and the related exposure.

¹⁹ Understating people’s role of risk co-creators, as implied in the “risk triangle” (Crichton, 1999), is not a naïve standpoint, since insurance is considered “not just a way of dealing with consequences of risks perceived as external [but] it is a way of helping create that perception” (Levitas, 2013, p. 124).

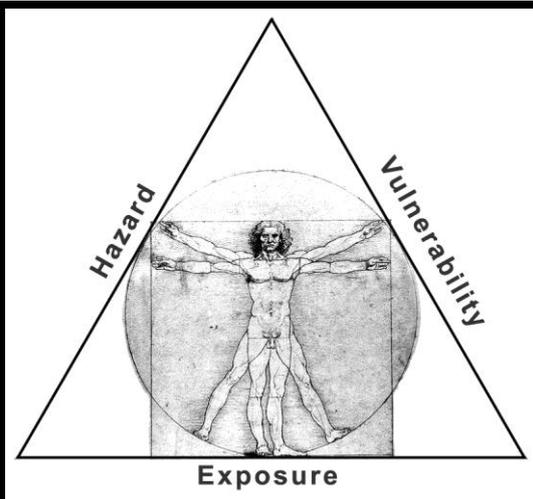


Figure 9: The flood-risk triangle's concealed human footprint

People are in fact at the centre of the risk concept, with the feet entrenched on exposure, while the hands manipulate hazard and vulnerability; the depicted movements suggest both the dynamic nature of risk and the human leeway on it

Source: elaborated by the author, based on Leonardo da Vinci's Vitruvian Man sketch (ca. 1509) and Crichton (1999, p. 103)

A means to overcome such limitations is to recognize flood risk as a hybrid, in the sense proposed by the philosopher Bruno Latour (1993), that is, as a complex phenomenon in which natural and human processes intertwine. Of course, fluvial floods are not only the result of river overflows, but mostly of the confrontation of the water with human interventions (including on the river system itself), valuable assets and ultimately human life. It is not by chance that floods are categorized by the UNISDR among the “socio-natural hazards”, the ones whose occurrence is being increased by human activity “beyond their natural probabilities” (UNISDR, 2009, pp. 27-28). Fluvial floods may thus be conceived as hybrids that connect a ‘natural’ phenomenon (river dynamics, turned into a hazard, and the space prone to it, which relates to the exposure aspect) to human culture and values (comprising what is at stake). In fact, the former only becomes a problem when it comes across human-made assets or cultural values that are distinguished from what is usually called ‘nature’.

For instance, a ‘flood’ event in a ‘natural’ setting is nothing more than the river process of high waters, which is itself part of nature. Therefore an overflow of a river or a lagoon in a North American-type natural reserve, in which the presence of people is generally not allowed (Diegues, 1998), does not really incur problems. On the contrary, when such a phenomenon hits profitable agricultural fields or urban areas not well prepared to face it, there is indeed a nuisance and/or harm, in the form of a flood disaster. Nowadays, as pristine places are less and less common, and almost every corner of the world exists on behalf of the urban society²⁰, high waters are increasingly being turned into floods, into a fully cultural subject. Perhaps this could be the reason why, in English, the term ‘flood’ is indiscriminately used for both processes (as previously discussed on p. 20), hence acknowledging the omnipresence of the cultural aspect within these phenomena.

²⁰ In contrast with this view of the end of nature, whereby all the ‘natural nature’ has already been scanned, scrutinized, corrupted, amalgamated to culture (Castree & MacMillan, 2001), there are also claims in other directions. For example, in her *Granite garden*, the landscape architect Anne Spirn (1984) sustains that cities are part of nature, not only because they are the natural habitat of the human species, but because they cannot be understood in isolation from overall natural processes. This conceptualization converges with the one by the social psychologist Serge Moscovici (*apud* Diegues, 1998), for whom nature is not an outside environment to which humankind adapts, but nature and human beings actually form a unitary whole. On the other hand, the geographers Maria Kaika and Erik Swyngedouw (2011, p. 98) recall that the consolidated “myth that the city is where nature stops” has already been demoted by several scholars, and thus argue “that the urban process has to be theorized, understood, and managed as a socio-natural process”.

Another fact that emphasizes the hybrid nature of floods is that, despite being included among ‘natural’ hydrometeorological or environmental risks, floods are increasingly driven by human actions (Rebelo, 2003), with the power to impact equally on its three components. With the accumulation of centuries of modifications in rivers and their basins, even the aspects of floods that used to be considered natural (e.g. river hydrodynamics) are now being more and more recognized as anthropogenic-driven ones (Pelling, 2001). So alternatively, floods can be comprehensively described as a human-natural process that is continually being constructed and reconstructed by each and every intervention on the territory. In this regard, it may be a crude reductionism to merely consider people fragile passive elements to be protected within a flood-risk framework (as it is frequently done); indeed, society as a whole should be acknowledged as active co-producer of flood events.

If the ‘natural’ aspect of ‘natural disasters’ has been more and more contested (Mileti, 1999; Pelling, 2001; Mileti & Gailus, 2005; Alexander, 2011), this is even more flagrant in the case of fluvial floods, which are often (unconsciously) designed events. In fact, floods can be understood as collective artefacts that are most of the time unintentionally produced, in which the flood hazard meets unfavourable social, economic and environmental contexts. This argument is aligned with the point of view developed by the sociologist Dennis Mileti (1999), after analysing several disastrous cases involving ‘natural hazards’ in the United States.

The recognition of floods as a hybrid is all the more important because of the prevalent worldview in which nature and society (culture) are mutually exclusive, separate domains, as discussed by Latour in his *We have never been modern* (1993). Deep-rooted in the Enlightenment, this dualism has been supported by the practice of “purification”, which “creates two entirely distinct ontological zones: that of human beings on the one hand; that of nonhumans on the other”, explains Latour (1993, pp. 10-11). Due to the relegation of the social aspects of ‘natural things’ and of the natural aspects of ‘social things’, what is conceived as ‘natural phenomena’ has been objectively studied and dealt with by the hard sciences, while social sciences have exclusively focused on ‘social’, subjective, issues. Yet, Latour argues, this artificial segregation by purification cannot be sustained any longer, due to the growing proliferation of hybrids that cannot be simply categorized as a natural or social concern. Climate change and biotechnologies are among the clearest examples of recent hybrids in which nature has “disappeared as the outside of human action” (Latour, 2009a, p. 8).

When the practices of purification are unveiled and thus no longer possible to be carried out as usual, even our understanding of cities, outstanding long-lasting hybrids, has to be completely reassessed, to converge with the appreciation of Lévi-Strauss (1955), already presented on p. 15. In addition to being as ubiquitous phenomena as cities, floods are also a perfect illustration of a combined socio-natural process in the sense posed by Latour (1993), although its ‘natural’ dimension has nothing to do with a prevailing romanticized idea of ‘good nature’, which is perceived as having an intrinsic positive value (Castree, 2001; Kaïka and Swyngedouw, 2011).

Being attached to the unstable, unpredictable and dangerous facet of ‘nature’, floods come closer to what the architect and historian David Gissen has defined as “subnature”: “threatening” or “peripheral and often denigrated forms of nature” (2009, p. 21). According to the author, although contrasting with “desirable forms of nature” strongly associated with comfort, like natural lighting or vegetation (2009, p. 22), ‘subnatural’ manifestations such as filth, dust, mould or weeds have contemporarily been embraced by some innovative architectural designs, which foster a revision of the prevailing notion of environment.

In opposition to the conception that it is one of the roles of architecture to protect people from these hostile forms of nature, Gissen’s book *Subnature* explores and presents designs in which these second-class natures are being incorporated to add new meanings to the spatial experience. Doing so, these provocative projects somehow claim for a more inclusive appreciation of nature that also contemplates its less controllable ‘subnatural’ forms pervading each and every city. It may not be fair to simply classify floods as subnature, for their human side would be potentially disregarded (even if human actions and/or conceptions are actually always behind each form of subnature²¹); yet, many ‘subnatural’ expressions are induced by flood events (one just needs to think about dankness, mud, puddles or insects). Anyway, to stress the potential undesirable natures that permeate floods, it might be more adequate to understand them as a combined ‘socio-subnatural’ process that is continually and involuntarily produced.

Besides their hybrid nature (which has long been dissimulated by enduring practices of ‘purification’), floods – when portrayed as a risk – present two distinct characters, one ‘objective’ and another one ‘subjective’; being liable to evolve, they complement each other in the sense that both are indeed needed to duly represent flood risk. The first character corresponds to the scientific facet of floods, meaning how it is understood or constructed by natural-sciences and technology experts. Having an inherently spatial nature and associated with formal risk analysis initiatives (such as advocated by the International Risk Governance Council, the IRGC), this facet is ‘objective’ as regards the “materiality of risk (physical change and destruction)” (Beck, 2010, p. 51), and relates to the so-called “realist vision of risk” (Aven & Renn, 2010).

On the other hand, the second character is closely linked to the sociocultural and political domains; that is, how flood risk is assessed or constructed by laypersons, decision-makers and society as a whole. Accounting for such aspects as flood-risk perception and acceptability, this facet relates to the “social constructivist vision of risk” (Aven & Renn, 2010)²². These two domains are thus referred to, by the risk-sciences scholars Terje Aven and Ortwin Renn, as the “‘physical’ and ‘social’ dimensions of [flood] risk” (2010, p. 15). Following Latour’s standpoint, these two flood-risk characters are often (unconsciously,

²¹ The author notes that “[s]ubnatures enable us to better understand our environment as a product of social and historical processes, as something tied to social history, as much as natural history” (Gissen, 2009, p. 213).

²² The objective facet of risk is more recent than the subjective one: the former being structured in Europe from the 18th century on, after Lisbon’s notorious 1755 earthquake, while the latter is as old as humanity; regarding floods for example, its subjective side has been traditionally associated with flood myths like the epic deluge.

one may say) taken as dissociated, although they definitely feed each other, be it explicitly or implicitly²³.

In a closer look, the first character of flood risk is linked to both the physical hazardous event and the elements that may be subject to it, even though the former may be more pronounced than the latter, when one tries to represent the risk. It stresses mostly the physical side of flood risk: that is, the hydrologic and hydraulic processes that take place when a stream overflows. Mapping is a crucial element here to represent flood risk in a single picture (like in the flood-risk triangle), although through a spatialized and territorialized lens that relates to a single context. In fact, predicting the probable location of flood-prone sites and the expected intensity of the hazard (associated with the probability of occurrence) is regarded as a first step towards flood-risk reduction (UNISDR, 2004). The requirements laid down in the EU Flood Directive are a case in point, in which hazard and risk mappings are considered fundamental tools for assessing flood risk and subsequently taking risk-management decisions (EU, 2007).

Mapping presupposes that the flood situation is minimally known, based either on historical flood data or flood modelling and estimations. Nevertheless, cartography usually presents a fixed picture, contrasting with the fundamentally dynamic trait of flood risk; in fact, flood-risk maps normally do not account for either ontological uncertainty (related to “inherent variability”, which is thus unpredictable) or epistemic uncertainty (related to “incomplete knowledge”) (Zevenbergen *et al.*, 2008a, p. 83). Having this constraint in mind, in order to spatialize flood risk as a whole, one may begin by identifying the flood-risk components in a given territory: that is, by mapping flood hazards, and related exposures and vulnerabilities. Flood-hazard mapping usually indicates the susceptibility of an area to be hit by a flood with a given severity²⁴; so it relates to the intensity of the hazardous event, which is associated with its probability of occurrence (that is, the estimated frequency or the so-called ‘return period’).

More recurrent flood events have lower intensities, while higher intensities (more extreme conditions) are related to events with lower frequency (hence with longer return periods). Normally, the hazard map indicates the extent of the flood-prone zones (for an example see Figure 10), and sometimes also the water depth of the expected flow, its velocity and its composition (sediments, debris and pollutants) (EU, 2007); the extent of the expected damage is directly related to these factors, as well as to the (unmapped) speed of onset and duration of the event. In this sense, hazard mapping expresses space – not time –, thus giving weight only to one of the two types of river dynamics, as stated by Prominski and his colleagues (2012, p. 20).

²³ The hydrologist Guiliano di Baldassarre and his colleagues (2014) stated that there is indeed a segmentation regarding the handling of the risk components (in line with Latour’s stance), even within the scientific realm: the hazard is mostly dealt with by natural scientists, while exposure and vulnerability are considered remits of social scientists, a fact that, in their point of view, does not favour effective flood-risk management decisions.

²⁴ One should observe that within the adopted flood-risk framework, the territory itself cannot be considered less or more vulnerable to floods; yet, it may be susceptible (or not) to a flood of a specific severity.



Figure 10: An example of flood-hazard mapping, provided by the municipality of Ivry-sur-Seine (France)

The considered scenario is based on the so-called ‘centennial flood’

Legend:

- dark blue: expected flood depth of more than 2 m
- blue: expected flood depth between 1 and 2 m
- light blue: expected flood depth up to 1 m

Source: MEDAD (2011)

Indeed, hazard maps show the temporary flow fluctuations: vertical variations (especially when the watercourse’s width is limited by natural or man-made obstacles) and horizontal spread (which characteristically occurs in floodplains) (see Figure 11). On the contrary, the morphodynamic processes (comprising erosion and sedimentation) generally fall outside hazard mapping, although they can also greatly influence the floodings’ courses of action²⁵.

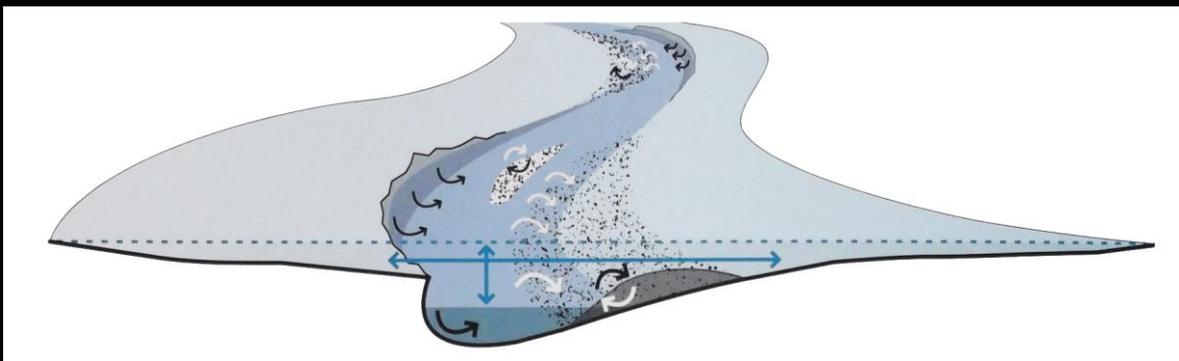


Figure 11: The complexity of rivers’ water dynamics

Legend:

- blue arrows: vertical variation and horizontal spread (temporary flow fluctuations)
- black arrows: erosion (morphodynamic process)
- white arrows: sedimentation (morphodynamic process)

Source: Prominski *et al.* (2012, p. 20) (modified by the author)

In an effort to reduce flood damage in the Community’s territory, the EU Flood Directive states that three scenarios should be considered when mapping the flood hazard: “(a) floods with a low probability, or extreme event scenarios; (b) floods with a medium probability (likely return period ≥ 100 years); (c) floods with a high probability, where appropriate” (EU, 2007, p. 30). It is interesting to note that this document somehow takes

²⁵ In the “Fundamentals” part of their *River. Space. Design.*, a comprehensive handbook devised to support designers’ tasks in dealing with riverine urban spaces, Prominski and his colleagues (2012) provide a clear and simple overview of the dynamics that are responsible for the continuous transformations of watercourses’ state and shape. In the “Design catalogue” part, these processes are coupled with several design strategies, tools and measures, which are then exemplified in the “Project catalogue” part, grouping outstanding European riverine projects.

into account climate-change prospects, since the 1% annual probability of flooding²⁶, which is usually considered the worst case by many authorities in charge of flood issues²⁷, is in this case qualified as a “medium probability” event (EU, 2007, p. 30). The river basin is the suggested scale to elaborate these maps, considering that topography and pedology are the main drivers of water processes (McHarg, 1969). Nonetheless, the related map outputs are not directly useful for defining cities’ land-use regulations, since the difference of scale plays a significant role: in densely built flood-prone settings, several ‘minor’ obstacles change both floods’ boundaries and behaviours, which are also impacted by the maintenance condition of canals and the drainage system. Consequently, actual urban flood zones are “no longer determined only by natural elements, but increasingly by the effects of man-made civil works, earthworks, buildings or planted vegetation, as a result of past political decisions” (Rossano & Hobeica, 2014, p. 290).

Also, some small-scale alterations (such as soil sealing or new infrastructures in the urban setting) that actually impact on floods’ propagation are not always duly taken into consideration in flood maps, since they are not captured as fast as they occur. Therefore, a focus on flood risk strictly through hydraulic modelling may hinder the due recognition of the effects of human action (and sometimes of human inaction) on both the frequency and the magnitude of the hazard itself²⁸. It is precisely due to the vast human interference on river hydrological processes and their unexpected potential outcomes that flood risk might be associated with the threats within the “risk society”, as described by the sociologist Ulrich Beck (1986; 2010). The conceptual framework of Beck’s world risk society was mostly devised taking into account risks that are not easily territorialized, but it could as well encompass flood risk, even if the latter cannot be considered a contemporary risk linked to the post-industrial world. In fact, Beck’s own words could be quoted to express that floods do go “beyond the opposition between society and nature”, being presently more accurately seen as a kind of “*uncertainty fabricated* by human beings” (2010, p. 48; italics in the original).

As shown in Figure 10 above, flood-hazard mapping ultimately delimitates the areas in which elements would be impacted by floods; in many cases, this mapping exercise in the urban setting reveals that the areas susceptible to floods are already occupied. This map is then taken as a basis for the mapping of the exposure to floods, which identifies what is at stake (*les enjeux*): the number of inhabitants and properties located in a flood-prone zone (EU, 2007). In fact, the exposure facet of flood risk has a very clear spatial expression, in

²⁶ The ‘1% annual probability of flooding’ is equivalent to the expression ‘1-in-100-year flood’, which, although commonly used, is less rigorous and even misleading, as pointed out, for example, by the ICE (2001). In fact, the concept of ‘return period’ usually leads to the misinterpretation that, for instance, the centennial flood happens only once every 100 years and its probability of occurrence increases as one gets closer to the date, symbolic and theoretical, of its expected ‘return’ (one hundred years later, in this case).

²⁷ This is for example the adopted threshold in the legislation regarding land-use planning in Portugal, the United States and France (ANPC, 2009; Ludy & Kondolf, 2012; CEPRI, 2015).

²⁸ As a means to overcome such limitation, some hydrologists have recently begun to work with the notion of floodplains as holistic “human-water systems”, in which complex interrelated natural and social dynamics – still to be better understood – take place (Sivapalan *et al.*, 2012; Di Baldassarre *et al.*, 2013a; Di Baldassarre *et al.*, 2014; Viglione *et al.*, 2014). These authors even herald the emergence of a new field of study, socio-hydrology, which has for instance been selected by the International Association of Hydrological Sciences as the theme of its 2013-2022 scientific decade (Montanari *et al.*, 2013).

opposition to vulnerability, which relies on wavering qualitative variables that are not really easy to identify, quantify and ultimately map. Therefore, despite the recent upsurge of vulnerability as a concept and its increased recognition as a crucial factor within risk studies (White *et al.*, 2001; Alexander, 2011), mapping the vulnerability to floods remains in itself a very difficult task, mainly due to the aforementioned reasons (see p. 24).

Thus (and following the discussion previously raised on p. 26), vulnerability and exposure are most commonly considered merged attributes in flood-risk mapping, in such a way that quantifications finally blur most of the qualitative attributes of the exposed elements that could be relevant for their response when faced by floods. Indeed, as highlighted by Cunha (2013), vulnerability has generally been the least explored (flood) risk component. In this regard, it is noteworthy that the term does not even appear in the EU Flood Directive, which nonetheless maintains that flood-risk maps should present some qualitative information (relating in fact to vulnerability), such as the “type of economic activity of the area potentially affected” and the “potentially affected protected areas” (EU, 2007, p. 31).

Having in mind the strengths and limitations of scrutinizing the three risk components through mapping, as well as the scope of challenges normally faced by flood-prone territories (which will be detailed in the next section), one may ultimately say that flood-risk mapping is much more than a technical task. Indeed, flood mapping also involves ‘subjective’ human valuations regarding for instance acceptability of floods’ potential socioeconomic outcomes (both negative and positive ones), a condition that underlies all flood-related decision-making processes. To apprehend such interlinks, the following situation may be considered (Rossano & Hobeica, 2014, p. 290):

[W]hen a potential flood space covers all or large parts of the living territory, the question [of flood-risk management] cannot be solved in simple terms of building limitations or natural floodplain restorations, but also involves a crucial negotiating aspect to define what needs to be floodable in order to accommodate higher discharges and to protect the most valuable assets.

This quote illustrates how the realist and the social constructivist visions of flood risk definitely overlap; sociocultural and economic pressures – that is, the “immateriality (social staging) (...) of risk” (Beck, 2010, p. 51), which can hardly be spatialized – play a crucial role for understanding flood risk and effectively managing it. In fact, the social dimensions of flood risk are as important as its material facet, as emphasized by the geographer Mark Pelling (2001, p. 170):

Intuitively, one feels that ‘natural forces’ cause ‘natural disasters,’ and that the important task of reducing human and economic loss should concentrate on managing physical processes. This physicalist orientation has come to dominate disaster management policy throughout the world. However, somewhat ironically, this approach may itself have contributed to the increased frequency of natural disasters by neglecting the contribution of human factors in disaster origins and outcomes.

Besides general socioeconomic conditions (which are implicit in Pelling’s account), the ‘human factors’ related to floods usually cover cultural aspects such as risk perception and valuation, acceptability (of residual risk), as well as awareness and sensitization. Flood-risk perception is related to the (direct or indirect, individual or collective) experience of floods

in both space and time, and frames the other social (immaterial) factors. On one hand, floods should be easily apprehensible, since river fluctuations in space, when not substantially affected by defensive infrastructures, are quite visible (Prominski *et al.*, 2012); on the other hand, the exceptional character of flood events (that is, river fluctuations in time, their probability of occurrence) does not favour risk salience. Likewise, the expected damage also informs flood-risk perception (Slovic, 1987; Viglione *et al.*, 2014). While frequent (that is, minor) events are likely to be present in the memory and routine of affected communities, sporadic flood disasters of higher magnitude have normally greater impacts in terms of damage and concentrated sensitization, but since they seldom happen, they tend to be underestimated (Di Baldassarre *et al.*, 2015). Such expressions of flood-risk perception are fully embedded in the culture and history of given cities and communities as regards their relationships with rivers and the related necessity of dealing with water issues (being the Netherlands one of the most outstanding examples of such relationships)²⁹.

Not focusing specifically on floods, Aven and Renn (2010, p. 7) state that, contrarily to “knowledge-based probabilities and related risk” (derived from quantitative assessments of previous experiences), “risk perception is based on personal beliefs, affects and experiences irrespective of their validity”, being this the major difference between the ‘objective’ and ‘subjective’ understandings of risk. These authors recall as well that “risk perception does not only cover perceived seriousness of risk but also acceptability of risk” (Aven & Renn 2010, p. 7), both having direct implications on the way it will be eventually assessed and managed (individually and collectively). Yet, as acknowledged by Beck in his seminal *Risk society*, “the risk itself *and public perception of it* [are two sides that] converge, condition each other, strengthen each other, and because risks are risks in *knowledge*, perceptions of risks and risks are not different things, but one and the same” (1986, p. 55; italics in the original). Underlying all technical efforts to objectively delimitate flood risk, there are hence subjectivities that are not always made evident, comprising (often hidden) social and cultural judgements, which underpin each distinctive flood-risk culture.

Psychologists – e.g. Slovic (1987) and Lima (1990) – assert that risk perception largely involves subjective estimations of hazards’ frequency and severity, based on either cognitive heuristics (that is, simplification mechanisms to facilitate the apprehension of a complex situation) or bias (reality misrepresentations), which may be called upon in a conscious or unconscious way. In any case, these tactics at times represent implicit responses to strategic and legitimate intentions that are not duly taken into consideration by more ‘objective’ risk analyses. For instance, regarding floods in urban settings, a well-known cognitive tactic refers to the denial of the very existence of flood risk in this particular context (CEPRI, 2015). Since urban settlements are increasingly disconnected from natural variations, people living in urban flood-prone zones tend to erroneously perceive their homes – and in the same token their neighbourhood and their cities – as inherently safe places.

²⁹ See *Sweet & salt* (Metz & Van den Heuvel, 2012) for an extensive account and a wide picture of the centuries-old Dutch way of dealing with water, fully illustrated with artistic expressions of such endeavours.

In the framework of his study on flood-prone neighbourhoods in the United Kingdom, the social scientist Tim Harries (2008) showed that even when dwellers are well aware that they live in a susceptible area, only a few of them proactively implement flood mitigation strategies in their homes. The anticipation and related preparations to face possible future disasters are disdained, the author stressed, “when they are seen to threaten the fundamental human need to *feel* secure” (emphasis added), in a conflict between what is taken as a hypothetical potential harm and “other needs that are immediate and pressing” (Harries, 2008, pp. 479-480). According to Harries, such mental barrier is supported by the prevailing composite idea that home is “innately safe”, nature is “innately benign” and the state is an “innately competent and willing protector” when flood events happen (2008, p. 488). As a general consequence, these self-defence mechanisms (heuristics and bias) tend to turn flood risk invisible, lowering thus people’s awareness to floods and discouraging more proactive behaviours (including when an emergency occurs) (CEPRI, 2009; Lamond & Proverbs, 2009).

But far from being simply taken as irrational, such mental simplifications have deep-rooted cultural origins, which can be for instance illustrated by the analyses of the formal constitution of cities made by Mumford (1961). In fact, this author emphasizes the powerlessness of hamlets and villages regarding uncontrollable natural forces, in contrast with the well-consolidated cities, where effective environmental management enhance their actual (and perceived) safety and prosperity. Despite being originally anchored in social relationships, the German medieval adage *Stadtluft macht frei* (“the air of the city gives freedom”) may as well be interpreted as having an enlarged message: just as the emancipation of the human condition, the provision of a stabilized environment strictly separated from the outside – wild, dynamic and risky – world is also at the very origin of cities. This can be hence taken as one of the roots of the idea of cities as ‘innately safe’ places. However, this historical perspective strongly diverges from a general perception of cities nowadays (namely megacities), increasingly viewed as sources of environmental and social problems (and thus potential disasters)³⁰.

Independently from which of the two standpoints is deemed more representative, both exemplify how the ideas of risk and safety in cities are context sensitive, and socially and culturally constructed. In any case, the long lasting permanence of cities after recurrent episodes of (either ‘natural’ or ‘human-related’) disasters and disturbances still supports the first line of reasoning, which associates cities to safety from hazardous ‘natural’ events (Vale & Campanella, 2005; White, 2010). And the perception of cities as an ideal risk-free environment often brings with it a lower tolerance vis-à-vis floods in the urban setting, supporting thus the search for more permanent solutions to prevent them from happening.

Interestingly, flood-risk perception engenders two different types of flood acceptability, both varying in accordance with floods’ expected frequency and severity. The first one is related to the tolerance of the residual flood risk, that is, the risk that remains after decision-making and the implementation of related mitigation initiatives (considering that

³⁰ See in this sense Mike Davis’s *Ecology of fear* (1998) or James Mitchell’s *Crucibles of hazard* (1999).

the zero-risk situation is most often unattainable). According to the psychologist Maria Luísa Lima (1990), the actual damage incurred during past disasters somehow reveals the degree of risk acceptability, since it is essentially the result of previous decisions and actions regarding the related threat. On the other hand, flood acceptability may also be related to the strategic recognition of other existing potential opportunities or benefits that would be lost or minimized if floods were duly managed; that is, one may accept floods in order not to lose something else, deemed more important, at least in the short term (e.g. the monetary value of properties in recognized flood-prone areas).

This explains for instance the refusal by some communities of having flood-defence structures within their direct sight, as exemplified by White (1937, p. 59) when referring to an American town that “has objected to flood protection by levees because they ‘advertised’ the flood hazard in the town and therefore were considered detrimental to maintenance or expansion of business activity.” More recently, in Bradford upon Avon (United Kingdom), flood defences were also refused to preserve the naturalness and views to the river (yet, the town has later on been seriously flooded), as mentioned by Crichton (2007). In another British town (Shrewsbury), the proposed flood-defence scheme had to be completely reviewed in order to assimilate the complaints of the local population as regards its visual impact in the historical centre (ICE, 2001).

The latter examples clearly show some intricacies of flood admissibility, as well as how safety and urbanity are perceived as legitimate competing urban demands (a conflict not easily handled within the respective flood-risk management initiatives). Being or not acknowledged as hybrid processes, as having both objective and subjective traits, floods (and flood risk) will always be present (one way or another) in many riverine urban spaces, which calls not only for reducing damage but also for enabling richer and more attractive urban ambiances that comprehensively fulfil human life.

2.4 Dealing with flood-prone urban spaces

Dealing with floods is a task presently carried out under the umbrella of risk management, understood as the “process of reducing the risks to a level deemed acceptable by society and to assure control, monitoring, and public communication” (Klinke & Renn, 2002, p. 1071). Therefore, flood-risk management ideally refers to a proactive decision-making process that should engender mitigation actions, being thus related to governance and accountability. Having in mind the materiality of potential consequences and the relatively ‘simple’ character of this risk (Aven & Renn, 2010)³¹, flood-risk management is usually anchored in the ‘objective’ nature of flood risks (namely in the risk assessment stage), although social judgement is crucial for both setting priorities and accepting the proposed solutions (and the

³¹ Following the classification of “risk problems” suggested by Aven and Renn (2010), floods would be included among the “simple risks”. Simplicity, in this context, “is characterized by situations and problems with low complexity, uncertainties and ambiguities. (...) Note that simplicity does not mean that the risks are low. The possible negative consequences could be very large. The point is that the values that are exposed are non-controversial and the uncertainties low. It is possible to rather accurately predict the occurrence of events and/or their consequences” (Aven & Renn, 2010, p. 12).

residual risk). However, if one considers the intrinsic hybrid character of flood risk, the apparent ‘simplicity’ of managing floods may be contested. For example, the value of exposed items is always relative, raising questions such as: which categories of values should be considered? Value to whom? How to account for cities’ intangible values? On the other hand, accurate predictions of floods’ occurrences and consequences are only valid in the short term, and these predictions are increasingly challenged by the climate-change prospects. At the same time, the impacts of flood-management strategies themselves are already being acknowledged as both complex and controversial (Di Baldassarre *et al.*, 2013a); hence, considering the longer term, the certainty usually attached to floods that made them be understood as a simple risk does not seem to hold anymore.

Anyway, one of the specificities of the (hybrid) flood risk, as compared to other risks with natural triggers, is the possibility of ultimately influencing the target of the potential damage through risk-management decisions, protecting more one area at the expense of others. Flood-risk management can thus be largely understood as a process of flood-burden minimization and sharing that can be intentionally planned and pursued. And the related management decisions may have repercussions both in the long term (such as through land-use and design-driven interventions) and in the short term (in the immediate response to a flood event, for example), being that the former always influence the latter. However, as stressed in Section 2.1, dealing with flood-prone urban spaces in their full potentials should involve much more than the straightforward task of simply abiding by flood-risk management precepts, and strive for the promotion of a richer urban environment.

Traditionally, flood-risk management in the urban setting has followed one of two defensive approaches to lessen potential damage: either the relocation to less susceptible locations (the most direct option when safer land is available) or, more commonly, the implementation of structures that modify river dynamics (Di Baldassarre *et al.*, 2013b). Both options imply isolating (that is, pushing towards zero) one of the risk components: in the former, the exposed elements are removed from a given floodable area, while in the latter the source of the hazard is mitigated (it is sometimes even taken as fully eliminated). Coping with floods through defensive lenses thus involves two kinds of risk-management measures: on one hand, the non-structural or ‘soft’ approach, on the other, structural or engineered interventions (the so-called ‘hard’ approach) (Kundzewicz, 1999; Saraiva, 1999; Jha *et al.*, 2012).

Structural measures refer to “[a]ny physical construction to reduce or avoid possible impacts of hazards, or application of engineering techniques to achieve hazard resistance and resilience in structures or systems” (UNISDR, 2009, p. 28). Closely linked to the idea of technological progress, these engineering-led interventions aim to control floods’ spatial and temporal patterns, and mainly comprise vertical (or linear) containment solutions directly on the stream, such as riverbed dredging, dams or dykes. They cover as well horizontal solutions focused on the river space (such as river widening, floodplain restoration, diversion channels or the creation of controlled flood areas), which mostly imply the allocation of land to water storage (Jha *et al.*, 2011; 2012; WMO/UNESCO, 2012). Some structural interventions are often implemented not only as flood-defence devices, but also to simultaneously respond to other (sometimes competing) objectives,

such as improving navigability, water supply, drainage enhancement or energy production; normally located upstream as regards the elements to be protected, these measures ultimately intend to keep water away from people and assets. As old as the riverine cities themselves, structural measures have been improved across the centuries to the point of ensuring their hegemony, being thus “strongly rooted in European territories, landscape and management policies” (CEPRI, 2015, p. 11).

Although the relocation of urban segments and their dwellers usually involves long-term structural interventions, such track is often pursued as an outcome of land-use planning decisions, the most invoked non-structural measure vis-à-vis floods³². In fact, the boundary between structural and non-structural measures is not always clear-cut and to a certain extent depends on both the degree of the (engineered) intervention needed and the intended outcome of the intervention. For example, the aforementioned horizontal physical solutions are sometimes included among the non-structural (soft) measures, since they often derive from large land-use planning regulations, and are also considered a more ‘ecological’, ‘environment-friendly’ or nature-led option to deal with floods (Kundzewicz, 2002).

According to the UNISDR (2009, p. 28), non-structural measures do not involve “physical construction”, but use “knowledge, practice or agreement to reduce risks and impacts, in particular through policies and laws, public awareness raising, training and education”. They are thus more closely linked to the ‘social character’ of flood risk and concern building codes, insurance policies and collective behavioural practices (such as flood forecasting and early-warning systems, or evacuation schemes); ultimately, they seek to keep people and assets away from the water, somehow promoting a ‘non-exposure’ approach. In a synthesis, the use of structural measures intends to isolate the river as a source of hazard, while the use of non-structural measures seeks the isolation of people and assets (see the schematic representation in Figure 12).

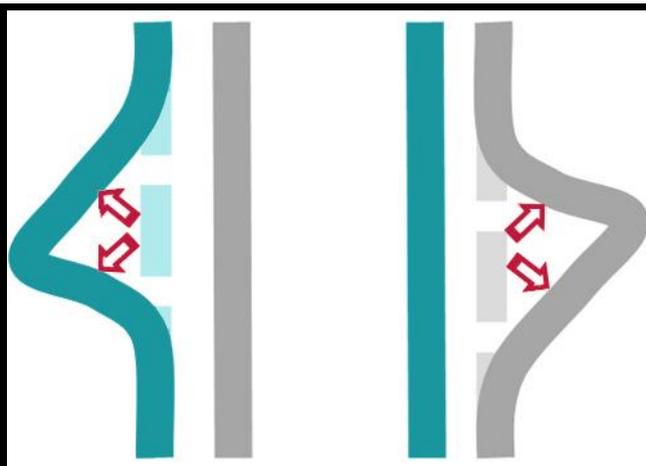


Figure 12: Schematic representation of the two traditional flood-risk management approaches

On the left, the use of structural measures; on the right, the use of non-structural measures

Legend:

– blue lines: river

– grey lines: urban settlement (that is, people and assets)

– red arrows: pursued distancing

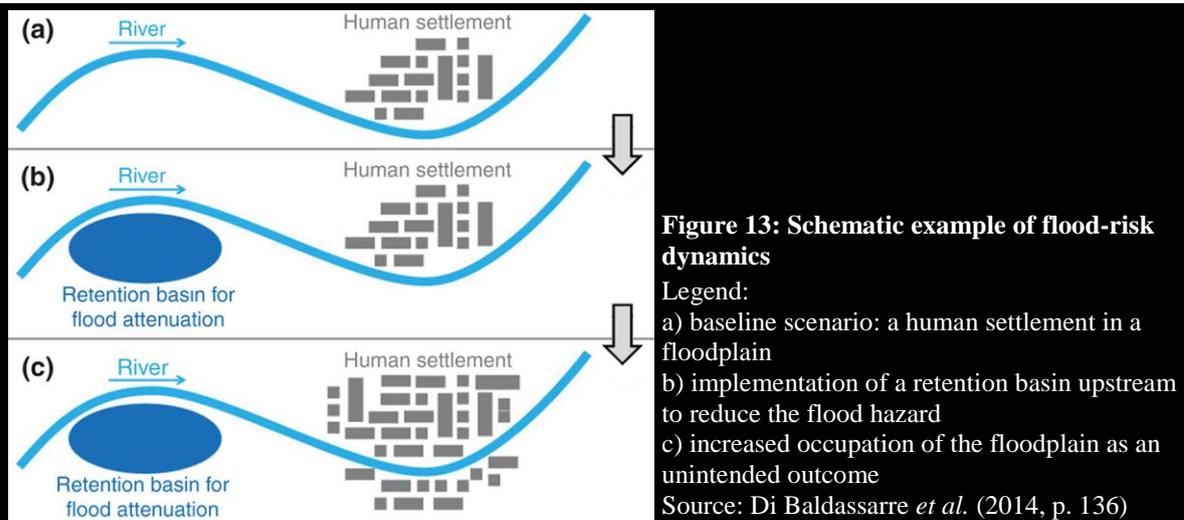
Source: elaborated by the author

In order to increase the likelihood of their effectiveness, these two options are usually combined, in a more integrated flood-risk management approach (Jha *et al.*, 2011). Yet, the resort to these defensive strategies (mostly the structural ones) has up to now largely

³² See for instance the work of Gilbert White (1937), who was one of the first geographers to advocate zoning as an effective means to avoid flood-susceptible locations.

overlooked the existing feedback loops between hydrological and social processes that lead to flood events (Di Baldassarre *et al.*, 2013a). In contrast, the mental effect of raising flood-defence infrastructures, often perceived as definitive solutions, is for example well known (Di Baldassarre *et al.*, 2015). The sense of absolute protection usually attached to them not only reduces people’s awareness, preventing thus timely and effective preparedness, but also supposedly allows the ‘safe’ (and sometimes haphazard) occupation of flood-prone areas (Pelling, 2001; Jha *et al.*, 2011).

As an unintended outcome of the apparent elimination of the hazard by such structural interventions, flood-prone zones tend to be occupied with potentially vulnerable assets (Di Baldassarre *et al.*, 2015), as their propensity to be damaged is normally undervalued (a widespread moral-hazard phenomenon)³³. Therefore, as exposure and vulnerability rise, flood risk is not necessarily reduced after all, even if it seems so (it may even increase) (Cuny, 1991). Such unforeseen feedbacks between flood hazard, exposure and vulnerability – which are not at all captured in the flood-risk triangle – are clearly exemplified by Di Baldassarre and colleagues (2014), who highlight that solely isolating the hazard may not be an enduring flood solution (see Figure 13). As rightly pointed out by Bauduceau (2014, p. 206), the historical strategy of managing floods based on hard defence “creates and maintains the utopian idea that we are protected from, or have put a stop to natural hazards, and that we can ignore risk without consequences.”



Consequently, despite centuries of flood prevention practices, flood risk as a whole has been steadily rising, due to a combination of several factors (Di Baldassarre *et al.*, 2013a). Perhaps the most significant of these is the increase of the urban population and, consequently, of impermeable surfaces, coupled with the aforementioned sense of safety nurtured by cities (especially following river regulation works or dam constructions). Wider human actions, either directly targeted at rivers or indirectly through interventions in the water basin, have likewise been playing a significant contribution in this sense. Yet, the ‘hazard-approach paradox’ (also known as the ‘flood-defence paradox’) is but one

³³ The work of the environmental planners Jessica Ludy and Matt Kondolf (2012) on the Spanos Park West urbanization (in Stockton, California, United States) illustrates such underestimation of flood risk.

reason to rethink the long-lasting hegemony of hard structural strategies against floods; economic, technological, environmental and accountability factors play an important role as well.

For example, White (2010) argues that since huge defence structures are generally state owned³⁴, in a context of declining public budgets and several competing urban priorities, the ever higher costs of building and maintaining flood-defence structures discourage their adoption, even when they are identified as the ‘best’ technical option. This author remarks that there is also a growing concern regarding accountability when these systems fail: in these cases, the state, taken as the responsible agent, has to bear increasingly higher compensation payments. In fact, “catastrophic effects”, either economic or social (or both), are experienced when these structures have their safety factors surpassed (White *et al.*, 2001). Furthermore, one should not disregard the fact that large infrastructural devices (such as dams and dykes) always represent a flood-risk transfer, either in space (to other locations) or in time (meaning that flood risk eventually increases locally in the long term, in the case of more intense future events) (ICE, 2001; Jha *et al.*, 2011).

Socio-environmental setbacks of large defensive infrastructures, such as forced population displacements and irreversible (or at least persistent) ecological damage³⁵, have been more and more recognized (Cuny, 1991). For instance, there is a growing concern regarding the environmental repercussions linked to the fact that such defensive structures leave small margins to accommodate natural river fluctuations (as shown above in Figure 11, on p. 31) (Saraiva, 1999; Prominski *et al.*, 2012). In the urban setting, these structures also obstruct people’s experience of the river space, acting as “technological blinders” (Rossano, 2015, p. 16), which, coupled with mental heuristics and bias (mentioned in the previous section), make flood risk invisible, despite the concentration and high value of the exposed assets.

Such abstraction of floods eventually encourages (or at least does not discourage) a less precautionous attitude towards the risk, since (“ecologically valuable”) smaller and less damageable floods are also prevented (Langenbach, 2007, p. 82), hindering thus the maintenance of the risk collective memory and culture (Di Baldassarre *et al.*, 2015; Rossano, 2015). Experiencing regular floods is indeed considered a fundamental factor for stimulating risk prominence and sensitization³⁶ (Zevenbergen *et al.*, 2010); in contrast, when even minor floods are eliminated, an illusionary sense of total reliability of defences is nurtured, in parallel to the lessening of the social tolerance towards river fluctuations.

³⁴ It should be noted that flood management has historically evolved from individual and small-scale communitarian practices to large-scale collective initiatives granted by the state; yet, in some particular contexts (for instance in the United Kingdom), it is currently possible to identify an opposite trend towards more individual practices (the emphasis being put on insurance as a key private flood mitigation strategy) (White, 2010).

³⁵ In less developed countries in particular, the use of structural defences even obscures the “deeper human causes and effects of [flood] disasters, such as inequality and poverty, which determine who is exposed to, and impacted by, [such] hazards”, as stated by Pelling (2011, p. 171).

³⁶ Regarding sensitization, a remarkable initiative was held in Lyon (France) between April and November 2009: the “Quiétude” installation project, designed by the architect Jacques Rival, which consisted of three giant day-to-day objects floating on the Rhône River to remind people of the effects of major floods (ACUF & CEPRI, 2012).

All these setbacks go in the direction of increasing people's vulnerability, either through the lesser importance given to their condition of exposure to floods, or through the lack of knowledge on how to behave when a flood emergency situation occurs (Lamond & Proverbs, 2009).

Although flood risk is indeed under control when there is no exposure (as shown on the right in Figure 12, on p. 38), the use of non-structural measures focusing on this risk component has also some limitations. First, although not in a uniform way across the globe, flood-prone zones generally tend to be enlarged by climate-change effects: future flood boundaries are thus presently unknown, but are assumed to be continuously stretched (Kundzewicz, 2002), which makes some of the current land-use management requirements related to floods quickly outdated. Secondly, when exposure to floods is straightforwardly restricted, the vulnerability of the would-be exposed people and assets is directly overvalued, since their propensity to damage is taken as uniform and intrinsically high.

Also, compactly and densely constructed urban areas pose the problem of the local availability of land to be exclusively devoted to flood protection, which makes resorting to land-use restrictions more adequate in low-density zones (urban fringes). More importantly, as already argued in Section 2.2, the hasty banning of construction in flood-prone central zones does not fully acknowledge potentials that might as well exist in these places (Barroca, 2006; Barroca & Hubert, 2008); furthermore, in most cases it is not quite reasonable to relocate neighbourhoods or even whole cities that already exist in floodable locations (CEPRI, 2015). On the other hand, non-structural measures focusing on individual and collective behavioural practices may encounter several barriers to effectively reduce flood damage (Harries, 2008; Lamond & Proverbs, 2009), as previously discussed (see p. 34).

In fact, climate change, around which consensus has been growing (Oreskes, 2004; IPCC, 2013; Bray & Von Storch, 2016), and its foreseen threats are among the main drivers towards the revision of the traditional flood-defence strategies³⁷. Actually, as human interventions to face floods are themselves becoming a risk-increase factor, the current defensive perspective needs to be reevaluated. Hard infrastructures, usually planned to last several decades, have clear technical limits to cope with more intense and frequent flood events resulting from climate change (Bates *et al.*, 2008), due to their great inertia and very low flexibility. The anticipated engineered solutions, such as increasing safety factors and thus the resistance of these structures in the face of extreme conditions, are indeed considered unfeasible in the longer term³⁸, given their prohibitive costs and the amount of involved uncertainties (Jha *et al.*, 2011). It is precisely the notion of certainty – regarding hydrological regimes, technological power and its achievements, human management

³⁷ As discussed on p. 39, the current upward trend in urban flood risk is not necessarily linked to climate change. As asserted by Jha and colleagues (2011), in the short term non-climatic factors such as the (inadequate) urbanization of greenfield land or further (inadequate) development of existing urban areas play a greater role than climate change in the increase of floods. Therefore, climate change only adds an extra layer of complexity to current flood control practices, being thus a broader contextual element among others.

³⁸ Besides, this perspective contrasts with current engineering practices that actually lower safety factors “due to improved modelling capabilities for prediction and optimisation” (Zevenbergen *et al.*, 2010, p. 15).

solutions and so on – that has been for a long time supporting a hazard-focused defensive approach (Zevenbergen *et al.*, 2010). Yet, the current uncertainties linked to climate change tend to put more emphasis on precautionary interventions targeting either the exposure or the vulnerability risk components, closer to the non-structural measures. This alternative is considered a no-regret “more robust approach” that has the potential to be “cost beneficial and socially equitable under the maximum range of future climate scenarios regardless of their probabilities” (Jha *et al.*, 2011, p. 21).

In response to this overall context, many voices have been arguing for a new relationship between cities and flood risk, away from the dominant defensive perspective. Several mottoes go in this direction: “water sensitive city” (Brown *et al.*, 2008), “absorbent city” (White, 2008), “sponge urbanism” (Sowell & Wiedemann, 2009), “tolerant landscape” (Löper, 2009) or “amphibious territories” (Berman, 2010), to name just some of them. They all intend to be metaphorical images of a supposed more water-friendly urban environment (presenting thus a lower vulnerability to floods in general), but also to outline a changing perspective in the human approach to floods: instead of trying to ‘eliminate’ them, they propose to ‘safely live with them’, through the adoption of an adaptation stance.

But what is actually meant by ‘living with floods’? First, this concept implies a shift towards the acceptance of flood processes (rather than endeavouring to prevent the unpreventable), while keeping the safety of people as the prime goal³⁹. In this sense, an underlying principle is “giving rivers more space”, as highlighted in the EU Flood Directive (EU, 2007, p. 28), by resorting to horizontal structural measures and (when feasible) land-use restrictions, as well as to other behavioural non-structural methods (such as sensitization and preparedness). Therefore, there is nothing intrinsically new in this perspective, as recognized for example by the architect-urbanist Kelly Shannon (2013); instead, it advocates a return to a more cautious, nature-driven approach to floods, in which “the previously dynamic relation between land, water and communities” is again embraced (RIBA, 2007, p. 3).

Such Community advice in fact echoes previous initiatives of some EU member states that, having recently experienced costly flood events, were searching for alternative management solutions to structural defence. For instance, the Dutch government adopted the “Room for the River” programme as early as in the 1990s, while several United Kingdom-based institutions have also been calling for the coexistence with floods: e.g. the ICE (2001), through its *Learning to live with rivers* publication, and the Department for Environment, Food and Rural Affairs (DEFRA), through its “Making Space for Water” programme (DEFRA, 2005)⁴⁰.

³⁹ Already in 1990, in his contribution to the World Bank colloquium “Environment and Natural Disaster Management”, the disaster expert Frederick Cuny (1991, p. 63) acknowledged that “[p]reventing floods is not a universal solution”, and recalled that “living with floods” has been a long-lasting indigenous response to floods, especially in rural areas, where it is easier to benefit from such regular events.

⁴⁰ This programme also included a best-practice initiative targeting architects and planners: the “LifE” project (“LifE” being an acronym for “Long-term Initiatives for Flood-risk Environments”), which promoted integrated sustainable urban developments in floodable areas (Barker & Coutts, 2009). The “LifE” project will be further presented in Section 2.5.

In the same vein, the Royal Institute of British Architects (RIBA) has showcased the ongoing debates and practices on this subject and invited its associates to promote “living with water”, since “[t]he desire to live adjacent to water reflects our cultural heritage and historic settlement patterns, and we continue to build on floodplains and other flooding-prone areas” (2007, p. 2)⁴¹. Planning and design are thus advocated as means through which architects could play a more important role in dealing with urban floods, an issue traditionally seen as a purely technical problem to be solved and left to the engineering realm. To encourage its audience in such endeavour, the RIBA also developed the guide *Designing for flood risk*, in which floods in the United Kingdom particular context and design-led alternatives to deal with them are thoroughly presented (RIBA, 2009). Yet, their focus on the physical dimension of flood risk somehow understates the social facet of floods, including the (unconscious?) contributions of architects and planners themselves to the increase or the decrease of the risk in the course of their overall jobs.

More recently, in order to stimulate thinking ahead on the subject, the RIBA and the ICE (2009) have jointly promoted a workshop gathering several professionals to envisage urban-design flood-adaptation solutions targeting coastal and riverine cities, using four timing scenarios up to 2100; the results of this initiative have been widely broadcasted to raise flood awareness (at least among designers). Three strategic approaches were then highlighted, as presented in Figure 14.

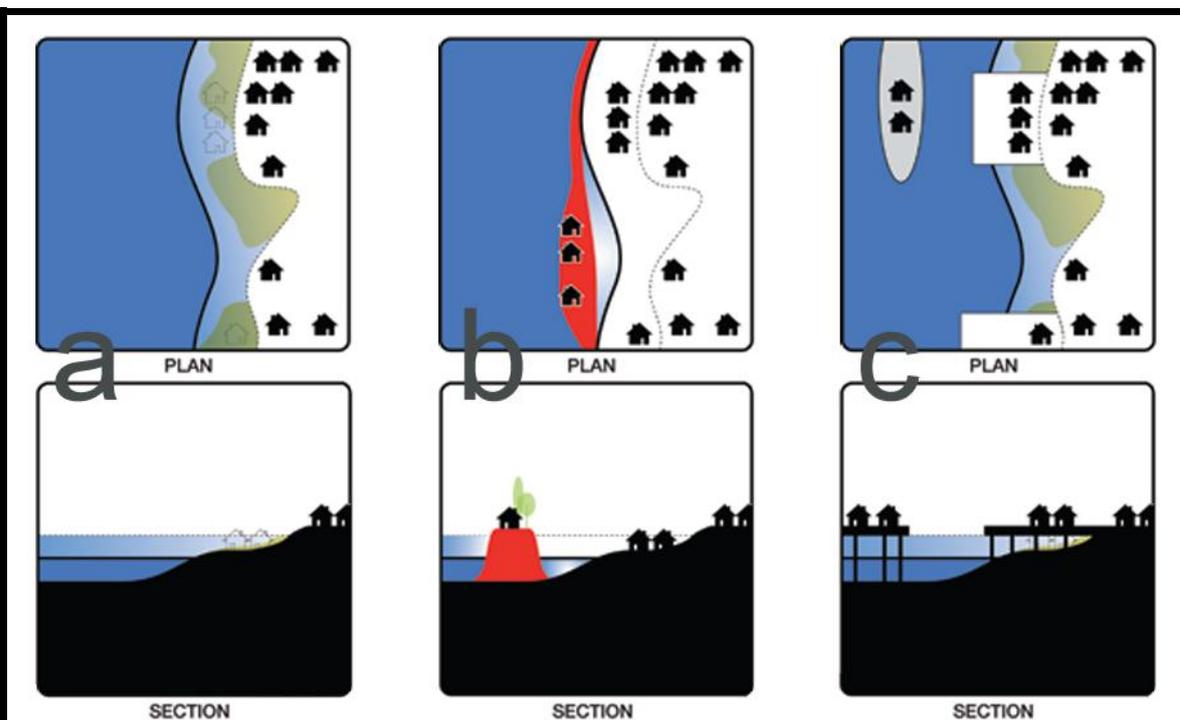


Figure 14: The RIBA and the ICE’s three approaches to face long-term rising water levels

Legend: (a) retreat; (b) defend; (c) attack

Source: RIBA and ICE (2009, p. 10) (modified by the author)

⁴¹ It is interesting to note that although aimed at flood mitigation, the aforementioned initiatives do not use the term ‘floods’ in their titles, but the more neutral and ‘inoffensive’ terms ‘river’ and ‘water’, likely in order to circumvent the mental barriers usually associated with the former.

The first one, managed “retreat”, basically refers to the well-known exposure avoidance, which extensively involves land expropriations and structure demolitions, a challenging (or even unfeasible) solution in many existing floodplains already massively built. The second approach, “defend”, somehow represents the business-as-usual scenario: mitigating the hazard with hard-engineering structures, which, in this particular case, are proposed to have multiple and more flexible functions (in order to make them economically feasible and attractive to private funding). In contrast, the last approach, “attack”, focuses on proactively engendering actions to offset the vulnerability of assets, while keeping (or even strengthening) the city’s interaction with the water.

This idea of not being passive vis-à-vis floods and intentionally defy them (which again is not exactly a new perspective⁴²), brings us to the second condition of ‘living with floods’: the active anticipation of the hazardous events, comprising the control of the potential disaster situations (Rossano, 2015), and even the tolerance of some disturbance from time to time. As astutely posed by the hydrologist Zbigniew Kundzewicz (1999, p. 569), since it is “impossible to design a [flood preventive] system that never fails”, we need “to design a system that fails in a safe way”. Therefore, this perspective could be seen as the deliberate adoption of a higher degree of flood acceptance, for ‘living with floods’ “means taking risks consciously”⁴³ (Kundzewicz, 1999, p. 570).

Although a controlling perspective is still present – and must always be, whenever people’s lives are at stake –, it is not the river processes alone that are subject to it, but a more complex entity that indeed represents the amalgamation of water and human dynamics: the hybrid floods as a whole. Hence, as an underlying assumption, attention tends to be paid not only to the river itself (the stream and its edges), but to the wider territory that includes all surfaces that can potentially affect or be affected by the river’s fluctuations and the intervening human dynamics (that is, the entire human-river space and context).

‘Living with floods’, as stated by the landscape architect Frédéric Rossano (2015, p. 21), entails “making space for flooding before flooding claims its space, and allowing every citizen to look beyond the myth of absolute protection”. After studying six European large-scale, landscape-driven flood-mitigation projects, Rossano concluded that they all have embraced a proactive approach that “represents a significant move away from full protection strategies, as [it] paradoxically [implies] accepting disaster in order to better control it” (2015, p. 25). Tangible experiences recalling that the absolute prevention of floods is unattainable can indeed be of great value in order to plan for possible emergency situations (Jha *et al.*, 2011). Therefore, regular small ‘doses’ of ‘quasi-disasters’, carefully designed and managed, represent the introduction (or the acceptance), in the urban settings, of river fluctuations even in their most negative expression.

⁴² See for instance the typology of housing on stilts traditionally used worldwide, which has always defied floods while allowing people to benefit from safely living in floodable zones (Zevenbergen *et al.*, 2010).

⁴³ The idea of “taking risks consciously” (Kundzewicz, 1999, p. 570) reminds us that in its regular use outside specialized domains, the term ‘risk’ is also understood as a ‘chance’ that can have positive outcomes as well, as already pointed out on p. 19. Yet, within specialized domains, “[q]uantitative assessments of beneficial consequences [of hazards such as floods] are rarely ventured” (White *et al.*, 2001, p. 84).

At first sight, ‘living with floods’ may be wrongly interpreted as a purely preventive stance focusing on horizontal structural measures to give more space for rivers’ waters. Yet, when taking into account the magnitude of the elements at stake (for instance the massive urban occupancy that characterizes traditional European cities), this concession of space to rivers can only be pursued if fully embraced with wider urban interests and policies, such as the provision of public amenities or the attainment of ecological goals, in a clearly adaptive perspective. It is not by chance that the RIBA views this so-called “river repatriation” process as an opportunity to reinforce river connections within the urban fabric, which opens up new possibilities of articulating “place-making with sustainable design and flood risk mitigation” (2009, pp. 9 and 21).

Therefore, the goal to be envisioned by a ‘living with floods’ stance should be the concomitant enhancement of safety (which does not need to be directly associated with defence) and of cities’ cherished sense of urbanity. To accommodate the sometimes competing urban uses and programmes (and the needed infrastructures) geared towards either increasing safety or enhancing urbanity in floodable spaces, design may be called upon as a means of conciliation (this will be further developed in the next section). ‘Living with floods’ ideally goes in the direction of acknowledging cities as much more than mere concentrations of people and assets, as traditionally seen through strict flood-management lenses.

Besides the acceptance of flood processes, another underlying concept behind the ‘living with floods’ strategy is adaptation, which somehow upgrades the focus on hazard prevention (that prevailed roughly until the beginning of the UN-led 1990-2000 International Decade for Natural Disaster Reduction) and on hazard mitigation that has followed it. While the hazard-prevention approach was mostly defensive and based on engineered solutions, the mitigation approach already included some vulnerability-related concerns (such as the promotion of coping capacity), but can still be understood as proposing *ad hoc* and short-term interventions to reduce floods’ potential negative impacts. On the other hand, adaptation refers, according to the UNISDR, to “[t]he adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities” (2009, p. 4).

Taken from the UNFCCC’s climate-change framework, this definition, when applied to floods, may seem to stress only the hazard component, yet without isolating it from other human-driven factors⁴⁴. At the same time, the need to adapt to future flood scenarios that may be not at all linked to climate-change prospects, but to ongoing human (urban) dynamics, should not be disregarded. In any case, when considered through flood-risk lenses, this definition brings to the fore three key points. First, it adopts a wider idea of adjustment: instead of considering only the conventional ‘adjustments’ of rivers or other flood sources, it also evokes the adjustment in human systems themselves. This alternative

⁴⁴ It is interesting to note that the concept of adaptation was not internalized in the EU Flood Directive, which, although advocating more space for the rivers, favours more traditional terms when suggesting that “[f]lood risk management plans should focus on prevention, protection and preparedness” (EU, 2007, p. 28).

is totally in line with the argument defended by White in his seminal *Human adjustments to floods* (1945), which intentionally blurred the traditional boundaries between physical geography and human geography to investigate better ways to handle floods. Since the required adjustments should target the “natural or human systems” (UNISDR, 2009, p. 4) – or, better saying, holistic ‘natural-human systems’ –, adaptation should ideally deal with floods by giving due consideration to their hybrid character. This has the potential of opening up a window to review the prevailing opposition of culture and nature presented in the last section (see p. 28) (Latour, 1993; Castree, 2001; Castree & Macmillan, 2001).

Secondly, when the climate is explicitly taken into account, the longer term is implicitly acknowledged, which implies a proactive and steady stance towards the flood issue. In this regard, the longer term calls for flexibility as a no-regret strategy to face floods (instead of robustness), in order to keep open human and natural possibilities under uncertain futures. Expressed for example in the proposal of multifunctional spaces, flexibility is a trait that enables adaptation to be pursued as a continuous means (and not an end in itself). Thirdly, in this UNFCCC definition, a positive attitude is portrayed, which is possibly the main difference between flood adaptation and the other two defensive approaches (flood prevention and flood mitigation). While in the latter floods are normally taken solely as a threat, a technical problem to be solved, an adaptive perspective recognizes that advantages may also be linked to river fluctuations, potentially giving rise to beneficial opportunities to be explored (for instance in the aesthetic or symbolic spheres, or even in the economic or environmental domains) (Zevenbergen *et al.*, 2010).

It should be noted that an adaptive strategy is not against the resort to structural flood defences *per se*, but these can play a secondary role when wider environmental and urban values are also taken into account. In fact, adaptation is not only a matter of changing the measures put in place, but furthermore a change in perspective, away from a purely defensive paradigm and towards a more integrative approach. Adaptation thus refers to proactive changes in the predominant mindset and worldview in relationship to floods (that is, adjustments in the social character of flood risk) (Parodi, 2010), in order to recognize and benefit from possible societal opportunities that may arise from the acceptance of flood processes.

Although it may at first sound naïve, this argument is in line with the one proposed by Pelling (2001, p. 183), for whom “[w]ithout vulnerability, ‘natural hazards’ lose their hazardousness and become benign or even potential resources for exploitation”. Therefore, by minimizing the vulnerability – see for instance CEPRI (2009)⁴⁵ –, the usually fearsome floods may come closer to the more ‘neutral’ high-water processes. However, it is not really easy to grasp urban floods without their hazardousness, nor to discern human advantages deriving from them. Yet, as already mentioned, regular and minor flood experiences have a strong sensitization power that can be useful for both common people and officials dealing with the issue.

⁴⁵ The ‘zero vulnerability’ goal is perhaps not only naïve but also unattainable; an event with higher magnitudes than expected can always happen.

On the other hand, these quasi-disasters can have the intangible effect of repositioning cities and their inhabitants as regards the cyclical flows of life and the unforeseen (Spirm, 1988), which is totally fine-tuned with the recognition of the dynamics of cultural-natural processes, as well as with the climate-change prospects. Interestingly, the following quote from RIBA's *Living with water* report brings together the three points discussed above (adjustment in human systems, long-term perspective and positive stance), while approaching them from a design point of view (RIBA, 2007, p. 33):

Any successful strategy to curb climate change and react to its effects must be inherently long-term in nature. This requires a change of perspective – too often we are drawn to the short-term and a reactive approach. Taking a longer-term view begins to open up opportunities outside of reacting to climate change, towards making use of a strategic vision and future aspirations. (...) We develop [that is urbanize] in the belief that we are largely free from risk – this affects our design choices, the construction materials we use, where we want to live, what we demand of our homes and our attitude towards both open space and open water. This is based on applying our existing ways of thinking to a changing world. While we relish adjacency to water, reflecting the important role it has played throughout our history, the way we develop [that is urbanize] remains very unforgiving of changing flood risk.

Concerning the positive stance, this RIBA report calls for architects “to begin to look towards a flooded future with confidence and imagination” (2007, p. 31), which are indeed much needed qualities to foster the due adaptation of the built environment to floods. Regarding the three above-mentioned strategies proposed by the RIBA and the ICE to face rising water levels (synthesized in Figure 14, on p. 43), adaptation is more associated with the last one, ‘attack’. The proactivity embedded in this ‘living with floods’ strategy may comprise for instance the resort to floodable and/or floating structures that break (then blur) the conventional barriers between water and city (see Figure 15). Although not related to fluvial but to pluvial floods, two interesting examples of floodable spaces are the Eli Lotar public garden (by Agence TER) in Aubervilliers (Greater Paris), and the Benthemplein (see Figure 16), the first ‘water square’ in Rotterdam (by the studio De Urbanisten) (Bava, 2010; Boer, 2010).

In fact, intra-urban water-retention structures, as well as all other SUDS-related measures related to increasing soils’ permeability⁴⁶, are effective options for dealing with rainwater (Hoyer *et al.*, 2011). Yet, in contrast with small-scale SUDS-related measures, large structures that temporarily retain water, when located by riverfronts, may also be (at least partially) effective means to manage riverine floods, in which the volume of water involved is normally much more important than that of pluvial floods⁴⁷. Indeed, despite being advocated to alleviate pluvial floods, water-infiltration measures have only minor impacts (if any) when a river overflows its usual banks.

⁴⁶ SUDS is the acronym for Sustainable Urban Drainage System, an expression often used as synonym of water-sensitive urban design, having a particular focus on pluvial floods (Brown *et al.*, 2008; Wong & Brown, 2009). Although they also aim to improve other water-related issues (such as ensuring supply, reducing pollution or treating wastewater) in an environment-friendly way, SUDSs embrace as well the enhancement of the overall ambience of the urban space while dealing with pluvial floods.

⁴⁷ Besides temporary retention structures of this type, the most relevant management options to deal with river overflows include not impeding the waters’ spread and subsequent evacuation, *inter alia* through the preservation of natural flow paths (CEPRI, 2015).

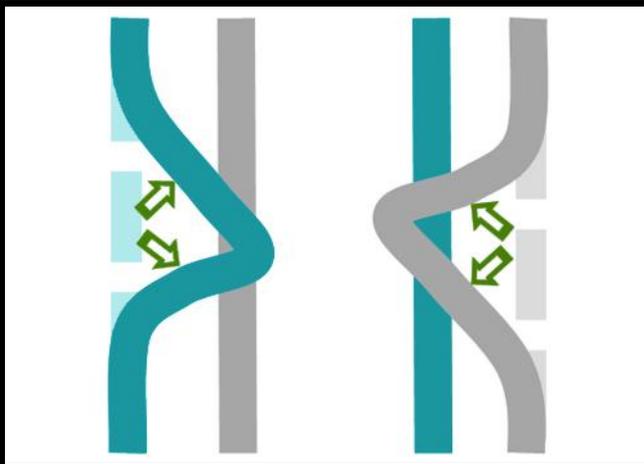


Figure 15: Conceptual model of flood-adapted urban-design strategies

On the left, floodable structures and public spaces; on the right, floating and elevated buildings

Legend:

– blue lines: river

– grey lines: urban settlement (that is, people and assets)

– green arrows: possible integration

Source: elaborated by the author



Figure 16: General view of the Benthemplein, the first 'water square' in Rotterdam

Source: Terrin (2014, p. 40)

'Living with floods' should not be seen as a one-size-fits-all strategy that will finally free cities from nuisances related to flood risk (CEPRI, 2015), since its limitations lie in the hybrid trait of floods themselves. For example, rapid-onset riverine floods surely pose additional challenges for 'living with floods', as the water depth, velocity and sediment load might imply too dangerous conditions that should of course be kept away from people's experience (CEPRI, 2009; Hubert, 2014a)⁴⁸. Also, since this perspective goes in the opposite direction of the prevalent defensive management strategies of fighting *against* floods⁴⁹ (which have their roots precisely in the military sphere), strong cultural barriers and organizational inertia should not be overlooked. This social dimension, as well as the divergent perceptions and priorities among the multitude of stakeholders involved (the exposed population, government agencies in different levels, developers, insurers etc.), may indeed represent an important constraint (like river dynamics themselves) to embrace an adaptive track.

⁴⁸ Indeed, the adaptive stance requires an in-depth understanding of flood conditions at two distinct and complementary scales. On one hand, it is important to grasp the hydrological behaviour of the river basin as a whole (in particular the rainfall-runoff relationship), which continually interacts with human-driven interventions and impacts (such as land-use changes, soil erosion, or the introduction of retention ponds or dams). On the other hand, hydraulic determining factors (topography, soil permeability, underground flows, surface roughness, physical barriers and functioning of defensive infrastructures) reflect the water flow at the floodplain level, being more directly influenced by local urban projects (Hobeica & Santos, 2016, p. 619).

⁴⁹ As noted by the economist Nicolas Bauduceau, scientific and technical director of the CEPRI, dealing with floods through hard defences "is firmly entrenched in Europe's regional, landscape development and management policies" (2014, p. 206).

In any case, the adaptation of building structures and collective practices is recognized as the most ancient human approach to safely live without ignoring the menace of floods. For example, Mumford (1960) referred that early Mesopotamian cities were built on elevated plateaux as a means to face the floods that regularly hit them. In his turn, Salomon (1997) pinpointed some traditional flood-prone French villages in which two-storey buildings usually provide a permanent safe place upstairs, while the (floodable) ground floor has only temporary uses or easily removable furniture and appliances. These two long-lasting typologies are still found today all around the world, and are frequently associated with the use of replaceable building materials. Although not exclusively carried out in traditional communities, the technical alternatives for building in floodplains generally count on old design principles, which can be summarized as follows (having in mind that the boundaries between the typologies are not necessarily rigid) (see Figure 17):

- a) buildings elevated on stilts, having an unoccupied (floodable) ground floor⁵⁰;
- b) buildings with crawl spaces under the ground floor (which are partially elevated);
- c) buildings with the ground floor either (c1) sealed (that is, robust, waterproofed) or (c2) floodable (that is, flexible, water resistant, with no living activities)⁵¹;
- d) floating buildings on the river itself; and
- e) amphibious buildings, which lift when needed.

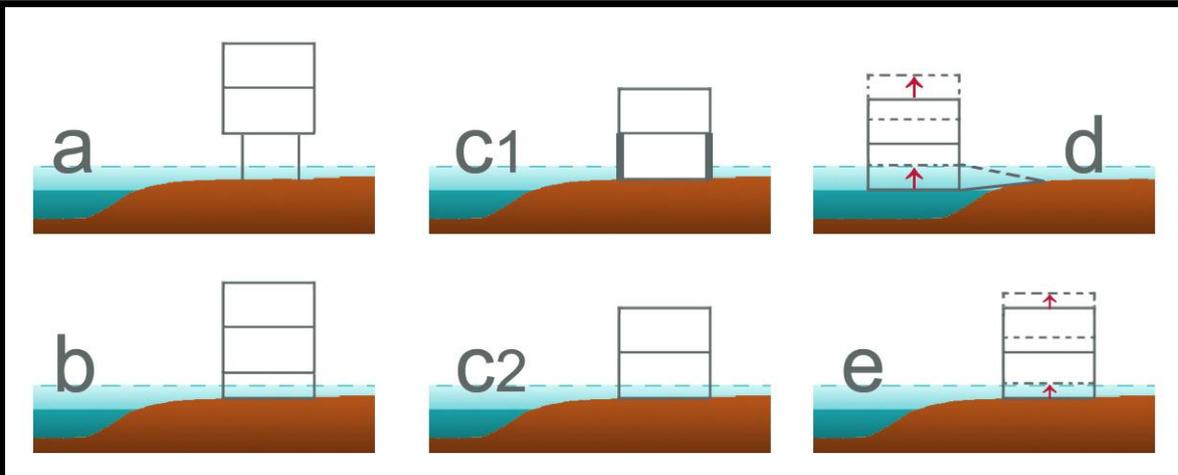


Figure 17: The adaptation of buildings to riverine floods: main typologies

Using the terminology proposed by the CEPRI (2009), alternatives (a), (b), (d) and (e) exemplify ‘avoidance’, while (c1) represents ‘resistance’ and (c2) the ‘give way’ alternative

Source: CEPRI (2009; 2015) (modified by the author)

The usefulness of each of these typologies and the choice of one of them are definitely place and cost dependent (being (e) generally the most expensive alternative). As regards place, the characteristics of the urban fabric and the related floods (frequency, height,

⁵⁰ Buildings erected on platforms that are elevated through land-grading interventions cannot be considered adapted by themselves, even if people can safely live on them.

⁵¹ While the (c1) typology refers to flood-resistant buildings, which attempt “to keep any water from entering property”, the (c2) typology equates to flood-resilient buildings, “designed in such a way as to reduce the cost and time required to reinstate the property should it be flooded” (RIBA, 2009, pp. 24-25).

velocity and duration)⁵², as well as the intended use of the building, are useful guides to support the choice of the most appropriate typology (CEPRI, 2009; Jha *et al.*, 2011). With the sole exception of the sealed typology (c1), all other options accommodate one way or another the water, being somehow flexible regarding future climate scenarios and possible alterations when needed⁵³, and expressing in different degrees the principle of hydraulic transparency, promoted by the French 1992 water law (CEPRI, 2015). Hydraulic transparency is generally understood as the avoidance of barriers to the water flow, fostering thus the preservation of its natural paths during high waters. As detailed by two practitioners, the geographer Alexandre Brun and the architect-urbanist Félix Adisson (2011a, n.p.),

a structure (bridge, building etc.) is considered ‘hydraulically transparent’ when it meets the following conditions: it does not increase the highest water level (water flow is not impeded), it does not reduce the floodplain area, it does not stretch the duration or the spread of flooding, and it does not intensify the water flow speed.

According to this principle, compensation measures (such as the resort to floodable car parks or sport courts) must be carried out so that an intervention in a flood-prone area does not decrease the site’s pre-existing capacity to temporarily store water. Therefore, the pursuit of hydraulic transparency implies not transferring the risk elsewhere, even if at the plot scale the hazard is not really mitigated but kept in its previous state (CEPRI, 2015). The promotion of hydraulic transparency through the adapted design of buildings is not by itself a guarantee that no damage will occur during floods; the main issue is hence to ensure that people stay safe inside those ‘transparent’ buildings during such events. Yet, a shortcoming of this concept is that it is quite conservative: opportunities to actively leaving more space for water may not be encouraged, nor the search for flood-adaptation alternatives that imply working at a scale larger than the one of individual plots.

As regards damage reduction, it is of utmost importance to flood-proof some building details (such as through the careful location and elevation of appliances) and to take into consideration the relationship of the parcel with its surroundings, for example to make available effective evacuation routes (RIBA, 2009). As for the public spaces by the water’s edge, some of the existing strategies to face floods also take the principle of hydraulic transparency into account, while others rely on improving resistance or on the adaptation to both wet and dry conditions⁵⁴. For instance, after having identified six typologies of urban river spaces in terms of particular spatial conditions and river processes, Prominski and his colleagues (2012, pp. 38 *et seq.*) propose coupling these six “process spaces” to design strategies that adequately respond to their respective specificities; some of these strategies are shown in Figure 18.

⁵² An interesting table relating the adequacy of some flood-proofing measures to flood characteristics can be found in the World Bank’s *Cities and flooding* guide (Jha *et al.*, 2012, p. 261).

⁵³ Since they take space from the water, sealed buildings (c1) also have the setback of potentially aggravating flood risk elsewhere (and they have to be designed to withstand the water load on their walls). In any case, this alternative should only be considered when two conditions are met: the expected water levels are low (below 1 m) and the expected flood duration is short (less than 48 h) (CEPRI, 2009, p. 10).

⁵⁴ For some flood-adaptive strategies at the neighbourhood scale, see for instance Bonnet (2016).

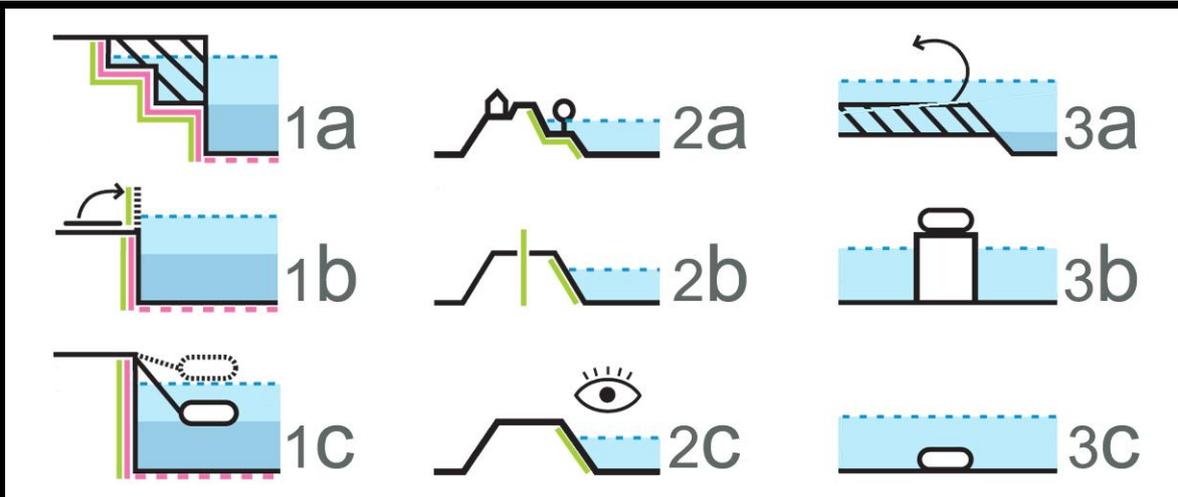


Figure 18: Adapting the shoreline public spaces to riverine floods: some design strategies

Each column represents a different type of process space (1: embankment walls and promenades; 2: dykes and floodwalls; 3: flood areas)

Legend:

1a) linear spatial expansion

1b) temporary resistance

1c) adapting

2a) differentiating resistance

2b) reinforcing resistance

2c) making river dynamics evident

3a) extending the space

3b) placing over the water

3c) tolerating

Source: Prominski *et al.* (2012, pp. 42-43) (modified by the author)

As shown above, the technical strategies to flood-proof new (individual) buildings are in principle straightforward; on the other hand, adapting existing buildings and the urban fabric (in its wholeness, comprising its public spaces, infrastructures etc.) may be a challenging (or sometimes even impossible) task (MEDD, 2005). Besides the technical limitations, serious financial, legal and social (cognitive) barriers do not favour moves towards flood adaptation (Harries, 2008; CEPRI, 2009; Lamond & Proverbs, 2009; Bauduceau, 2014); and these social constraints can also be found as regards new constructions. For example, “[u]nless regulations are in force, developers and designers may have the tendency to ignore flood resilient designs because of increased cost and lack of expertise”, as recalled by Jha and his colleagues (2011, p. 33).

Having detected that “in the Île-de-France region, approximately 95% of buildings in floodable zones and hosting individual or collective housing are not adapted to floods”, the CEPRI (2015, p. 118) identified four reasons that can explain this absence (and that, more generally, discourage flood adaptation elsewhere). The first reason is simply the denial of flood risk (the fact that people refuse the existence of floods in the city was already raised on p. 34), while the second is forgetfulness (short-sighted memory), which hinders the effective consideration of past flood events when refurbishing the urban space. The third factor is biased memory, whereby “people seek to emulate the impacts of past floods on very different present contexts and levels of urbanization”; finally, the French compensation system as regards floods that are declared ‘natural disasters’ also lowers individual sensitization and commitment (CEPRI, 2015, p. 118). It seems that one of the most efficient ways to circumvent the barriers pinpointed by the CEPRI is, paradoxically, to have more floods acting as a “vaccine against the illusion of absolute safety” (Rossano, 2015, p. 22).

Therefore, despite the existence of relevant technical means, flood adaptation is still not the mainstream answer to face fluvial floods in urban-regeneration initiatives, which leaves several questions open to be explored, for example: how to bring the urban-flood issue to the fore in a shared and open manner (not only focusing on its negative side)? How to articulate the flood adaptation of single buildings with the adaptation of the urban fabric (as a more complex system of networks and infrastructures) in urban-regeneration initiatives? What about the expected interactions between scales – building, plot, neighbourhood, city and river basin – in terms of flood adaptation? These last two questions have for instance been posed in the domains of both urban projects (Bonnet, 2016) and flood management (Zevenbergen *et al.*, 2008a), but it is not possible to expect definitive answers to them. Moreover, how to sensitize and articulate the multiple stakeholders involved in an urban intervention located in a flood-prone area (municipal authorities, water professionals, designers, civil-protection officers, final users etc.)? What are the possible means to deal with floods that achieve safety without being exclusively supported by defensive lenses, so that urbanity can also be enhanced? How to reach the appropriate solutions and negotiate them regarding all the legal requirements in place and ensure as well their social acceptance (and thus their efficacy)? The next section introduces spatial design as a framework in which these and other related questions can be raised, discussed, reformulated and ultimately answered by making flood adaptation a dynamic and multifaceted design task.

2.5 Spatial design as a flood-adaptation tool

As human-natural processes that are permanently being constructed, riverine floods could often be regarded as an ‘unconsciously designed’ condition. Following that, one may argue that safety can ideally be enhanced if fluvial floods become better designed in their whole, i.e. if riverine spaces are consciously and collectively conceived in a way that accepts the hybrid floods. To explore flood adaptation as a design task and spatial design as a pertinent flood-adaptation tool, we should first introduce some more general notes on design.

In his keynote lecture at the 2008 “Annual International Conference of the Design History Society”, Latour (2009a, p. 2) observed that the term ‘design’ has remarkably evolved from its limited meaning of “adding a veneer of form” (or a “superficial feature”) to “redress the efficient but somewhat boring” products, to ultimately encompass “the very substance of production”. Indeed, ‘design’ is presently used to refer not only to the fabrication of daily objects but also to every domain in which human action shows its transformative power: “cities, landscapes, nations, cultures, bodies, genes and (...) nature itself”, as the author provocatively complemented (Latour, 2009a, p. 2). Two critical changes are thus stressed in this enlarged sense of design. First, the whole stages of action leading to the final output have been gaining importance; therefore, means are not understood as neutral moves to reach a given end but are at the very core of the related decision-making processes.

At the same time, the subjects of design, now covering all sorts of products derived from human interventions (that is, much more than the traditional industrialized objects), have become increasingly complex, even if the artificial keeps being design’s privileged sphere

of action (Cross, 2006). Moreover, according to Latour (2009a), by dealing concomitantly with both surface (form) and substance (content), design in its current sense demarcates itself from building, destroying, repairing, making or fabricating – all of them traditionally related to the production of mute ‘objects’, with a focus solely on their materiality and functionality. The new sense of design embraces but also surpasses these terms altogether, since it also covers the symbolic role (or the substance) of the designed ‘things’ (Latour, 2009a)⁵⁵.

Recognizing that “it is impossible to offer a single and authoritative definition” of ‘design’, since its historical roots and intrinsic nature vary along with specific cultural contexts, the editors of the *Design dictionary* agree that, in English, this term is “broadly applied to include the conception – the mental plan – of an object, action, or project” (Erlhoff & Marshall, 2008, p. 104). Referring to the etymology of the term, the scholars Michael Erlhoff and Tim Marshall (2008, p. 104) also add:

Design comes from the Latin word *designare* meaning to define, to describe, or to mark out. At a certain point in history, design shifted from a term that generally described a great number of human activities, toward its current status as a defined and professional practice.

Despite this current established status, design is perhaps undergoing nowadays a slight shift towards its primeval and general sense, since the act of designing is covering more domains than previously – or, one might say, professional designers are becoming a ubiquitous expertise category due to the enlarged scope of the design activity. In this sense, design may be seen not only as a specific professional practice, but as a reference mindset gathering individuals who deliberately manipulate ideas, concepts and matter to conceive artefacts and processes that aim to make human life and activities easier, fuller and richer. As summarized by the philosopher Stéphane Vial (2015, p. 64), design is “a future-oriented practice underpinned by an ameliorative purpose”. Indeed, the focus of the design activity has traditionally been tackling complex issues – namely “wicked” (Rittel & Webber, 1973), “underdetermined” (Dorst, 2004) or “ill-defined” (Cross, 2006) problems –, through the adoption of solution-focused strategies.

This rational perspective was well developed in the seminal work of the political scientist Herbert Simon (1969) on the designed character of the artificial world, and has prevailed until the emergence of an alternative line of thought in the 1980s, heralded by the philosopher Donald Schön (Schön, 1983; Dorst & Dijkhuis, 1995; Groat & Wang, 2013). A constructivist approach is then proposed, whereby the design problem and the answers to it are structured hand-in-hand through the process of design itself. In such a reflexive practice, design problems or the issues at stake are posed, revealed, elaborated and produced, instead of merely solved. In fact, Schön understands the act of designing “as a conversation with the materials of a situation”, which he describes as follows (1983, pp. 78-79):

⁵⁵ In a nutshell, Latour (2009a) distinguishes ‘things’ from ‘objects’ as follows: while ‘objects’ are understood as “matters of facts” (that is, true givens in themselves not really open to discussion), ‘things’ refer to disputable “matters of concern”. Accordingly, “[t]he more objects are turned into things – that is, the more matters of facts are turned into matters of concern – the more they are rendered into objects of design through and through” (Latour, 2009a, p. 2). For a thorough discussion on this topic, see Latour (1993).

A designer makes things. Sometimes he makes the final product; more often, he makes a representation – a plan, program, or image – of an artifact to be constructed by others. He works in particular situations, uses particular materials, and employs a distinctive medium and language. Typically, his making process is complex. There are more variables – kinds of possible moves, norms, and interrelationships of these – than can be represented in a finite model. Because of this complexity, the designer’s moves tend, happily or unhappily, to produce consequences other than those intended. When this happens, the designer may take account of the unintended changes he has made in the situation by forming new appreciations and understanding and by making new moves. He shapes the situation, in accordance with his initial appreciation of it, the situation ‘talks back,’ and he responds to the situation’s back-talk. In a good process of design, this conversation with the situation is reflective. In answer to the situation’s back-talk, the designer reflects-in-action on the construction of the problem, the strategies of action, or the model of the phenomena, which have been implicit in his moves.

As the quote above clearly expresses, in the constructivist view designers extrapolate a strictly pragmatic and functional role to engage themselves in the anticipation of unknown problems, challenging thus the initial design request and possibly re-elaborating it in unexpected manners (Dorst, 2004; Cross, 2006). Indeed, as asserted by the designer Klaus Krippendorff (2007, p. 70), beyond solving problems, designers are also moved by the possibility of anticipating (and shaping) different future prospects, through the identification of opportunities – not actually related to perceived problems – to improve life’s conditions, or simply by opening ways to move away from the *status quo*.

When compared with this stance, design as a problem-solving activity may be considered “an inherently conservative act of incrementally shifting around what is already there in a manner directed by preconceived ideologies”, as stated by the architect Jeremy Till (2009, p. 167). Anyway, understanding (and also practising) design as a strict problem-solving activity or as a more comprehensive demand-structuring process is fundamentally a matter of worldview: while the positivist paradigm underlies the former, the constructivist paradigm supports the latter (Dorst & Dijkhuis, 1995). Consequently, in professional fields that traditionally deal with an ‘objective’ world (such as engineering), the design act would generally follow a problem-solving approach.

Apart from this philosophical distinction regarding the essence of its actual practice, design is a polysemic term that usually covers two related senses (method and product), being both a verb and a noun. The verb ‘to design’ refers to the action or the process of reaching (or constructing) the related solutions and artefacts; in this case, design is understood as a means or a tool. To design, meaning to anticipate through a reflective and creative process, is “clearly an essential feature of architectural production” (Till, 2011, p. 5), a statement that is shared by many architects and urbanists – see for instance Vilanova Artigas (1968) or Portas (2011). Conversely, the noun ‘design’ usually denotes the output that provides a response to the issue in question: that is, the resulting product of the design act (being it a bridge, a spoon or a building). In this vein, the design is the ‘solution’ (especially when ‘to design’ is performed as a problem-solving activity).

This dual sense of the term ‘design’ also implies that it covers in itself two different perspectives: as a blueprint, design entails an artistic approach that is output centred; on the other hand, as a process, design has an emphasis on its outcomes more than on the final

products themselves. In fact, in the latter approach, the process in its own may be intended as the actual design product, while design is performed as a collective endeavour in which the concerned stakeholders can express their innate forward-thinking capabilities. Nonetheless, the double meaning of design (verb and noun) derives from the fact that in English the idea evoked by the term comprises a synthesis of both intentions and their formal representation (mainly through drawings and models), aiming at their concretization⁵⁶.

Besides problem-solving and demand-structuring activity, a third and broader definition of design (which actually complements the previous ones) is proposed, among others⁵⁷, by Krippendorff (2007, p. 69), for whom “[d]esign is making sense of things (to others)”. Closely related to the substance of designed artefacts as recalled by Latour (2009a), this definition indeed brings three worth-noting points. First, the author stresses the creation of meaning as the central task of design, claiming thus “perception, experience, and perhaps appearance as its fundamental concern” (Krippendorff, 2007, p. 69)⁵⁸. In this regard, besides being useful devices, design artefacts are acknowledged as holders of meanings to society through their semantical properties, being hence subject to interpretations.

Following this rationale, design is far from being “a purely technical procedure” (Vial, 2015, p. 64), but is above all a sense-making activity, deeply rooted in its sociocultural and political context (Forester, 1985; Till, 2009). Therefore, while “problem-solving, predicated as it is on positivist thinking, tends to either abstract or exclude the social and the political, sense-making inevitably engages with them”, as observed by Till (2009, p. 168). As regards the architecture realm, this perspective is duly acknowledged by the urbanist Nuno Portas (2011, p. 209), who presents design as the challenge of jointly “giving sense and form” (or “giving a meaningful form”) to a certain spatial situation.

Secondly, by opting for the term ‘things’ instead of ‘objects’ in his definition, Krippendorff takes the same stance as Latour (1993) (see footnote 55, on p. 53), for whom the strict separation between ‘things’ and ‘objects’ is becoming obsolete since the latter are increasingly losing their indisputable character, being thus more and more open to redefinitions. Finally, with the introduction of ‘the others’ – being them users, related stakeholders (co-designers) or society as a whole –, Krippendorff also recognizes the social (that is, collective) essence of both design processes and outputs, therefore indicating engagement as one of the crucial dimensions of design⁵⁹. As a consequence, when “form-

⁵⁶ This united sense of design is split in most Latin-derived European languages; for example, to have the same whole meaning, one needs to combine, in Portuguese, *desígnio* and *desenho*; in French, *dessein* and *dessin*; in Spanish, *diseño* and *dibujo*. Italian is a notable exception, since the word *disegno* also carries both senses.

⁵⁷ See also the arguments of the urban planner John Forester (1985) following the same reasoning.

⁵⁸ In an earlier work, Krippendorff (1989, p. 9) noted that this capacity of making sense through design incurs a paradox: while the ‘making’ part entails innovation, ‘imbuing sense’ entails continuities; in any case, as he asserted, the current sense of design has escaped this paradox by being attached more closely to the ‘making side’, “at the expense of the sense that was to be achieved thereby”.

⁵⁹ According to Till (2009, p. 173), it is precisely ‘the others’, namely ‘assuming responsibility for them’, that should be at the core of architecture’s reasoning and practice, ‘the others’ being “the diverse mix of builders, users, occupiers, and observers of architecture, people whose political and phenomenal lives will be affected by the construction of a building and its subsequent occupation.”

giving is understood more deeply as an activity of making sense together, designing may then be situated in a social world where meaning, though often multiple, ambiguous, and conflicting, is nevertheless a perpetual practical accomplishment”, as synthesized by Forester (1985, p. 14).

These three points were particularly elaborated by Latour in his aforementioned lecture, in which he proposed a “few steps toward a philosophy of design” and introduced “five advantages of the concept of ‘design’” (2009a, p. 3). In Latour’s point of view, modesty, attentiveness to details, intention to produce meaning, sense of improvement and an ethical dimension are the key qualities that enable design to overcome the static “notion of making” (2009a, p. 7). By acknowledging that design was historically conceived as a mere exterior upgrading in existing items, Latour stressed that the concept carries in itself an awareness of humility acting, a modesty that derives from the fact that it has never been foundational. And due to this quality (and in contrast with the overconfidence of past ‘makers’), designers are more conscious of the contingencies inherent to their operational contexts. On the other hand, differently from generalization, design displays an innate attentiveness to details: a deep recognition of particularities is expressed through skilfulness, artistry or craftsmanship, features that eventually contribute to the uniqueness and quality of the designed outputs. As complemented by Latour (2009a), such attention to details expresses a sense of care or a precautious attitude towards the designed things, which is absent when one talks about ‘making’ something.

By merging form and purpose, design carries the intention to produce meaningful ‘things’, in contrast with crude ‘objects’ that, being sealed, refer only to themselves (Latour, 2009a). In this regard, a design process that only gives response to the practical facets of a problem without critically facing it – that is, without dealing as well with its deeper substance – results purely in a “technocratic expression”, using Portas’s words (2011, p. 23). Concerning the sense of improvement, Latour considers that design is essentially an ongoing process rooted in previous experiences: “it is never a process that begins from scratch: to design is always to redesign” (2009a, p. 4). Therefore, design is never definitive, for it takes into account the transitory character of a given situation and of its enlarged socio-cultural milieu; it will surely be surpassed when the overall context changes. That is why design is considered by Latour as “an antidote to hubris and to the search for absolute certainty, absolute beginnings, and radical departures” (2009a, p. 4).

Finally, design always implies a “concern for ‘appropriateness’”, as expressed by the design scholar Nigel Cross (2006, p. 2), having thus an ethical dimension regarding both the way it is carried out (what are the concerned values in question?) and the implications of the designed output when finally integrated into daily life. In this same line, Cross considers that “*design is rhetorical*. By this, [the author means] that design is persuasive. (...) Design is rhetorical also in the sense that the designer, in constructing a design proposal, constructs a particular kind of argument” (2006, p. 31; italics in the original). Hence, besides being open to interpretations, due to this ethical dimension design is furthermore open to disputes and judgements.

If the five attributes identified by Latour are ontologically related to the concept of design, they should hold in every situation in which design as an activity applies, “from chairs to climates” (Latour, 2009a, p. 6). This assumption does not mean, of course, that design’s spheres of action are homogenous, nor gradual, as noted by Portas (2011, p. 43); in fact, things subject to be redesigned bring their own idiosyncrasies and vicissitudes to the design process itself. Therefore, the design of a spoon and the design of a bridge are totally unrelated processes: the involved variables, constraints, materials and means are specific to each of these two design situations; they share nonetheless the mindset and essence of design at large (a rearrangement with an ameliorative intention). Anyway, among the large spectrum of things subject to design, our concern is turned to the ones with larger scale and territorial scope: buildings, neighbourhoods, cities, landscapes – all of them involving human-nature relationships within space.

Meant to be an interdisciplinary professional field, spatial design may be understood as the design branch that has the general aim of enhancing existing conditions through the manipulation of form, function and substance of space constituents at different scales (Hobeica & Santos, 2016). Spatial design is here taken as a generic umbrella term that “includes various design disciplines such as interior design, landscape design, exhibition design, environment design, architecture, etc.” (Vial, 2015, p. 59), all of them having design as their core activity and dealing one way or another with space through a relational point of view (and not simply as a container of things) (Latour, 2009b).

As such, the idea of spatial design recognizes the existence of overlaps in the field of action of these established disciplines, and breaks conventional frontiers between them. It is precisely this inclusive condition (of scales and standpoints) that makes spatial design an attractive concept. At the same time, it is not by chance that the landscape architect Karl Kullmann recognizes that spatial-design disciplines (namely architecture, landscape architecture, urbanism, urban planning) presently converge and “contest similar disciplinary territory”, an emblematic sign, in his opinion, “of an emergent landscape-based trans-disciplinary practice” (2016, p. 31) (see Figure 19).

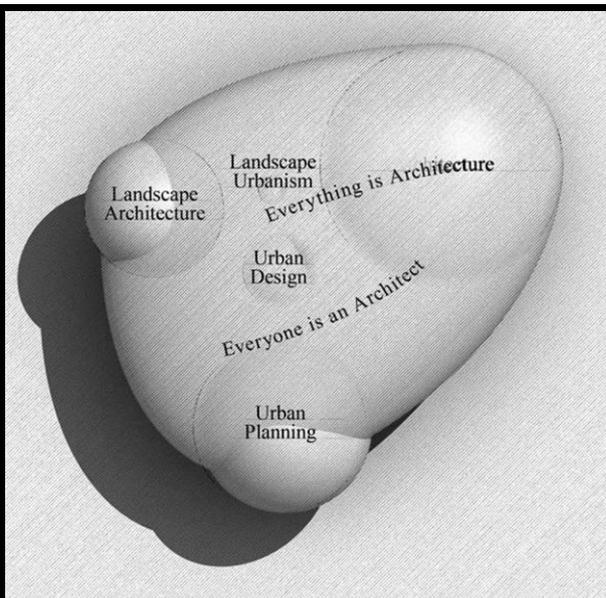


Figure 19: “Architecturally based integrated design”

‘Spatial design’ may be taken as an umbrella term to refer to architecture’s expanded sphere of action
Source: Kullmann (2016, p. 39)

In this sense, spatial design as a concept comes closer to an “expanded notion of architecture” (or “architecture at large”), as expressed by the architectural theorist Hilde Heynen (2016), for whom architecture is related to the “spatial setting” in general, whereas it functions as “a stage of negotiations”. Accordingly, the idea of spatial design is somehow aligned with the expansion of architecture’s field of action, pinpointed by the architectural theorist Anthony Vidler (2010). Moreover, spatial design closely dialogues with the notion of “geo-architecture”, advocated by the architect-urbanist Le Corbusier in the 1940s, to refer to conscious human interventions to shape the living space, which since that time has had a scale much larger than that of the city itself (Sarkis, 2014). As stated by the architect Hashim Sarkis (2014, pp. 126-127), who has scrutinized Le Corbusier’s ideas in that sense, “geo-architecture imbues territorial formations with a sense of legibility and a sense of beauty. Beauty is both possible and necessary at this scale. Architecture gives the territory its visible shape and does so from the discrete confines of the project.”

Such conceptual move is totally aligned with the painter Wassily Kandinsky’s appreciation of a comprehensive stance on arts of which he saw the emergence at the turn of the 20th century, whereby an inclusive “and” (*und*) perspective started to counter the 19th-century exclusive “either-or” (*entweder-oder*) one, characterized by fragmentation and segregation (Kandinsky, 1927). With this foresight – an intrinsic feature of the artistic inquiry, as pointed out by Foqué (2010) –, Kandinsky was somehow heralding the transdisciplinary vein advocated in the 1970s by Piaget (1972) as a key feature of the last century. Although it is relatively easy to identify architects who extrapolate the strict architectural practice – designing buildings – to conceive, for example, day-to-day ‘objects’ (Mies van der Rohe, Le Corbusier, Aldo Rossi, Álvaro Siza Vieira etc.)⁶⁰, a more regular inclusive perspective in terms of creative mindset, as envisioned by Kandinsky, is still to be reached in the realm of architecture (Till, 2009). And this is the main reason for Traganou’s claim quoted in the introduction (see p. 6): for her, positioning architecture within spatial-design studies *lato sensu* is “a necessary means” to duly examine “architecture’s relationship with broader socio-cultural and political contexts” (2009, p. 174)⁶¹. In her words (2009, p. 178),

[b]y re-inscribing architecture within the broader field of design studies, buildings and other spatial constructs should find their place in a mental map where ideas, technologies, epistemologies, institutions, market conditions, techno-economic and socio-political contexts affect a variety of cultural productions that operate within the same historical context.

Realizing that similar “design languages” and “forms of knowledge” are employed in architecture and other design practices, Traganou thus calls for bridging existing fields within spatial production, rather than creating a new particular discipline (2009, p. 173). But differently from the conception of self-contained material artefacts (which may yet have open semantic attributes), designing spaces is all about designing relationships

⁶⁰ At the other extreme, it is also possible (although less easy) to identify architects who conceive large-scale infrastructures as part of their design activities (for example Rem Koolhaas or Manuel de Solà-Morales).

⁶¹ Traganou (2009, p. 173) notes that architecture has traditionally followed “an art-historical tradition” that puts a great emphasis on individuals – the architects –, as if they were the most central figure in the design process. Such oversimplification understates all relevant relationships between the architects and the multitude of stakeholders involved “from the commission to the construction of a building”, who inform as well “both the material qualities of the [architectural] product and the symbolic values invested in it” (Traganou, 2009, p. 174).

between people, things and their processes – that is, between constituents of space itself in its multidimensional complexity (Latour, 2009b; Prominski, 2014). Notwithstanding the fact that all ‘human’ interventions at large (as well as all ‘natural’ processes) are constantly designing and redesigning space, our interest is here turned to the formal, intentional and creative action of ‘professional spatial designers’ (such as architects, landscape architects, urbanists, engineers), for their acknowledged role in current urban-regeneration processes. Accordingly, our understanding of ‘professional spatial designers’ includes also practitioners such as geographers and hydrologists, in view of their strong contribution for understanding (and thus shaping) urban floods.

Most urban-regeneration initiatives nowadays comprise the conception of an urban project of the targeted city segments as a means of spatial reflection, design and ensuing implementation, aiming to turn them into actual ‘places’⁶². The architect-urbanist Patrizia Ingallina (2003) noted that in France urban projects are spatial expressions of strategic city plans, which cover a comprehensive urban vision but are not yet spatialized. On the other hand, as claimed by the architect-urbanist Bernardo Secchi, contemporary urban projects are geared towards the reclamation “of the ground” (*suolo*), “intended as a design material (...), as a composition of single different elements, or as a series, as a definition of the surface characters where buildings are based” (1986, p. 20).

Consequently, the focus of urban projects is neither on individual buildings nor on the urban agglomeration, but exactly in the interface of these two spatial dimensions. In that sense, professional spatial designers have the key role of translating those city visions into spatial features in such intermediate scale, duly anchored in the materiality of the ground. These professionals are of course among the several stakeholders that collaborate to the construction of a collective urban vision; yet, given their ability to mentally manipulate a given spatial structure and envision its possibilities of transformation, they usually also act as orchestrators of urban projects (Rossano & Hobeica, 2014).

Having in mind the dynamic character of these initiatives, urban projects can be described as intentionally pursued urban processes that have strong spatial expressions; that is, urban projects somehow equate to wide-ranging spatialized processes. According to the architect-urbanist Manuel de Solà-Morales, who deeply explored urban projects from both the theoretical and the practical points of view, the following five aspects currently define such projects (1987, p. 25):

- 1) [T]erritorial effects beyond their area of intervention;
- 2) complex and interdependent character of their contents; overcoming of monofunctionality (park, roadway, typology, etc.); mixture of uses, users, timing, and visual orientations;
- 3) intermediate scale, to be completed within a maximum time limit of a few years;
- 4) voluntarily adopted duty of carrying out an architecture of the city, independent from the architecture of the buildings;
- 5) important public component in the [investment] and of community uses in the programme.

⁶² Urban projects as a contemporary mode of city intervention are only briefly introduced here; for a thorough review, see for instance Secchi (1986), Solà-Morales (1987), Ingallina (2003) and Portas (2003).

Such enumeration thus highlights spillover effects, multifunctionality, feasibility, design intention and public concern as main attributes of urban projects; overall, these concepts aggregate the conditions needed to face the modern city and its inherent complexity, as remarked by Solà-Morales (1987). In fact, urban projects as medium-scale interventions are firmly attached to their own context, recognizing both the role of key elements to be preserved and the more transient condition of the ones to be replaced in order to move forward (Ingallina, 2003). Using Solà-Morales's own words, urban projects consist in "taking the geography of a given city, with its claims and suggestions, as a starting point, and allowing architecture to introduce language elements to give form to the site" (1987, p. 25).

Based on this assertion, the existing setting (the geography in its full sense: human and natural) should set the tone in these initiatives, while design contributes with new shapes and meanings. Architecture should be taken broadly in Solà-Morales's statement, since architects alone are probably unable to fulfil the entire disciplinary spectrum needed for context analyses, interpretations and answers within current urban projects, as noted by Portas (2011); urban projects are indeed a complex interdisciplinary task. Furthermore, as these projects do not aim to define each and every spatial element within it, but mostly to establish spatial rules and relationships along with the related programme, its openness may not be straightforwardly welcomed by traditional architectural training, which is "always reluctant to 'open design', to intentionally incomplete definitions or to design by layers", as recalled by Portas (2011, p. 116).

Nonetheless, spatial design as a broader category of action takes openness, partial definitions and several strata as its strengths (not weaknesses), since these traits (mostly related to time) are inherent to the existing complexity and dynamism of most spatial relationships. Urban projects are also characterized by a strategic approach that benefits from unexpected opportunities and possible synergies, being a collective endeavour normally open to public participation and to partnerships between public and private organizations, bringing together multiple skills as regards the involved professionals and municipal services (Ingallina, 2003; Portas, 2003). Great importance is given to the programme – which functions, uses and practices are to be fostered in a given spatial situation? –, being it normally anticipated in the design brief, while the focus of the intervention mostly goes to the public domain: the public space is taken as the main thread or the leitmotif of the urban fabric (Secchi, 1986; Solà-Morales, 1987).

In view of the above considerations, urban projects are not only a matter of formal arrangement (that is, of design just as a product), but above all the outcome of a series of decisions about relationships within space, not strictly linear but with several feedback loops, involving many stakeholders (being thus closer to the idea of design as a process). And the design is eventually informed by all the stakeholders: from public authorities at large to landowners, building contractors, investors, regulators, designers, city dwellers and society as a whole, even if the proponents of a given urban project can be quite easily identified (one or several public institutions, mixed public and private organizations, or even citizen associations) (Avermaete, 2016). As synthesized by the scholar Gilles Hubert (2014a, p. 226),

[t]he challenge of the urban project is, on the one hand, to be able to design consistent public policies in response to locally identified issues and, on the other hand, to develop a permanent network of stakeholders, capable of coordinating initiatives across various sized areas and over varying timeframes. Ultimately, these are also the goals of risk management.

Since spatial design is a means through which urban projects are conceived (when considering a professional approach), it is inherently a complex task of organizing multiple collective needs, intentions, uses, desires, possibilities and constraints in a balanced, insightful and also inspiring spatial arrangement (Rossano & Hobeica, 2014). Complexity indeed characterizes the general framework in which spatial design is pursued; as recalled by Forester (1985, p. 14), design practices “take place in an institutional world where rationality is precarious at best, where conflict abounds, and where relations of power and authority constitute the terms of the feasible, the desirable, and at times even the imaginable”.

Negotiation is thus a key feature of spatial design, which is beyond the simple selection of the best spatial ‘solution’ among the envisaged options, encompassing the evaluation and management of several requests and needs (technical, aesthetic, sensorial, financial etc.) to be spatially synthesized in a coherent way, while minimizing the chances of future negative repercussions. In this sense, negotiations are carried out during the design process to select the variables at stake, but conversely the design process itself can also be performed as a means to raise new conditions (not anticipated in the design brief) and alternative scenarios, to weight them and hence to improve decision-making.

Of course, during the design process, choices (space related or otherwise) have to be made, and this brings to the fore at least three pertinent issues. First, to recognize and to balance several demands and needs often pose the question of commensurability: even if all of them may be considered legitimate, some design requirements may conflict with each other (Christensen, 1985), possibly to the point of deadlock. And since these requirements cannot always be easily ranked or measured using a common standard, some ultimate judgements (and design decisions) have to be politically made (Rittel & Webber, 1973); obviously, these do not concern solely ‘professional spatial designers’. Negotiation – within and through spatial design – hence implies both taking decisions and supporting decision-making at large (Rossano & Hobeica, 2014). This brings us to the second issue: given the diversity of stakeholders, spatial design must also deal with conflicting systems of values and beliefs, recalling thus the ethical dimension of design commented above (Latour, 2009a). Therefore, through engagement, spatial design always expresses the shared or negotiated assumptions underlying its process.

Thirdly, since many of the multiple design requirements are often not fully known at the stage of the design brief but unveiled within the design process itself (sometimes, oddly, only during the design implementation), decision-making always has to deal with different degrees of uncertainty. Not only can unexpected demands and constraints be raised in the course of the design process, but others will only be perceived as important ones in the long term (or by new unanticipated stakeholders). Indeed, the overall conditions and social values within which design operates are far from static (and their changes are not always

linear); the degeneration of some areas within cities is an incisive example of these time-related circumstances.

Therefore, besides considering the issues at stake that are known beforehand and the ones that become known through its process, spatial design should also be pursued by leaving some leeway for the unknown (that is, for issues mostly related to time). In fact, contingencies normally represent the very condition of both the world at large and the more circumscribed context within which design operates⁶³ (Christensen, 1985; Till, 2001; Wilkinson, 2011); change is thus the rule, not the exception. In this sense, contingencies have the power of recalling life's inherent transiency, philosophically speaking.

Anyway, contingencies reveal a paradox in the spatial-design practices: despite their omnipresence both upstream of the design process (in the inputs) and downstream (in the outputs, as expressed by unintended consequences of some design choices), they are usually aimed to be restricted and regulated, at best (or are unreasonably ignored, at worst) (Christensen, 1985; Till, 2009). "A crucial planning task is to discover, assess, and address uncertainty", according to the urban planner Karen Christensen (1985, p. 63); yet, in her particular professional domain, "both means and ends are [traditionally assumed to be] known", thus calling for rational approaches, such as the resort to replicable answers for issues of the same nature. In this framework, the conditions of uncertainty that prevail in the planning context (either related to the means or the ends – or both) are not addressed by the tools normally used by these professionals.

Christensen then argues that planners should not ignore uncertainties, but cope rationally with them by "tailoring planning [styles and processes] to real-world conditions" (1985, p. 69)⁶⁴. On the other hand, Till (2001, p. 1) identifies the establishment of order ("in the pursuit of perfection") as the very core of architects' remit in such a way that they aim (or at least try) to pacify or ban the contextual contingencies and uncertainties that can disturb the intended stability. However, as asserted by him, "contingency, far from a defect, is in fact a catalyst for strong interpretation" (Till, 2001, p. 22), since it calls for design answers that are actively engaged in reformulating the unstable conditions (as much as possible), while being attentive to them in a humble way (that is, not trying to fix what is essentially dynamic). Even in the landscape-architecture domain, Prominski (2006, p. 26) notes that

⁶³ Referring specifically to architectural design, Till (2001, p. 22) astutely states that "[a]rchitecture is continually open to uncertainties. It is buffeted by forces beyond its control. The process of design cannot be subjected to method, the process of briefing cannot be fully rationalised (clients are hardly simple beings), the process of building is open to continual uncertainty, and the occupation of architecture is unpredictable. Bring to this rich mix the social and political context in which architecture is situated, and it can be seen that at every single level architecture is contingent on other forces." Therefore, the author concludes that the attempts to rid architecture of its contingency nature are doomed to failure. Overall, this argument can be transposed to other spatial-design situations without incurring the misconception that design's spheres of action are all homogenous or gradual (as previously stated on p. 57).

⁶⁴ Although focusing on planners at large, the rationale developed by Christensen (namely the expectations towards planning issues and the roles of planners derived from her "prototype conditions of planning problems") (1985, p. 64) could be equally useful for spatial designers, who somehow combine planners' overall roles with the one of devising concrete (and meaningful) spatial arrangements.

[f]or a long time, the perspective on landscape was restricted: it was seen as a green remedy, a compensation for the pressures of modern life. As a result, designed landscapes resembled Arcadian paintings (...); the goal was the creation of ideal, static images which allowed for the contemplation of a balanced unity of man and nature. Over many centuries, this idea of landscape has settled deep in our collective mind.

In this still prevailing design approach, the inherent cultural and natural dynamics of landscapes are not fully acknowledged, since they could distort the underlying romantic idea of perfection (Prominski, 2006). However, this scenic notion of landscape understates three issues – “uncertainty, processes and relationships” – that are more and more present in the context of the always evolving contemporary landscape topics (Prominski, 2006, p. 28). To overcome such limitation, Prominski proposes viewing landscape as “a temporally and spatially open system”, in which complexity, uncertainty and uniqueness prevail; and although not being “exactly predictable”, such system can be successfully managed through design (2006, pp. 27 and 33). Therefore, as stated by this author, contingencies should not be seen “as something that has to be resolved, but as an integral part of the design” (2006, p. 33).

These three brief notes related to the realms of planning, architecture and landscape design underline that the general mindset regarding uncertainty is not exclusive to specific domains, and may indeed be an intrinsic trait of the human condition; as cleverly put forward by Christensen (1985, p. 63), uncertainty is hated by planners just as it is by most people. Yet, the reflections raised in the three notes above suggest that there is at least some awareness that contingencies should not be disregarded, but better addressed by those dealing with social dynamics in space and time. In fact, in the framework of spatial design, when contingencies are not taken as a requirement like the more palpable ones, urban projects can be defeated by the unforeseen. If urban projects are carried out by strictly taking for granted their assumptions, means and goals, they can face (or create) new problems (such as increased implementation costs or lack of enough social demand), for not being able to adjust to unexpected changes.

A contemporary way to circumvent this drawback is the formulation of scenarios, a planning and design method that contrasts with “the ‘pre-vision’ certainties of the past” (Secchi & Viganò, 2009, p. 9), often rooted in unattainable goals within a frozen framework. Far from being predictive, the scenarios explore possible paths as regards the expected spatial relationships engendered through design, thus turning more feasible the negotiation between different design requests and between alternatives, in both the short and long terms. According to Secchi and Viganò (2009, p. 10), the formulation of scenarios

reintroduces the element of time into the project for the city. At the same time, it interprets the desire for change – which has become more and more evident and aggressive (...) – and the sense of increasing uncertainty that inevitably accompanies it: the more change advances, the greater the anxiety about the future becomes.

Viganò complements elsewhere (2012, p. 9) that the formulation of scenarios does not imply “an endless proliferation of alternatives, but [the use of] design to investigate and produce knowledge in order to achieve objectives, advance technologies, and understand the values expressed by society” – an approach denominated ‘research by design’ (Till,

2001; Fabian & Viganò, 2010). By anticipating several alternative paths, scenarios help to prepare the stakeholders in a given spatial design to unusual futures; and by bringing to the design process relevant ‘what if’ questions (Costa, 2013), scenarios do acknowledge (and perhaps welcome) the unforeseen, which can then be tackled through more flexible and adaptive design approaches. As such, the exercise of bringing forward different scenarios is itself even more important than the actual spatio-temporal alternatives delivered by them, since the related learning process is a critical feature to review the prevailing mindset regarding uncertainty within design. This nevertheless requires that spatial designers show humility – in line with the modesty trait of design described by Latour (2009a) –, in such a way as to accept more ‘open design’ processes and outputs.

Indeed, by following this track, designers do not actually control or define all parameters of the final output but, at best, organize and guide them towards the most favourable direction. In any case, as noted by several authors from an array of spatial-design fields (Spirn, 1988; Till, 2001; Prominski, 2006; Portas, 2011), this mentality may not be the one that prevails among architects, landscape designers, urbanists. Besides raising the issue of professional autonomy, this perspective somehow defies the traditional notion of authorship, much cherished by some (or the majority?) of these professionals. Yet, although uncommon, voices in the opposite direction can also be heard, as expressed for instance in the following statement made by Rocha (2000b, pp. 172-173):

Viewing architecture as something finalized and ready, as it used to be at certain points in history, is not possible anymore (...). It is hard to imagine a project with a premeditated end point. Architecture’s main mission lies in the continuity of the [design] action. The fulfilment of the human habitat overcomes the idea of something ready and established⁶⁵.

At the same time, at least from a theoretical point of view, every design output (from spoons to bridges) could be regarded as an ‘open design’ artefact, since it is always exposed to more or less intense transformations by those who eventually live with and within them. The potential of mutability engendered by life is even more blatant in the landscape domain, since it involves a major source of contingencies as its main sphere of action: ‘nature’ – that is, intertwined natural-cultural processes and expressions (the same idea of nature presented in Section 2.3, as regards floods, still holds; see p. 28). Design with, within or against nature indeed continually faces flows and dynamics that are not predictable, and some designers (landscape architects or otherwise) precisely consider this instability the most interesting condition in their jobs⁶⁶.

⁶⁵ In an interview to a Portuguese architecture magazine some years later, Rocha (2007, p. 58) extends these thoughts by stating: “since the beginning, the architect has to be conscious that there will be transformation, and this should inspire some of the decisions taken in the project. I don’t think it is possible to design with a predefined idea of the transformations to come. On the contrary, through the spatial setting we design a construction that supports the unpredictability of life”. And he finally adds: “[a]s an architect, I think it is an arrogance to design for the present, we have to design for the future. This of course influences the foresight of the concepts we formulate, with caution not to become mad. We should design what should be now designed, although it is not intended for the present. It is designed to support the orientation towards the future” (Rocha, 2007, p. 63). These arguments echo the modesty of design advocated by Latour (2009a).

⁶⁶ Examples of this perspective can be found in the accounts of the landscape architect Michel Desvigne (2009) regarding his work, or in the design approach of the French architectural practice R&Sie(n) (Gissen, 2009; Arbona, 2010).

At this point, we will raise some conjectures (more than actually acknowledge the state of the art) regarding the broader issue of designing with nature, before bringing to the fore and dealing more specifically with the literature and concepts related to designing flood-prone spaces. This move may be risky, but it seems important to frame in more general terms our understanding of the proactive incorporation of floods into spatial design. The quote below, from the preface of Spirn's *Granite garden* (1984, p. 15), can be taken as a starting point:

Nature pervades the city, forging bonds between the city and the air, earth, water, and living organisms within and around it. In themselves, the forces of nature are neither benign nor hostile to humankind. Acknowledged and harnessed, they represent a powerful resource for shaping a beneficial urban habitat; ignored or subverted, they magnify problems that have plagued cities for centuries, such as floods and landslides, poisoned air and water⁶⁷.

While presenting 'nature' as imbued of 'neutral forces', Spirn contends that nature and cities should not at all be viewed as separate domains: nature is conceived not as the outside (or the opposite) of the urban realm, and cities are understood as the more or less successful intertwining of culture and nature. The author then stresses the importance of 'design with nature' as a broad means to improve the urban environment; in this assertion, an implicit idea is that the nature to be embraced within design mostly refers to its idyllic, tamed, stable states – the 'good nature', as briefly introduced in Section 2.3 (see p. 28)⁶⁸. In fact, 'good' aspects of nature (such as natural lighting and ventilation) have been more and more taken into consideration in the design agenda of the sustainability pursuit era (Gissen, 2009), while hurricanes, tornados and earthquakes, for instance, often "hostile to humankind" (Spirn, 1984, p. 15), do not seem to be included in this acceptance of nature, and would thus fall outside the design scope. Furthermore, Spirn notes that design with no regard to such 'good nature' would sooner or later be 'punished' by nature itself, for this leads to its manifestation in a 'distorted' state. Interestingly, the provided examples of problems that may arise in this sense (disasters and pollution) are all combined natural-human conditions in which 'nature' is perceived as rebellious, uncontrolled and capricious.

Under such undesired disturbing situations in which the supposed neutrality of the forces of nature is lost, design is normally called to tame them, and this could be more adequately described as 'design against nature'. In any case, both 'design with nature' and 'design against nature' share the idea that it is simply impossible to abstract the so-called 'nature' in its various expressions from spatial-design activities. This is totally in line with the idea of "envelopes" expressed by Latour (2009a, pp. 6-7), in reference to the work of the philosopher Peter Sloterdijk⁶⁹: "we are enveloped, entangled, surrounded; we are never

⁶⁷ In subsequent texts, to this list of tangible shortcomings of ignoring nature in the design of cities, the author also adds one related to aesthetics and urbanity – when arguing against the "boring sameness" that is found in many cities around the world (Spirn, 1985, p. 476) –, and another one related to the human experience – "forfeit[ing] a sense of connection to a larger whole beyond ourselves" (Spirn, 1988, p. 112).

⁶⁸ This reasoning somehow echoes the lessons heralded by the landscape architect Ian McHarg (1969), although his seminal book *Design with nature* focuses on planning at the regional scale and presents a much less optimistic view of cities (following the same stance as Mumford, who wrote the preface of the book) than that adopted by Spirn.

⁶⁹ For an extended introduction on his theory of spheres and its relationship with spatial design, see Sloterdijk (2005; 2009).

outside without having recreated another more artificial, more fragile, more engineered envelope. We move from envelopes to envelopes (...), never from one private sphere to the Great Outside.” In this point of view, nature is always within, entrenched in the several envelopes that are continually re-created (although hurricanes, tornados and earthquakes *per se* can hardly be understood within this framework, in contrast to the damage potentially engendered by them, which seem to perfectly fit).

It is noteworthy that, depending on the standpoint, Venice – one of the most praised human inventions – can be taken as an eloquent example of either ‘design with nature’ or ‘design against nature’. For instance, when referring to Venice, Rocha recalls that the new geography created by the canals – in a site that was in principle inadequate for a human settlement (a saline lagoon) – was later celebrated with the construction of great palaces; the “supreme architecture of Venice”, he concludes, “is the constitution of its territory” (2000a, p. 71). On the other hand, Venice is probably the best known historical model of the adaptation of a human environment to water processes and variations (Langenbach, 2007). Yet, the “Venetian model”, as proposed by Langenbach (2007), shows a sort of equilibrium between city and water that is not at all static; indeed, the constant presence of the flood threat has been a crucial factor for the conservation and actually the permanence of Venice (see Figure 20). And it is precisely thanks to flood proneness and all related contingencies that the real city of Venice is far more interesting than its attempted replicas elsewhere, which, despite the ‘guarantee’ of their physical permanence, cannot evoke life in its wholeness – they can only be lifelessly perpetuated.



Figure 20: A recurrent scenery in Venice: Saint Mark Square under water (*aqua alta*)

Source: Zevenbergen *et al.* (2010, p. 38)

Venice and the concept of living with water it holds epitomize both the great human capacity to successfully intervene in an unfavourable setting and water’s vast potential to contribute to the flourishing of a distinctive urban atmosphere. However, this does not mean that the ‘Venetian model’ can be easily replicable, nor that the delicate balance attained between city and water in this particular case can be taken for granted. On one hand, the interfaces between land and water assume diverse characteristics elsewhere, calling thus for particular solutions in which “discontinuities and rifts are both reality and opportunity. Presumably the Venetian model [is a dream that] can only be followed where various strategies, models and even contradictions can be made to interact” (Langenbach, 2007, p. 82). On the other hand, due primarily to their fragility regarding water issues (namely the challenges engendered by climate change), Venice and its hinterlands are

presently viewed as an “extreme territory”, which configures a timely laboratory to envision and test new planning and design approaches and tools (as pursued notably by the University of Venice) (Fabian & Viganò, 2010; Viganò, 2012).

The example of Venice illustrates that, whether explicitly embraced or not, ‘nature’ – understood as a composite of interrelated human-natural elements and processes (Prominski 2014), sometimes called either geography, environment, territory or landscape – is continuously being designed. Designing nature in a conscious mode implies framing and reframing natural-cultural processes and expressions to fit enlarged human goals (which of course extrapolate basic utilitarian purposes), considering nonetheless that changes and ephemeral states prevail over stability. Designing nature ultimately recalls Rocha’s words evoked in the introduction (see p. 7), which can be rewritten as follows: by means of imagination and design, humankind has the potential to unveil ‘virtues of nature’ that would pass unnoticed – such virtues may be related to either frequent or unusual ‘natural’ traits.

In this sense, to be recognized as “the prime and primordial architecture” (Rocha, 2000b, p. 172), geography must be understood not merely as a (more or less fixed) scenery but as a repository of multiple and dynamic ubiquitous processes that are not necessarily “hostile to humankind” (Spirn, 1984, p. 15). Therefore, reinterpreting and reconfiguring geographies through design inevitably mean dealing with more or less pacified and stable ‘natural’ features as well as unexpected and sometimes disturbing ones. In this context, the erection of complex structures (such as buildings, infrastructures, cities) that are supposed to last thus entails a conflict between stability and instability, in which their permanence and preservation are constantly challenged, as it is explicitly the case in Venice.

This argument takes us back to floods, the design of flood-prone spaces and how floods can be actively incorporated into spatial design. Due to their disruptive nature, floods have usually been viewed in urban riverfront regenerations as a constraint to be refrained (Hubert, 2014a)⁷⁰; yet, from the spatial-design point of view, one may consider that floods should be dealt with differently in comparison to other site restrictions such as noise or ground pollution. While the latter may be merely recognized as technical issues calling for solutions, floods also potentially have positive aspects to be environmentally, socially and aesthetically explored, an issue that was already briefly introduced on p. 46, when referring to the possibility of floods losing their hazardousness in particular contexts in which the vulnerability is minimized and/or well managed. Floods could for instance be taken through design as a means of experiencing life cycles (Spirn, 1988), which may lead to flood sensitization and awareness.

Anyway, when assessing and negotiating contextual factors (such as site characteristics, financial restrictions and social demands) in a spatial-design framework, a negative or a positive value is normally attributed to each of them. So we argue that the main difference regarding floods is that, despite being usually included in the negative ‘list of constraints’,

⁷⁰ According to Hubert (2014a, p. 226), “[f]looding is seen as a constraint for local authorities, as a generator of additional costs for developers and as a source of potential damage for inhabitants in risk areas. To successfully integrate flood risk, it must be incorporated into a comprehensive and strategic local vision. The urban project approach theoretically offers this possibility.”

they can also be referenced among the positive features of a site, if river dynamics are fully recognized as part of the idiosyncrasies of the human-urban environment. Of course, they are among the several contingencies to be faced by urban projects, but this does not mean that they have to be taken solely as a restrictive input. Till's general argument to embrace contingency seems to be particularly compelling as regards floods (2001, p. 191):

For the given to be seen as place of potential, one has to rid it of the negative connotations of mess and chaos. The only way to do this is by understanding the contingency of a given, in its very uncertainty and openness towards establishing something else, as an opportunity and not a threat: to see that freedom is to be found in the recognition of contingency and not outside it.

On the other hand, it is noteworthy that when traditional design restrictions are dealt with through an approach that is not strictly technical and reduced to efficiency, the ensuing design response has the potential to be both more sensible and innovative, adding value and meaning to the experience of such spaces. Lighting solutions in buildings as designed by the architect Luis Barragán and drainage systems in the urban realm as devised by the landscape architect Herbert Dreiseitl's practice are expressive illustrations of such perspective (see Figure 21 and Figure 22)⁷¹.



Figure 21: An example of natural lighting solutions in one of Barragán's designs

Corridor leading to the indoor swimming pool, in the Casa Gilardi (Mexico City), built in 1976
Source: Buendía Júlbez *et al.* (1996, p. 193), © Sebastián Saldívar

In both cases, the resulting atmosphere is indeed an attribute that reflects the quality of the designed space, as pointed out by the architect Peter Zumthor (2006). Yet, these valuable examples are related to aspects of the 'good nature', and therefore do not really shed light on how to positively deal with hostile 'natural' features. Fortunately, several projects that explore second-class facets of 'nature' as creative inputs are featured in Gissen's *Subnature* (2009); for instance, in the B_mu Tower, a contemporary art museum in Thailand designed by R&Sie(n), the ever present dust in Bangkok's atmosphere is captured to finally configure the skin of the building. In this project and the others presented by

⁷¹ As will be discussed later, the expression 'designed by' is used throughout this thesis merely to facilitate the identification of cited works, and does not imply an assumption of authorship as exclusively related to an individual or a particular team of individuals; the stance supported here is that design processes are indeed "composite and collective" (Yaneva, 2012, p. 4).

Gissen (2009), both the idea of nature and existing constraints are re-elaborated along with the design process (in which ‘natural’ constraints are actually turned into some sort of thread for the design), while the building and its surroundings are concomitantly envisioned, in an interplay of design scales.



Figure 22: Details of a drainage system in one of Dreiseitl's urban-design proposals

The Town Hall Square, in Hattersheim (Germany), built in 1993

Source: Dreiseitl and Grau (2005, p. 19), © Herbert Dreiseitl

In the same vein, when fluvial-flood risk is included within the site's existing constraints in a given urban-regeneration initiative, the designers' task is made even more challenging, as the possibility to turn flood proneness into a valuable spatial opportunity to create a safe and liveable environment is latently offered (although this has not been straightforwardly acknowledged). In fact, as recalled by Langenbach, floodable river spaces often configure fluctuating boundaries in which there is a “clash between city and river” that can be represented by pairs of “opposing elements: prosperity and decline, order and chaos, construction and destruction” (2007, p. 77). Yet, this dichotomist point of view, resulting from processes of purification (Latour, 1993), tends to reinforce a naturalistic approach of flood risk that strongly understates people's contributions (in several scales) to the actual variations of river waters.

At the same time, in the supposed ‘land side’ (the ‘cultural’ one, the reverse of the ‘natural’ realm in this segmented framework), centuries of water works through which usable surfaces have been modelled may be as well oddly downplayed. However, the boundaries between land and water, although always unstable, carry in themselves the chance of negotiating these apparent oppositions in a more inclusive manner, especially when floods are recognized as hybrids. In this sense, proactively designing these boundaries – and within them, floods themselves – does not fall into the strict realm of architecture, nor into the one of landscape, but somewhere between (and also beyond) them.

Yet, as already discussed, in some situations floods represent not only a physical constraint within urban-regeneration projects but also a mental (cognitive, social) restriction (see p. 48); and since the idea of combating floods is well rooted in flood-management initiatives (and consequently in people's minds), fostering an inclusive approach through design might at first sight seem counterintuitive. Therefore, the design of floodable urban spaces is a complex task of managing several pressures at once: first, as discussed in Section 2.2, design has to harmonize (that is, to negotiate) flood proneness with other urban requirements in order not to prevent the enrichment of urban experiences – see for instance Klijn *et al.* (2013) or Terrin (2014). Hence, it should duly consider that floods are not the sole contingency to be faced in an urban project (safety is but one of several expectations), while addressing not only urban demands and aspirations but also larger river-related ones (notably ecology), in a comprehensive territorial approach.

Apart from dealing with flood risk, designing urban riverine spaces entails as well the establishment of relationships (not only of spatial nature) between land, river, people, surrounding spaces, infrastructures, buildings, time etc., which are much beyond the achievement of an aesthetically commendable scenery. Delivering spaces that are liveable for people's use but also suitable for 'natural' processes to happen is in fact a challenge. According to Prominski and his colleagues (2012), the enhancement of urbanity (or "amenity", using their own word), safety ("flood protection") and ecology should be the main target when designing river spaces⁷², while these three dimensions should not compete with each other. In their point of view, this naturally calls for a process-oriented design approach, although many river-space designs mostly "concentrate on just one [river] state or situation and thus fall short of their potential" (Prominski *et al.*, 2012, p. 10).

Furthermore, dealing with floods through design means handling both objective flood-risk analyses and subjective flood-risk perceptions, as stated in Section 2.3 (design standing in the intersection between the two). In fact, the process of designing flood-prone spaces potentially involves the reformulation not only of objective flood parameters (such as water depth or velocity) but also of the prevailing social representation and perception of flood risk (spatial design can likewise be performed as a means to reinforce flood-risk perception when it is already in line with a preventive and proactive approach). This dual task configures *per se* a typical "wicked problem" (Rittel & Webber, 1973), since the prevalent flood-management strategies entail a paradox: mitigating the hazard – that is, minimizing its frequency and impacts (which, in its turn, makes floods less present) – must go along with keeping people aware of it. As already stressed in Section 2.4, these two objectives cannot be easily tackled through defensive stances, meaning that simply 'solving' the problem may not be the best answer in the longer term.

In this sense, strengthening the role of spatial design to foster an integrative and adaptive approach to floods could help to better balance the choice between hazard-, exposure-, and

⁷² The ecological aspects of dealing with riverine floods within urban-regeneration projects are outside the scope of this thesis.

vulnerability-focused measures⁷³, while enhancing protection without taking a purely defensive perspective. Spatial design can indeed be a timely tool to manage floods, given its inherent potential to orchestrate the various expertise domains, tactics and mechanisms involved in both flood management and urban development. At the same time, designing floodable urban spaces often implies the acceptance of losing some safe grounds and the tolerance of some damage from time to time, two conditions that are dynamic (as the involved areas cannot be exactly defined beforehand) and reflexive (since by submerging certain zones, others will be spared) (Rossano & Hobeica, 2014).

And finally, to be effective, dealing with flood-prone spaces through design requires going beyond mitigating damage in the longer term to acknowledge and showcase floods as hybrid and dynamic processes, as advocated in Section 2.4. This entails changing the prevailing mindset regarding floods, somehow following the argument of the landscape architect Kim Wilkie (2007, p. 10): “[p]erhaps we start at the wrong point with flooding, treating the water as a dangerous hazard to be blocked out or speeded through, rather than as a precious resource to be harvested.” In this sense, spatial design is also called upon to raise unexpected positive aspects of experiencing floods, from the more tangible (keeping awareness and promoting risk culture) to the more intangible ones (see p. 47).

Not only should the possibility of floods be positively integrated through design, but also the dynamics of flood events should be taken into consideration: how and where the waters will spread to during their fluctuations (knowing that the boundaries of the floodable areas are not fixed but rather gradual – from permanent streams, seasonal riverbeds, retention areas, floodplains –, with different levels of permeability allowing alternative activities to take place) (Rossano & Hobeica, 2014). For instance, it is crucial to understand the functioning during a flood of the site to be regenerated (does it mainly store or transfer water during fluvial floods?); at the same time, the post-flood phase should also be anticipated, for example by providing safe routes to facilitate emergency response and recovery (CEPRI, 2015).

Due to the human-natural dynamics involved in such areas, the design of flood-prone urban spaces goes beyond any purely objective, unique and final ‘solution’, implying thus the conception of alternative scenarios, based on which complex negotiations and painful arbitrages should be fostered in order to reach both urbanity and optimal risk-safety distribution (Rossano & Hobeica, 2014). By designing flood-prone urban spaces, designers at large (including the professional ones) are managing floods among other design requests; they are indeed configuring – ideally in a conscious mode – the involved risks.

Therefore, spatial design can play a decisive role in flood-risk management when it is performed as a flexible negotiation platform in which several demands, multiple stakeholders (authorities, land owners, citizens, designers etc.) and different territorial scales are put together in a dynamic process to redefine land and river perimeters, statuses and associated rules (occupancy and uses, for instance) (Rossano & Hobeica, 2014; Terrin, 2016). Such design processes may be carried out as an opportunity to enable the sharing of

⁷³ See for instance the Dutch experience, within the “Room for the River” programme (Klijn *et al.*, 2013).

flood-risk management responsibilities, the distribution of the potential costs or damage among different categories of spaces and related stakeholders, and also the promotion of flood-risk culture. In sum, designing floods within urban-regeneration initiatives is totally in line with the concept of “andscape” proposed by Prominski (2014).

Considering that presently “the traditional, dualistic Western understanding of nature as something independent from human influence is obsolete”, and aiming to transcend such narrow definition, Prominski turned towards the East and explored two Japanese “unitary concepts of nature and culture” (2014, p. 6), as a means to support a new, more fine-tuned theoretical framework “suitable for landscape architecture and beyond” (2014, p. 11). The first concept, “*seibutsu no sekei* (world of living things)”, as heralded by the biologist Kinji Imanishi (*apud* Prominski, 2014), refers to the existence of an intricate web of relationships between all the elements (humans included) in the living world (see Figure 23). The second one, “*fudo* (milieu)”, as defined by the philosopher Tetsuro Watsuji (*apud* Prominski, 2014), expands the notion of environment as a uniform background, and highlights the overlap of several specific settings in which relationships take place, while these milieus are simultaneously the product and the producer of its various components (see Figure 24).

Both concepts take a relational point of view that does not exclude any element, either ‘natural’ or ‘cultural’; indeed, such distinction loses its meaning in the Japanese cultural background, in which the ideas of nature and culture overlap, a mindset that has recently been influencing some Western ‘human geographers’ – see for instance the texts gathered in Castree and Braun (2001). As noted by Prominski (2014), instead of opposition, these two Japanese concepts recognize the tight connections of culture and nature – that is, the sense of unity that underlies them⁷⁴.

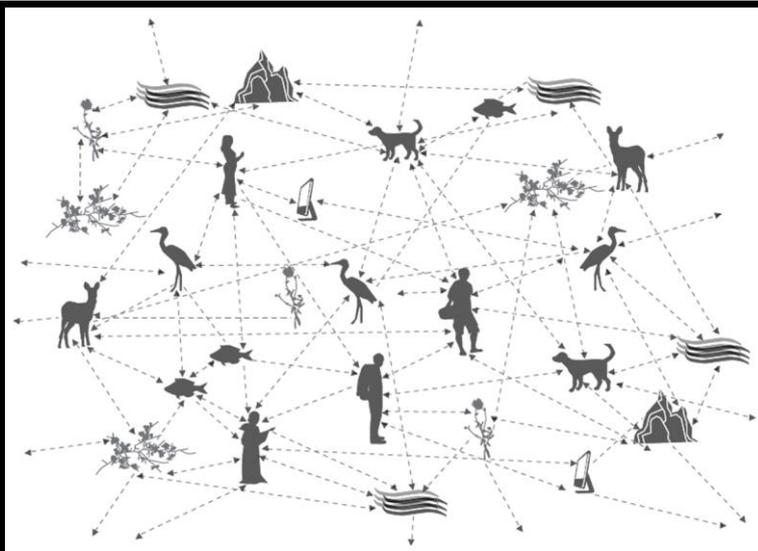


Figure 23: Imanishi's unitary concept of nature and culture: *seibutsu no sekei*
Every element (be it ‘natural’ or otherwise) relates to others in a dynamic way: sociality (extended to nonhumans) structures the “world of living things”
Source: Prominski (2014, p. 8), © Martin Prominski and Christiane Kania

⁷⁴ The “so-called ‘first law of geography’”, as formulated by the geographer Waldo Tobler (1970, *apud* Nijkamp, 2013, p. 19), goes in the same direction of recognizing the connections between things in general: “[e]verything is related to everything else, but near things are more related than distant things”. According to the economist Peter Nijkamp, this law “talks about ‘everything’, and not only about matter, so that also ideas, concepts or knowledge are encapsulated by [it]” (2013, p. 20).

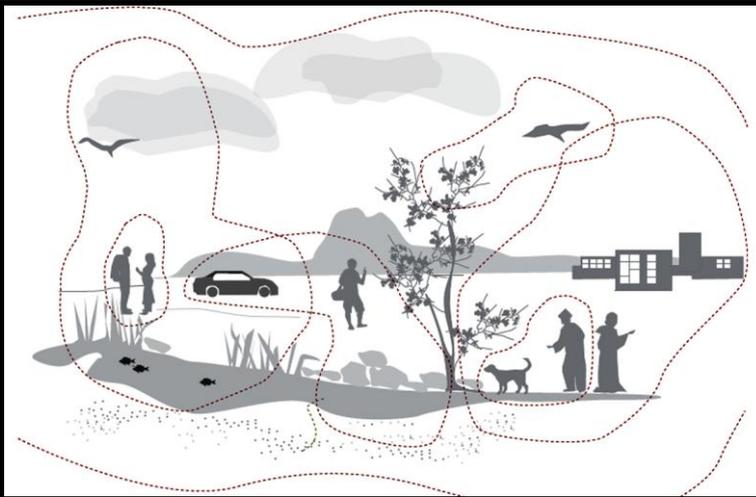


Figure 24: Watsuji's unitary concept of nature and culture: *fudo*

The “milieus” constitute overlapping multidimensional settings in which interrelationships take place
 Source: Prominski (2014, p. 10), © Martin Prominski and Christiane Kania

In an effort to transpose the values behind these two concepts, Prominski (2014) proposes the term “andscape” to refer to the state or the condition of unity that takes into account the overall dynamic relationships between living and non-living organisms and their settings, all of them encompassed within our cultural-natural world. This new concept is inspired by the aforementioned essay by Kandinsky (1927) (see p. 58), in which the artist complained about the dominant 19th-century worldview that favoured excessive specialization and segregation (the ‘either-or’ paradigm) over synthesis, and suggested in alternative an integrative ‘and’ approach. Reverberating the same stance of the Japanese concepts, ‘and’, in Kandinsky’s point of view, could function as a bridge to link what have often been perceived as separate domains since the 19th century (within arts and even beyond them).

Prominski’s proposal of the term “andscape” is based on his conviction that it is presently possible to design (at least in the landscape realm) “in a unitary mode, beyond simple dichotomies of nature and culture” (2014, p. 6), and he presents in his essay some projects that exemplify this perspective. The author suggests that when “using the term ‘andscape’, a dualistic, divisive understanding of nature and culture becomes impossible – instead, the focus is on the dynamic relations between humans, animals, plants, stones, water, and all other elements in the world” (Prominski, 2014, p. 6). As such, the term encompasses both culture and nature, both city and landscape, both human geography and physical geography, thus blurring inter- and intra-disciplinary barriers, as well as spatial and temporal scales.

And although being primarily conceived to address and communicate “the synthetical, integrative character of landscape architectural design” (Prominski, 2014, p. 11), “andscape” can as well be a suitable guiding concept for all design situations in which nature and culture inevitably come together⁷⁵, as it is the case when floods are involved. In a way, the translation of this concept into practice can be identified in emerging fields such as socio-hydrology (Sivapalan *et al.*, 2012; Di Baldassarre *et al.*, 2013b; Di Baldassarre *et al.*, 2015; Di Baldassarre *et al.*, 2017), which focuses on the intertwining character and co-evolution of social and hydrological processes (see footnote 28, on p. 32, and Figure 25).

⁷⁵ Prominski himself recognizes that the concept of “andscape” can also be pertinent in other domains, citing as a timely example resilience thinking, as explored by the Stockholm Resilience Centre. Integration (instead of separation) is the focus of this approach, in which resilience is understood as one of the key governing attributes of socio-ecological systems (Walker *et al.*, 2004).

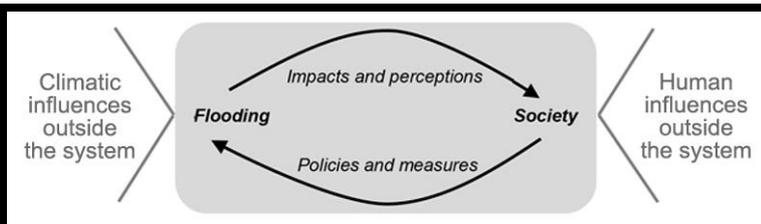


Figure 25: The socio-hydrology model: interplays between flood- and society-related processes

Source: Di Baldassarre *et al.* (2017, p. 10)

Designing flood-prone spaces (or even designing floods at large) in a conscious mode is only possible when an “andscape” perspective is embraced: this means taking a relational point of view as regards the involved elements, while equally considering what has been traditionally conceived as separate domains (that is, the related natural and cultural processes). When scrutinizing the ways to deal with flood-prone spaces presented in Section 2.4, it is notable that the ‘either-or’ paradigm (Kandinsky, 1927) is the one that prevails, illustrated in the conceptual model of the two traditional flood-risk management approaches (Figure 12, on p. 38). As presented in that scheme, either city or river is favoured, in a clear segregation between culture and nature. On the other hand, the conceptual model of ‘living with floods’ (Figure 15, on p. 48) is totally aligned with the “andscape” perspective; for instance, as noted by the architect Ila Berman (2010, p. 69), amphibious projects incorporate “calculated mixtures of flow and stasis into their design parameters to encourage a more synthetic relationship between architecture’s artificial containment and the flux of its natural fluid environs.”

Only within this integrative approach can floods be acknowledged as hybrids and designed as such, in a way that extrapolates the conventional design subjects. In fact, urban floods may be perceived as too ‘natural’ to be handled by traditional architects and urbanists, normally rooted in exclusive ideas of art and artificial that support the conception of buildings as self-referenced objects (Till, 2009). At the same time, urban floods are too ‘human’ to be left only to landscape architects; as already mentioned on p. 62, most of these professionals are still used to work with an outdated scenic and static stereotype of landscape. Yet, this reality can be overcome through a stronger “evolutionary process” perspective that holistically takes nature into account, more in line with the context and demands of contemporary societies (Prominski, 2006).

Therefore, starting from “andscape” as a conceptual framework, we propose to explore a ‘design and floods’ stance, examining the possibility of a reflexive relationship between these two processes, in which they would feed one another. Ideally, ‘design and floods’ contrasts with the dominant ‘design against floods’ mindset, usually geared towards the development of defensive structures that create barriers and even reduce the sense of urbanity. It also aims at expanding the ‘design for flood risk’ alternative (RIBA, 2009), which still keeps the negative term ‘risk’ and somehow puts it in an unnecessary central position in relationship to other urban issues; at the same time, it does not really shed any light on floods’ human dimensions. In fact, both ‘design against floods’ and ‘design for flood risk’ can be equated to problem-solving approaches that somehow understate design’s remit of uncovering new issues and assigning new meanings to usual situations (even negative ones). We thus argue that ‘design and floods’ should embrace such a holistic (and not strictly technical) endeavour, through a positive adaptive stance.

In this regard, besides acknowledging floods as hybrids, ‘design and floods’ requires fully recognizing urban spaces as places, that is, territories with meaning to human life. Hence safety and urbanity (that is, place-making) should be at the core of ‘design and floods’, which implies for instance the challenge of strengthening visual and physical links between cities and urban rivers, and even providing access to the water whenever possible. Dealing with floods through design should not entail the negotiation between safety and urbanity, but the combination of these two legitimate requirements into a single goal. Moreover, designers should be aware of the wide-ranging repercussions of their proposals, as clearly put forward by the architects Iñaki Alday and Margarita Jover (2009, p. 58): “[a]ny place in a territory forms part of a river basin, so any project in a public space will affect in some way the river basin in which it is located”. Such a reasoning is obviously valid for any kind of project (besides public spaces), such as isolated buildings or large infrastructures.

Some current research initiatives, pioneer experiences and urban projects are actually leaning towards a ‘design and floods’ direction. An interesting example that combines research and practice is the LifE project (briefly mentioned in footnote 40, on p. 42), although it is not related to urban regeneration (but to new urban development) and does not really go much “beyond simple dichotomies of nature and culture”, as put by Prominski (2014, p. 6). Promoted by the British government between 2005 and 2009, and jointly led by the design practice Baca and the research consultancy Building Research Establishment⁷⁶, the LifE project aims to deal with flood-prone areas by combining the objectives of risk mitigation, energy generation and urbanity enhancement, with the use of non-defensive measures (Barker & Coutts, 2009; 2016). Working with (and not against) the involved hydrodynamic processes, this perspective indeed “marked a shift from traditional thinking by permitting water into sites in a controlled manner” (Jha *et al.*, 2012, p. 325), while reducing the maintenance costs of the defensive structures, minimizing the residual risk (and hence life disruption during flood events), and increasing flood awareness.

Following a ‘research by design’ approach, the LifE project elaborated three conceptual master plans as case studies, in different riverine locations (in the upper, in the middle and in the lower catchment areas of a river), within which three general principles to reach the intended objectives were integrated: living with water, making space for water and zero carbon (see Figure 26). The intention behind these master plans was to show how a flood-adapted urban project could “be achieved, what it might cost and how it might look” (RIBA, 2009, p. 7); in these exercises, dynamic flood modelling was a crucial element to enable planning and designing with floods for the long term (Barker & Coutts, 2009). The final output of the LifE project was a handbook to support flood-related decision-making, in which several design and planning measures are coupled, for instance, with different land-use allocations, surface-water management options, transport and access alternatives and construction approaches, according to the severity of the hazard, to the exposure and to the degrees of vulnerability (Baca & BRE, 2010).

⁷⁶ Baca Architects is a British research-focused practice specialized in water-related projects (namely flood risk and waterfronts). One of Baca’s directors, the architect Robert Barker, co-authored the World Bank’s research paper *Five feet high and rising: cities and flooding in the 21st century* (Jha *et al.*, 2011) and contributed to the World Bank’s *Cities and flooding: a guide to integrated urban flood risk management for the 21st century* (Jha *et al.*, 2012), signalling the importance of Baca’s achievements regarding this issue.

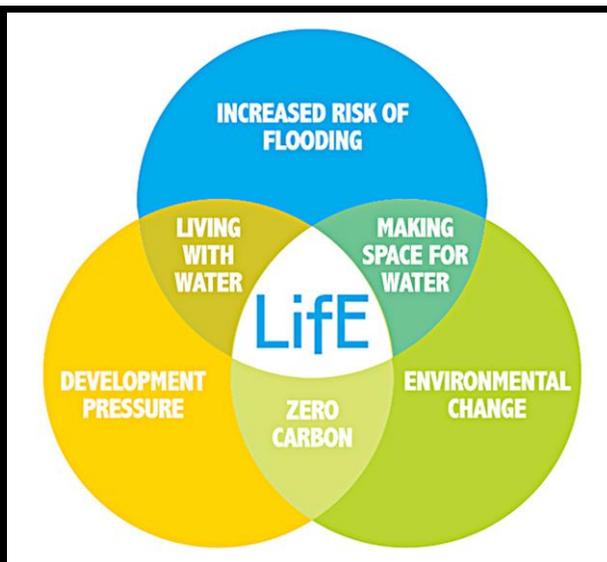


Figure 26: The Life project's approach

Source: Baca and BRE (2010, p. 8), © Baca Architects

Baca's actual works have been aligned with the tenets of the Life project (Barker & Coutts, 2016), and show how design can play a decisive role to face flood-risk management in an integrated manner, even if some of the issues previously identified (namely the hybrid nature of floods and the related need for an "andscape" perspective) are not clearly addressed within this initiative. In any case, the Life project highlights that given their rather quick implementation (in relationship to the city's longer timeline) and (more or less) contained size, urban projects are timely opportunities to engender flood-adaptation strategies, even if optimized answers normally lay in the combination of measures at multiple scales, from the water basin to the urban plots and the buildings themselves.

The interactions between urban-regeneration interventions and dealing with floods were the focus of the European research project "Freude am Fluss", jointly conducted between 2003 and 2008 by the François Rabelais University of Tours (France) and the Radboud University Nijmegen (the Netherlands). Targeting public policy and legal aspects at the national level (and centred on the French and Dutch cases), the project intended to answer the following research questions (Spits & Serrano, 2008, p. 6):

- What is the magnitude of urban development in floodplains in modern history from an international perspective and how can it be explained?
- What are the policies for buildings in floodplains and how are measures implemented?
- What could be the impact of technical innovations such as floating houses for policies?
- What are possible institutional innovations (i.e. legislation, insurances...) to improve the balance between land use planning and river management?

These questions, which do not emphasize design processes or products, were explored by the analyses of several cases around the Loire Valley (France) and the Meuse River (the Netherlands). One of the research's conclusions was that the geographical context and the institutional planning system at the national level, coupled with the adopted flood-management measures, somehow shape the relationship with and the perception of rivers, eventually directing the possibilities of negotiation related to urban development in flood-prone areas at the local level (Serrano *et al.*, 2008). Although one may question if the sociocultural dimension regarding rivers results from or conversely underpins the selection of flood-management strategies, it seems to be a major driving force behind the pursuit of

an “andscape” perspective in ‘design and floods’. In this regard, the extent to which such sociocultural dimension feeds into the design process remains an underexplored issue.

Another recent initiative that is worth mentioning is the 2013 edition of POPSU Europe – “Plateforme d’Observation des Projets et des Stratégies Urbaines” –, which focused on the innovative urban approaches and architectural projects developed in some European inner-city flood-prone zones⁷⁷ (Terrin, 2014). While the “Freude am Fluss” research stressed the national level and did not explicitly intend to extrapolate the academic knowledge-production role, the POPSU targeted the local level and managed to bring together concerned researchers, designers and public authorities as a means to share and foster the application of their respective knowledge bases. The following major questions were explored by the latter (Terrin, 2014, pp. 8 and 10):

1. How is flood risk integrated into the design process for urban projects? (...)
2. How can cities strengthen their relationship with water and what types of planning methods do they use to develop their new architectural and urban spaces? (...)
3. What conceptual and planning innovations have allowed flood risk to be integrated into architectural and urban projects? (...)
4. What technical and building innovations are being used in architectural projects to solve flood-risk issues?

This time, a planning and design standpoint is clearly and pragmatically taken. The cases of some French, Dutch and German cities were presented and discussed in four seminars, which covered the efforts being undertaken to manage floods within some of their ongoing urban-regeneration interventions, all of them working with the alternative of combining urban development with “the ‘controlled’ presence of water” (Terrin, 2014, p. 16). The overall conclusion is that dealing with floods within urban projects does not at all need to hinder the attractiveness of floodable spaces: flood adaptation can actually be pursued in a way to even increase it. When “the consideration of risk in local development (...) is seen as an opportunity, and not just a constraint” (Bauduceau, 2014, p. 214), safety and urbanity can go hand-in-hand in urban projects, through the proposition of innovative approaches and solutions in urban and architectural design.

At this point it may be worthwhile to briefly review some concrete experiences that explicitly take flood risk into consideration and follow a more holistic approach, taking into account for instance two projects that represent extremes in terms of urban development and occupancy⁷⁸. Although it can hardly be qualified as a typical urban project (being more a standalone intervention), the Parque del Agua in Zaragoza (Spain) is undoubtedly a flood-adapted project in which the designers have pursued an “andscape” perspective, as acknowledged by Prominski himself (2014, p. 18). In its turn, the

⁷⁷ The POPSU was initially launched by the French government in 2003 to analyse and compare the interdisciplinary research, policies and experiences related to urban projects in some French metropolises, in order to foster better decision-making within the concerned public institutions (Terrin, 2014). Since 2008, this platform expanded its focus to reach the European scale (POPSU Europe) as a means to share among public authorities innovative approaches and best practices around broad urban themes (such as railway stations and urban dynamics, pedestrians and the sharing of public spaces, or gardens in the city).

⁷⁸ These two projects were covered in more detail in Hobeica (2010), on which this review was initially based, while the project of the Parque del Agua was further analysed in Hobeica and Hobeica (in press).

regeneration of a former port zone in Hamburg (Germany) – the HafenCity intervention – is considered by many authors (such as Hölzer *et al.* (2008a), Prominski *et al.* (2012), Costa (2013) or Terrin (2014)) a paradigmatic flood-adapted urban project, having been extensively showcased in Europe and the rest of the world.

Developed within the master plan of the “Expo Zaragoza 2008” (which had water and sustainable development as its theme) and located inside a meander of the Ebro River (well known for its strong water-discharge variations, typical of the Mediterranean regime⁷⁹), the Parque del Agua connects new developments in the northwestern fringe of Zaragoza (see Figure 27). Designed by the practice Aldayjover (architects Iñaki Alday and Margarita Jover) and the Atelier de Paysage (landscape architect Christine Dalnoky), this 125-ha park introduced multiple uses into a floodplain in which only woods and farmlands were previously allocated as a means to deal with the recurring flood events (see Figure 28).

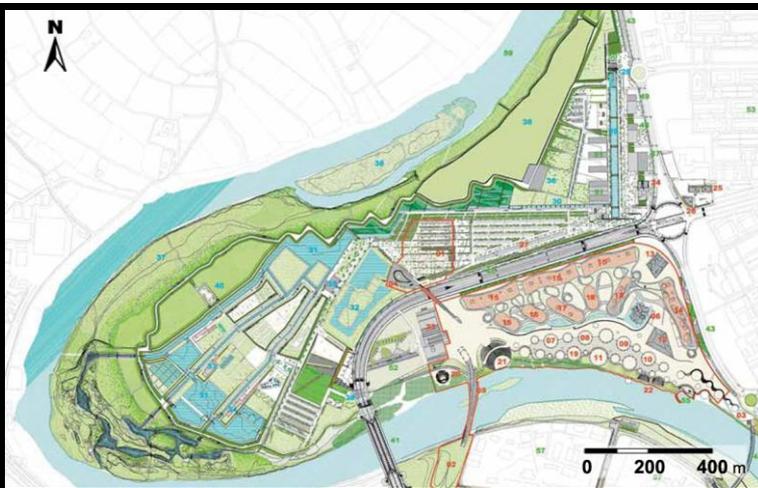


Figure 27: The master plan for the “Expo Zaragoza 2008” and the Parque del Agua
Source Expo Zaragoza 2008 (2009)
(modified by the author)



Figure 28: The Ebro’s meander inside which the Parque del Agua would be implemented
The area’s previous uses are clearly visible: agricultural plots surrounded by woods
Source: Alday and Jover (2008b)

The park’s design follows the traces of the old agricultural plots and irrigation system – water is actually present in 8 ha within the park (Beas, 2008) – to constitute a “submersible landscape” (Prominski *et al.*, 2012, p. 87), which has two distinct compositions and atmospheres: one close to the river and another one behind the dyke that surrounds the

⁷⁹ In Zaragoza, the Ebro’s average maximum discharge is 420 m³/s (in February) and its average minimum discharge is 40 m³/s (in August) (Ayuntamiento de Zaragoza, 2009a), while the estimated discharge for a flood with an annual probability of 1% is 4,300 m³/s (Ayuntamiento de Zaragoza, 2004).

park's core. The dyke, which partially reuses the path of an ancient flood barrier, was “simultaneously intended as a hydraulic work and an urban promenade, in a way to protect the city from extraordinary high waters and to solve the current problems of accessibility to the riverbanks” (Pellicer & Monclús, 2006, p. 207). Moreover, it marks the boundary within which control over river processes is exerted: in the riverbank, water dynamics (namely silting deposition on the left bank) ‘design’ riverine gravel beaches from time to time, and access to them was duly provided by the professional designers so that the park’s users can experience this transient landscape (Prominski *et al.*, 2012).

In fact, the shoreline, in which the riverine wood was expanded, was left to be flooded regardless of the intensity of the event (see Figure 29 and Figure 30) – and this was one the premises of the design proposal –, while the dyke-protected area can be submerged only during events that are more severe than the 4%-probability flood (Alday & Jover, 2008a). Composed by a system of channels, pools and fields, the park’s protected area filters the river water through vegetation in an aqueduct, and also contains a series of ancillary buildings (such as restaurants, a theatre and a water-treatment station), closer to the city fabric (Ayuntamiento de Zaragoza, 2009b). The uses and activities within the park were zoned based on their capacity to ‘live with’ floods; hence the park’s overall functioning is guaranteed during ordinary river overflows (Alday & Jover, 2008a). For instance, car parks and other less delicate uses (such as a heliport not expected to be used during emergencies) were located in floodable zones, while more sensitive buildings were placed on higher grounds (Prominski *et al.*, 2012). By keeping the meander as hydraulically transparent as before, the Parque del Agua does not intensify the overall flood risk as regards the downstream central parts of Zaragoza.



Figure 29: The works of the Parque del Agua flooded on 5 April 2007
Maximum water discharge:
2,275 m³/s
Source: Alday and Jover (2008b)



Figure 30: The Parque del Agua flooded on 3 June 2008
Maximum water discharge:
1,555 m³/s
Source: Alday and Jover (2008b)

The HafenCity (port city) project derives from the recovery of Hamburg's former port areas by the Elbe River and near the city centre, which have been transformed since the end of the 1990s into a 155-ha multifunctional district, outside the dykes that protect the traditional city. In that segment, the river is influenced by the tides (with daily variations of around 3 m), being this special-status area thus prone to floods linked to storm surges (when tidal variations can reach up to 10 m) (Costa, 2006b; Gabányi, 2008). Following the strict German flood regulations⁸⁰, the master plan, jointly elaborated by KCAP and ASTOC (a Dutch and a German design practice, respectively), envisaged design as an evolving framework to deal with both urbanity and sustainability, and put forward clear yet flexible rules, rather than a fixed, predefined plan, being able to adapt to new circumstances (see Figure 31). This condition was only possible given the integration of several professional domains and the tight control of the design and regeneration processes by the municipality, through a dedicated urban development agency. Indeed, a solid institutional setting was needed in order to safeguard the public interest of the intervention, namely the flood-adapted design of the urban realm and the new buildings (including almost 7,000 dwellings for 12,000 inhabitants) (HafenCity Hamburg, 2016) (see Figure 32).



Figure 31: The 2010 updated master plan of HafenCity

Legend:

- purple: completed
- yellow: ready for allocation
- red: under construction
- green: site development under preparation
- orange: sites allocated

Source: HafenCity Hamburg (2016, pp. 2-3), © Fotofrizz



Figure 32: General view of flood-resistant public spaces and buildings in HafenCity

Source: Prominski *et al.* (2012, p. 8), © HafenCity Hamburg

In HafenCity, the flood-defence perspective was coupled with flood-adapted interventions and preparedness measures, to reach the same safety level attained in the traditional city (to face 0.25%-probability floods) (EC, 2009). For instance, instead of building an expensive

⁸⁰ As recalled by Jha and colleagues (2011, p. 44), the 2005 German Flood Act imposes that greenfield development “in the floodplain is forbidden in most cases”; however, previously developed flood-prone zones are allowed to be regenerated, as long as “the design of new construction is strictly controlled”.

dyke that would obstruct the views and accesses to the river, the main flood-protection strategy selected was raising the ground and buildings on mounds, as traditionally done in that region (Costa, 2006a; Prominski *et al.*, 2012). Even the road system was elevated and finally connects the district with the dyke-protected city centre through bridges and footbridges that act as evacuation routes and sensible reminders of floods (see Figure 33); moreover, the former also give access to emergency vehicles during disasters, while the latter are intensively used by pedestrians all year round. Located at or below the floodable level (but safe from daily high tides), the buildings' ground floors have no living use, being occupied by restaurants, entrances and car parks; yet, these structures are flood-proofed by means of movable devices, following the strategy of resistance (Prominski *et al.*, 2012).

Due to the stability conditions of the quay wall, a 20-m-wide strip along the shoreline had to be left unbuilt (although overhanging parts of buildings are allowed), fostering the creation of 10.5-km long accessible public spaces by the water (not elevated), composed of promenades, terraces and floating platforms, which can undergo flood events two or three times a year on average (EMBT, 2004). In this densely built neighbourhood, an “andscape” perspective as heralded by Prominski (2014) is present only in the public spaces bordering the river, in which daily fluctuations transform their ambience (see Figure 34). Designed by EMBT (architect Benedetta Tagliabue) and the landscape practice WES, the public space of HafenCity's first section was intended to be “dynamic and flexible”, “a changing landscape on a human scale, moving partially with the floods, bringing people nearer to the water and its moods”, according to the designers themselves (EMBT, 2004).



Figure 33: HafenCity flooded due to a storm surge in November 2007
Source: BaltCICA (2009)



Figure 34: One of HafenCity's many floodable public spaces by the shoreline
In the foreground: the Marco Polo Terrace
Source: WES's website, © Jörn Hustedt

These two totally unrelated projects – an urban park and a densely built urban district – are among several European examples of urban-regeneration interventions in flood-prone zones that aim to take fluvial floods into account through an integrative approach, by managing the water within the area through design instead of repelling it. For instance, such stance is also present in SEURA’s proposal for Les Ardoines (by the Seine River, in Vitry-sur-Seine, Greater Paris) (Brun & Adisson, 2011a; 2011b) and in the master plan for Zollhafen (by the Rhine River, in Mainz, Germany), prepared by the city’s department of urban planning (see Figure 35 and Figure 36)⁸¹.

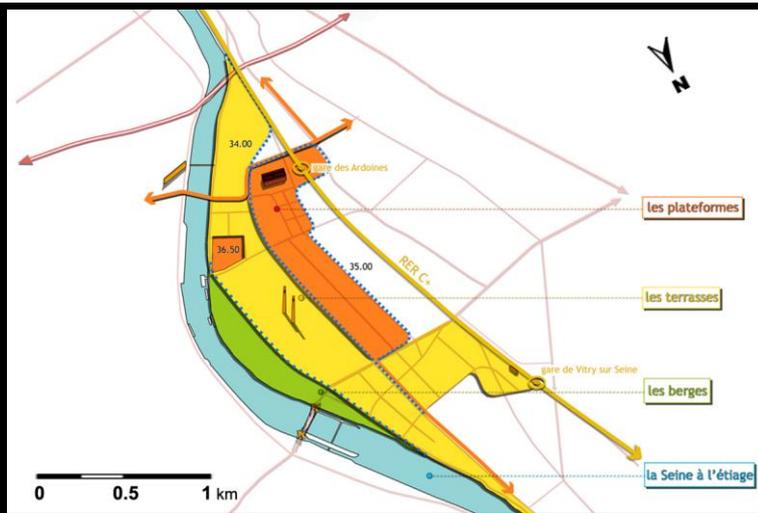


Figure 35: The redesign of the site’s topography in Les Ardoines

Legend:

- orange: the platforms (36.5 m)
- yellow: the terraces (34 m)
- green: the riverbank (32 m)
- blue: the Seine River (minimum annual water level: 31.5 m)

Source: Brun and Adisson (2011b, p. 79) , © SEURA



Figure 36: A 3-D model of Zollhafen’s master plan

Source: Terrin (2014, p. 117), © Zollhafen Mainz

The former had initially been recognized as a smart flood-adapted solution that took the territory at large into consideration (Brun, 2010); nonetheless, this master plan was later on completely reformulated due to issues such as costs, land ownership and finally the stance privileged by the current flood-risk regulations (its new version is now based on a plot-by-plot approach) (Hubert, 2014b). Regarding Zollhafen, in order to promote the awareness and involvement of stakeholders (including designers and residents), the Municipality of Mainz elaborated, during its participation in the EU-funded “FloodResilienCity” project, two key documents to present the enforced flood-adaptation rules and behaviour advices in

⁸¹ Although an integrative approach towards floods is equally shown in the proposals developed under the Dutch “Room for the River” programme, most of them cannot be considered actual urban projects. In fact, these proposals have been formulated as flood-management interventions, even though they also have as one of their guiding principles the quality of the resulting space (Klijn *et al.*, 2013).

case of floods: the *Project developer's guide* and the *Flood-risk management guide* (Barroca & Serre, 2012; Terrin, 2014). Several contemporary European flood-related projects do recognize both space and water dynamics as crucial variables in their flood-adaptation strategies, being thus valuable sources of knowledge that could be transferred to other similar situations (of course taking into account the particularities of each case).

These 'design and floods' experiences indeed raise several issues worth to be explored (for instance, considering the previous cases, the shortcomings of the first plan for Les Ardoines or the acceptability of Zollhafen's guides by the local stakeholders). Unfortunately, most flood-related design experiences are presented as ultimate products of successful initiatives, and approaching them at this stage gives only a few clues about the baseline conditions (linked to their own context) and the evolving processes that actually paved the way for such outputs. For example, beyond well-known technical tools and means, what would be the "andscape" conditions, strategies and mechanisms that can make spatial design successful in pursuing flood adaptation within urban-regeneration projects? In fact, even though riverine urban projects have been subject to design activities, this does not guarantee that flood proneness has been fully integrated as a design issue.

In this sense, as a first assumption, one may think that the hybrid floods' dynamics somehow challenge the design practices that are closed, product-centred ones. Floods indeed require that, through design, flexibility and openness (that is, capacity to evolve) be more explicitly brought into urban structures, which are normally planned and designed as fixed and inert. Yet, such impassiveness is only apparently true, especially if one takes the standpoint of Latour and Yaneva (2008), for whom viewing buildings as static is just a matter of lack of adequate apparatuses. For these two authors (Albena Yaneva is an anthropologist of architecture), every building encompasses a myriad of (past and ongoing) decisions, struggles, relationships, involving for instance people, matter, money, values, weather, rules, which are ultimately flattened and invisible when the building is taken as final product. And bringing to the fore these mostly intangible iterations and interactions can perhaps be a valuable source of lessons on how to better pursue 'design and floods' altogether.

In flood-prone urban projects, these invisible dynamics are even more blatant, for the reasons previously discussed in Section 2.2. Therefore, taking an inclusive approach as regards different possible states (or scenarios) of the city-river (or culture-nature) pair seems advisable, an issue already raised by some prominent landscape architects dealing with urban water issues. The landscape architect Henri Bava considers for instance that "a combination of risk prevention, landscape enrichment and urban planning" is needed "in an attempt to meet the expectations of the urban landscape and create a coherent, inhabitable environment" (2010, p. 124). In his turn, Dreiseitl recalls that to achieve the main requirements involved within riverine urban projects⁸², the design task is made "disproportionately more demanding", in particular, due to "the conflicting interests of safety and the search for a new closeness to water places" (2012, p. 9).

⁸² According to Dreiseitl (2012, p. 9), the four requirements to be met in the design of riverine spaces are: (1) to enhance the city's image and attractiveness through open space remodelling; (2) to benefit from the privileged riverine location for the promotion of economic activities; (3) to reach high ecological standards; and (4) to conciliate urban development and water-related risks.

Focusing on attenuating the flooding problem – which is nevertheless always present, even when making sense is central to the design task –, but also coming closer to a more comprehensive approach that duly accepts floods within cities, the CEPRI (2015, p. 51) proposes six design principles to guide designers and construction professionals in their task of regenerating flood-prone neighbourhoods. Although Principle 1 regards the inclusion of a protection system within the area under question, the CEPRI suggests for instance using such defensive structure as a multifunctional device to hold additional urban functions, somehow in line with the RIBA’s “defend” approach (see p. 44); some degree of urbanity should hence be added to these safety devices. The following principles are more related to the involved human-cultural dynamics: Principle 2 advocates giving (or giving more) room for the water, somehow in tune with the RIBA’s “retreat” approach.

Principle 3 argues for the adequate location of activities and urban infrastructures, following a type of zoning supported by the identification of critical infrastructures for floods and their hierarchization through the corresponding exposure and vulnerability, and the degree of protection to be attained (this was indeed the base of the Parque del Agua and of Les Ardoines’s first plan). Principle 4 covers the design of flood-adapted buildings (which can cope with different water levels), while Principle 5 focuses on ensuring the continual functioning of technical networks, acknowledging the interdependences between them (two issues covered in Zollhafen’s *Project developer’s guide*). Finally, Principle 6 relates to the anticipation of disastrous situations (as illustrated by the HafenCity intervention), by creating ‘smart spaces’ for crisis management and reconstruction.

In an attempt to reconcile and reconnect cities and flood risk, these principles ultimately encourage design to take into account the overall dynamics presented in all flood-prone sites (CEPRI, 2015); for example, some of them were behind the proposals made within the LifE project (as previously presented) (Barker & Coutts, 2009). Although advocating a ‘design for flood risk’ perspective, the RIBA also advances some principles for a more integrated approach towards floods (2009, p. 10):

Assuming it is unavoidable, when designing for flood risk the primary aim is to integrate control and mitigation of the risk seamlessly into an overall design that in turn successfully achieves the goals of place-making and sustainable development. In order to achieve this it is essential that the risk of flooding is recognised as a key constraint and the drivers of the risk as potential opportunities from the outset. A multi-disciplinary approach is needed to develop integrated control and mitigation measures. (...) [I]t is possible to develop holistic design responses by identifying flood risk at the outset, by understanding the range of issues this gives rise to and the potential contribution that analysis, engineering, hydraulics and landscaping can make.

Even stressing control and mitigation, the RIBA recognizes that flood risk should be taken as a key design element, both as an actual constraint and a source of potential opportunities, especially if it is dealt with comprehensively by designers with multiple (and complementary) backgrounds. That is, the professionals that have traditionally managed flood risk (notably engineers and hydrologists) obviously keep having a key role when floods are to be tackled through design. In fact, the analysis of flood risk (and consequently the ways to deal with it) has up to now mostly stood out as a disciplinary question (Di Baldassarre *et al.*, 2013a).

This remark takes us back to the three flood-risk constituents: the flood hazard has typically been handled by engineers (based on hard solutions), while the exposure component has mainly been a matter of geographers and planners (through land-use regulations, predominantly on a regional basis). One may thus wonder: shouldn't the vulnerability component be tackled as part of the scope of action of professional spatial designers (architects, urbanists, landscape designers) (see Figure 37)? In other words: why isn't the vulnerability facet of flood risk explicitly explored as a remit of spatial designers, since their formal interventions have a crucial influence on the occupation and use – both quantitatively and qualitatively – of the territories?

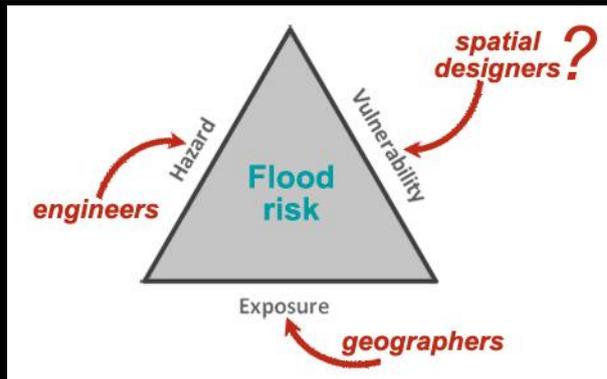


Figure 37: A (non-exclusive) disciplinary appropriation of the flood-risk components

This scheme is of course a simplification: all three disciplines (and also others non represented here) have a say on the three risk components (even if some 'natural' remits are notable)

Source: elaborated by the author, based on Crichton (1999)

Despite laudable examples (as the ones previously mentioned), the concrete involvement of spatial designers in flood-related projects seems to be still an exception (Brun, 2010; Bonnet, 2016), not the rule. In fact, regarding risks in general, post-disaster situations – especially when they involve important rebuilding activities – tend to be more appealing to architects and urbanists, as illustrated *inter alia* by the accounts of Evans-Cowley and Gough (2007), Giovinazzi and Giovinazzi (2008) and Diefendorf (2009), or by the special issue number 155 of the renowned architectural journal *Lotus International* (“Geography in motion”, 2014).

Although this does not constitute a central issue in this research, several hypotheses could be raised to explain this perceived lack of interest and proactivity: on one hand, the predominant emphasis on the destructive character of floods (viewed as an uncontrollable ‘natural’ process that nobody wants to experience) eventually veils any potential positive aspect – admittedly not easy to grasp. Another possibility is that the difficult spatialization of flood vulnerability (an issue tackled on p. 32) may also hinder its full incorporation into spatial design (even when only the physical properties of the built environment are taken into account). Moreover, in the instances in which the general vulnerability is mapped through the resort to statistical data, it is often presented in an aggregated manner (at the scale of the whole neighbourhood) and hence may not be straightforwardly incorporated into urban projects.

Likewise, the cultural ubiquity of hard-engineering solutions may have been discouraging more proactive and tailored design solutions (although, when applicable, floods are regularly figured within the sites’ constraints maps). This hypothesis could also be coupled with the fact that since floods defy architects and planners’ quest for control and order (as expressed in the arguments of Christensen (1985) and Till (2001), mentioned on p. 62), it may be more favourable (‘safer’) for them to abide by the canons of hard-structural

measures. This reasoning seems aligned with the one of Berman (2010, p. 69), for whom “[g]iven an architectural tradition that has been historically engendered by the values of firmness, stability and permanence, [the flood-control] infrastructural artefacts have promoted static, discrete and formal systems over mobile, continuous and material ones”. And Berman complements her arguments in the following terms (2010, p. 73):

Despite recent fears associated with rising waters and their potential for urban destruction, for many architects the [water spaces] adjacent to our sedentary urban centres have remained conceptually and physically underengaged, except by those invested in infrastructures intended to control and restrain them. For others, however, the complexity and boundlessness of this liquid landscape has yet to be fully explored, for the dynamic potential it offers for amphibious urban life as well as its provision of a future territorial frontier for expanded architectural intervention.

A deeper engagement with water spaces, which logically includes dealing with the hybrid floods, would indeed be a way to reaffirm the expansion of the architectural field and its domains of action (Vidler, 2010; Sarkis, 2014; Heynen, 2016), but this requires the enlargement of the professional knowledge base of designers. In fact, regardless of the actual reasons, one consequence of the weak involvement of spatial designers in flood matters up to now is that their awareness and understanding of the related processes and repercussions are generally inexistent or low. This was one of the conclusions of a French survey conducted in the Île-de-France region (in which 40% of the floodable areas are already urbanized), based on interviews with spatial designers in charge of local urban projects⁸³ (Brun, 2010).

The study revealed that addressing flood risk was viewed by the respondents as a “secondary priority”, “firstly because public or private project commissioners still bypass the issue, downplay its importance in their design briefs or reduce it merely to its legal aspects” (Brun, 2010, p. 10). Also, due to the lack of knowledge, spatial designers do not duly integrate floods among the territories’ environmental dimensions (even if urban sustainability is increasingly ranked high in their agenda); floods thus end up being relegated as a technical issue to be managed by experts (Brun, 2010). According to one of Brun’s informants, spatial designers are used to work with dry scenarios, and when confronted with floods in their practice, they get acquainted with them mostly through learning-by-doing processes. Another designer interviewed by Brun complemented by saying (Brun, 2010, p. 14):

Sustainable development requires us to reintegrate the technical aspects into urban architectural design. So we are back to the sources of the 1950s. Besides, there are now joint degrees between architecture schools and engineering schools. Sustainable development constitutes a bridge. There could be more joint projects. Sustainable development requires a technical discussion totally upstream of the urban project [and iterations with the project promoter during the elaboration of the project]. It’s not that easy. Overall this is not yet part of the French habits. We French architects are used to give priority to form and to appeal to the engineers once the project is finished. This approach is [outdated]. [Square brackets in the original]

⁸³ This survey, commissioned by the regional water-management body (Les Grands Lacs de Seine) in the framework of the EU-funded “FloodResilienCity” project, intended to understand how floods are actually taken into account in the design of urban projects, by covering such questions as (Brun, 2010, p. 6): “How have designers been conciliating the demands stemming from the urban densification and the reduction of flood vulnerability? Are they familiar with the issues related to flood risk? Do they prioritize these issues?” and “Can flood risk contribute to the renewal of urban forms?”

Even if the conclusions of this survey are context dependent and should thus not be generalized without caution, they can nonetheless be taken as a sign that a more proactive stance is perhaps needed from spatial designers. But then, are architects and urbanists up to the ‘design and floods’ challenge? Or is flood vulnerability too big an issue to be dealt with by these professionals? Without disregarding the relevance of questions like these, it is worth noting that a disciplinary segregation as to dealing with floods, as provocatively caricaturized in Figure 37 above, has several shortcomings.

First, in a spatial-design framework, floods should be taken as much more than a risk with three components (hazard, exposure and vulnerability) and two dimensions (physical and social), but as a complex human-natural process that, even when conceptualized as a risk, may also have positive outcomes. Also, such a strict division of roles clearly defies the emerging concept of Urban Flood Management, an integrative framework related to both urban and flood management that tackles urban floods through adaptation. A thorough definition of this approach is offered by the engineer Chris Zevenbergen and his colleagues (2010, p. 3):

Urban Flood Management is not about preventing any flooding or even minimising flood losses. The absolute prevention of flooding is an impossible task. Rather Urban Flood Management is about maximising and maintaining the performance of the city as a whole. Urban Flood Management is also about looking for opportunities and solutions that add to the welfare of a society in such a way that the sum of social and economic benefits outweighs the potential costs.

Although keeping an engineering (pragmatic) approach, urban-flood management intends to be a comprehensive (interdisciplinary) means to deal with floods, by widening the traditional hazard-centred flood-management practice to also jointly cover exposure- and vulnerability-related strategies⁸⁴ (Zevenbergen *et al.*, 2010; Jha *et al.*, 2011). One of the main messages of the World Bank’s *Cities and flooding* guide is that “an integrated approach to flood-risk management is the key requirement”, meaning that the optimal solution lies in “a combination of hazard reduction, exposure limitation and resilience enhancement”, through an adequate balance of both structural and non-structural measures (Jha *et al.*, 2012, p. 37).

In this vein, one may say that urban-flood management is not truly innovative *per se*, except as regards the underlying idea of accepting fluctuating hydraulic and social conditions, which can also be taken as sources of advantages; a positive stance is thus envisaged. This framework calls for designs for flood management to be “able to cope with a changing and uncertain future” (Jha *et al.*, 2012, p. 587). Therefore, the schemes ensuing from such an integrated approach are intended to soundly “fit in with [other] water-related issues” and “be part of a wider agenda such as urban regeneration or climate change adaptation” (Jha *et al.*, 2011, p. 41).

⁸⁴ One of the advocates of Urban Flood Management is the UNESCO-IHE (UNESCO Institute for Water Education), a interdisciplinary research institution based in Delft, the Netherlands. Some of its outputs are related to urban-regeneration planning and design – see for instance Gersonius *et al.* (2008), Zevenbergen *et al.* (2008a), Zevenbergen *et al.* (2008b), Zevenbergen *et al.* (2010) and Van de Ven *et al.* (2011).

The emerging urban flood-management concept finds in spatial-design processes a valuable tool to adequately manage the three flood-risk components, and to ultimately “harness the cross-professional nature of the response” to the flood-adaptation challenge (RIBA 2007 p. 3). In fact, besides the indispensable knowledge of hydrologists and engineers, an adaptive perspective vis-à-vis the hybrid floods requires an active investigation into the social, economic and cultural characters of a given territory, in order to identify the best adaptation strategy potentially embedded in it. In this sense, hydrologists, civil engineers and geographers can also actively play the role of spatial designers, without limiting themselves to the artificial segregation presented in Figure 37 (see p. 85).

Thanks to their ability to mentally manipulate space constituents (developed in architectural practices) and to creatively anticipate unusual prospects, spatial designers can orchestrate the needed interdisciplinary design teams to comprehensively and responsibly adapt territories to floods (Rossano & Hobeica, 2014). This point was made clear by the architect-urbanist Michiel Dehaene, who commented about the assets of urbanism to face climate change: “the designerly ways of proceeding and the deliberate generalist perspective [inherent to urbanism] are gradually being acknowledged as a valuable path to explore the possibilities of an alternative future” (2010, p. 65). As regards more generally the design professions, the author complements that these

have an important role in producing constructions which represent visions in a concrete enough manner that they can help in holding the process of shaping the future accountable. Designers can in that sense give an account which begins to make such complex issues public in the sense that they provide an object for debate, give substance to a vision in a manner that one can begin to account for the concrete consequences of a proposition (Dehaene, 2010, p. 64).

In fact, Dehaene’s thoughts echo Latour’s “five advantages of the concept of ‘design’” (2009a, p. 3), presented in the beginning of this section (see p. 56). At this point, it may be worthwhile to review these advantages from a flood perspective; that is, to explore some of their possible implications specifically regarding flood-prone spaces. The first advantage, “modesty” (Latour, 2009a, p. 3), seems to adequately fit the ideas of adaptation and acceptance, both required by ‘design and floods’. Adaptation in itself is only possible if pursued through ‘humility acting’; one may quite rightly say that it is a hubris stance regarding either ‘cultural’ or ‘natural’ processes (or both) that has been the underpinning of strictly defensive approaches towards floods. Modesty thus seems to be a key ingredient for a new vision to cope with floods through design, which includes the acceptance of time as a relevant design variable and also of water as a dynamic element of urban life (river variations being hence inescapable processes).

In some particular cases, designers are also called to modestly accept rivers themselves as co-designers of urban projects, in which fluvial morphodynamic processes would intensively take place. In its turn, “attentiveness to details” (Latour, 2009a, p. 3) reminds us that ‘one-size-fits-all’ solutions have little to offer in terms of flood adaptation; in fact, ‘design and floods’ presupposes the careful reading of the concerned territories, in terms of both geography and history (including the related culture of dealing with floods). Hence the notion of place takes precedence over the one of space, and some particular advantages of the flood-proneness condition can be explored.

Through design's third quality, the intention to produce "meaning" (Latour, 2009a, p. 3), transitory conditions and contingencies can be fully embraced, instead of ignored. For instance, spatial design can actively make flood proneness visible, by communicating river dynamics, and conceive places that at the very least tolerate floods. As for the sense of improvement ("to design is always to redesign") (Latour, 2009a, p. 4), one may argue that, through design, some features of the hybrid floods can be retained while others are re-elaborated; the related negotiations may lead to adjustments in order to make the integration of floods into the urban realm feasible and less damageable. This fourth quality also implies that the envisaged 'design and floods' output is always dynamic: it will never be completely attained, being in a continuous process of change.

Finally, the fifth advantage, the involvement of an "ethical dimension" (Latour, 2009a, p. 4), is the most invoked one in Dehaene's quote above. Indeed, 'design and floods' should ideally be performed in a way that unveils the controversies involved in flood risk – in opposition to Aven and Renn's categorization of floods as a "simple risk" (2010, p. 12) (see footnote 31, on p. 36) – and invites the stakeholders to debate and actively design it. Accountability can thus be more directly and transparently associated to both professional and non-professional designers of floods. Given these five qualities, the professional designers involved in the urban regeneration of floodable areas can, through their creative interventions, ensure that dealing with floods extrapolates technical and sectorial roles to also embrace social and artistic compromises. In other words, they can strive for adaptation in urban projects not to be restricted to the physical (environmental) dimensions, but for it to direct as well mindsets towards a smoother coexistence between cities and riverine floods.

2.6 Chapter summary and final remarks

As a means to simultaneously summarize and emphasize the main topics raised in this chapter in a legible manner, this section will present them through schemes, following an incremental mode. Figure 38 expresses the several demands with which urban-regeneration projects have to deal (although the conflicts that may arise among these demands are not explicitly shown); urban projects are here taken as means to structure shared urban visions and to support their implementation. Spatial design – that is, the design disciplines in charge of shaping space constituents in a meaningful way – is thus called upon to manage these competing demands in order to enhance urbanity.

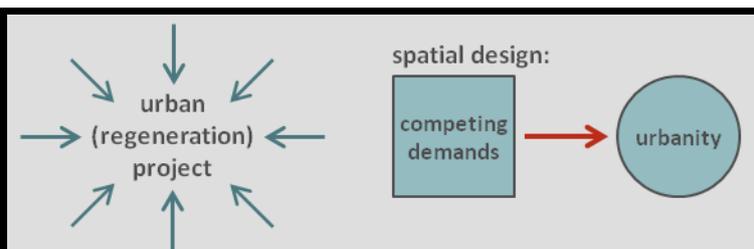


Figure 38: Spatial design's conventional role in urban (regeneration) projects

Source: elaborated by the author

In its turn, Figure 39 recapitulates the potential contradiction embedded in the redevelopment of flood-prone riverine urban areas, which (synthetically speaking) opposes the objective of enhancing urbanity to the one of promoting safety vis-à-vis floods. Indeed, fluvial floods

bring to the fore the ideas of destruction and risk, the latter having physical and social dimensions that should be duly recognized when choosing suitable flood-risk-management alternatives. At the same time, floods are here acknowledged as hybrids that aggregate at once natural and cultural processes, and that are (most of the time) unconsciously designed. Consequently, floods – as a truly designed ‘thing’ – are here considered being open to disputes and negotiations. These latter conditions are illustrated in Figure 40.

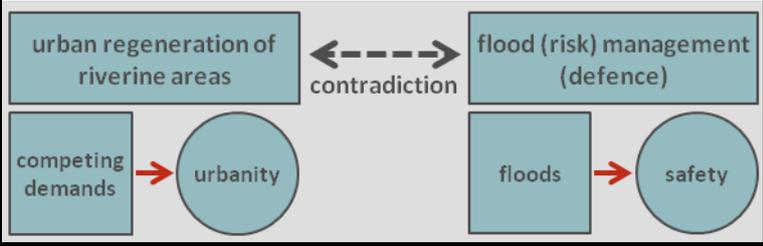


Figure 39: The redevelopment of flood-prone riverine areas: a potential contradiction
Source: elaborated by the author

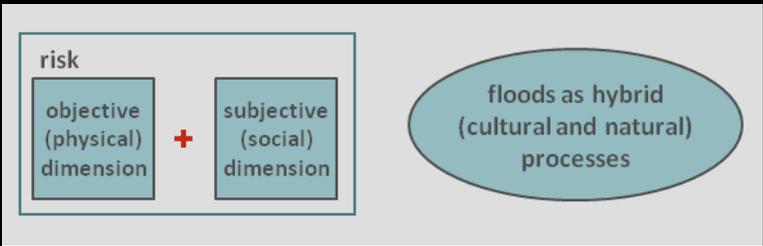


Figure 40: Flood risk’s key characteristics from a spatial-design perspective
Source: elaborated by the author

Due to the drawbacks of the (up to now) prevalent flood-management strategies firmly anchored in the notion of defence, an adaptive perspective has thus been envisioned. This alternative goes in the direction of flood acceptance (that is, of safely ‘living with floods’), which tends to attenuate the contradiction of redeveloping flood-prone riverine areas, while keeping the goals of both urban regeneration and flood management. From the content of Section 2.4, a broad dualistic framework can be outlined (see Table 1), emphasizing the main differences between the defensive perspective and the conciliation approach, in terms of imbued worldviews, values and attitudes. Such a dichotomic generalization depicts two ‘ideal’ extreme situations, while there is in fact a whole range of possibilities between them (it is only used here for its didactic role).

Table 1: Two different perspectives vis-à-vis floods

Traditional flood-defence perspective	vs.	Envisioned flood-conciliation approach
Flood as an undesirable, negative process; the best attitude towards it is prevention (avoidance)		Flood as a consequence of an inevitable ‘natural’ process; the best attitude towards it is acceptance (adaptation)
Attempt to control ‘nature’ (seen as strictly separate from culture), to freeze what is by essence dynamic (comprising thus an ideal notion of static equilibrium)		Attempt to partially influence an artificial ‘thing’ (flood as a hybrid), while making more flexible the urban environment, which is by essence perceived as rigid (in the pursuit of a dynamic equilibrium)
‘Rational’, technocentric management		A more holistic management
Flood risk is eventually concealed in urban settings		Flood risk needs to be made perceptible, latently present in urban settings

Source: elaborated by the author (inspired by Parodi (2010)⁸⁵)

⁸⁵ In an article focusing on “human footprints” in “water landscapes” via technology (not specifically centred

Adaptation, the key concept in the envisioned flood-conciliation approach, can be pursued either to maintain the overall existing (physical and sociocultural) conditions, or instead to induce long-lasting transformations (Pelling, 2011). In this regard, Pelling’s suggestion of “adapting *with*” climate change instead of “adapting *to*” it is particularly appealing (2011, p. 163); with such replacement of terms (‘with’ instead of ‘to’), he intends to emphasize that climate change, taken as an ongoing and irreversible process, should be embraced as an opportunity for an overall socio-environmental adaptation, in the sense of transformation. Independently from climate change (as stated in footnote 37, on p. 41), the same idea may apply to floods: urban environments should more widely adapt ‘with’ floods, taking these hybrid processes also as potentials to be explored, instead of merely adapt ‘to’ them.

As highlighted in Figure 41, the most relevant implication of dealing with floods through a flood-conciliation approach is perhaps acceptance: that is, accepting the limits of defensive measures and also the (well-managed) presence of river waters (possibly with the sporadic occurrence of some damage) in urban settings. In its turn, to actually conciliate the regeneration of riverine urban areas and flood management through design, the acceptance of the hybrid floods as a full spatial-design issue is needed, in line with the enlargement of the architectural domains of action as envisioned by many scholars and practitioners.

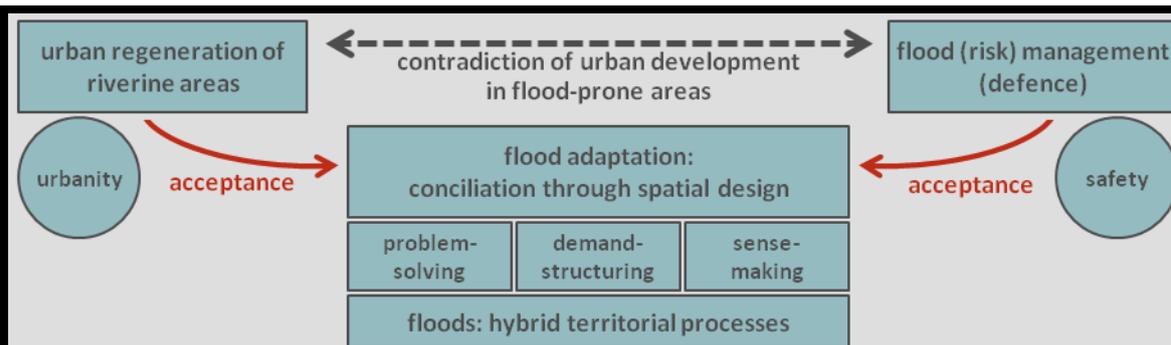


Figure 41: Envisioning spatial design as a flood-adaptation tool
Source: elaborated by the author

The required acceptance can have two parallel implications: on one hand, the ‘safety acceptance’ implies that solving the flood ‘problem’ could be coupled with the exploration of possible unexpected demands (including opportunities) in the long term (as tentatively shown in Figure 42), which is not a straightforward assumption given the cultural roots of the current practices of flood-risk management. For instance, the characterization of floods as a “simple risk” (see footnote 31, on p. 36) may be taken as a relevant sign of the predominance of the problem-solving logic in dealing with floods, and this restrictive

on floods), the hydraulic engineer and philosopher Oliver Parodi (2010) discusses some Western cultural roots of the recent practices of river training. The author then confronts the worldviews behind two ‘ideal’ styles of hydraulic engineering: the *Massivwasserbau* (“massive hydraulic engineering”) and the *Naturnaher Wasserbau* (“‘ecological’ or perhaps ‘near-natural hydraulic engineering’”) (Parodi, 2010, p. 51); yet, the concept of flood adaptation (or conciliation) supported in this thesis goes beyond the selection of (technological or more ‘natural’) means to deal with floods (although it does not disregard the cultural background behind the adopted management and design choices). In any case, recognizing that hydraulic engineering is increasingly getting closer to a more ecological stance, Parodi presents some suggestions for a more fine-tuned engineering practice (for example the idea that water-related “technology as artefact should be perceptible for everyone”) (2010, p. 57), which are ultimately aligned with the arguments supported here.

standpoint may not effectively encourage the due assessment and valorisation of the potential (social, environmental, economic or otherwise) ‘benefits’ of floods.

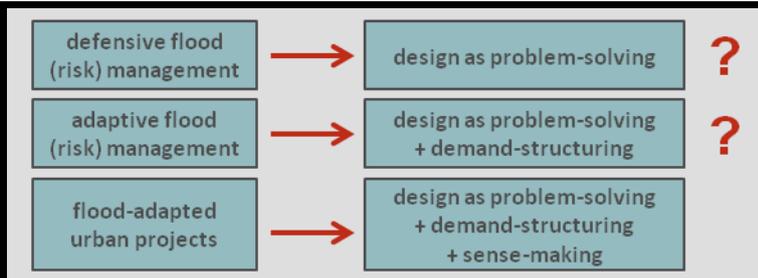


Figure 42: Design's different objectives depending on its subject?

Source: elaborated by the author

On the other hand, the ‘urbanity acceptance’ implies that flood-adapted urban projects be explored through design in its three acceptations: ‘solving’ the problem of the hybrid floods, while structuring other parallel (and perhaps unanticipated) demands, two tasks that should go in tandem with design’s sense-making role. Actually, to be an effective flood-adaptation tool, spatial design has to be pursued as a process that is valuable in itself and as a means to reach a given output. One may thus argue that the dual character of flood risk, as introduced on p. 29, is somehow mirrored in the dual nature of design: method and product (as presented on p. 54). While the “realist vision of flood risk” (Aven & Renn, 2010) has indeed been the baseline of ‘designing against floods’ (in which design is mostly a product-oriented activity), the “social constructivist vision of risk” (Aven & Renn, 2010) may support a more process-oriented approach towards ‘adapting with floods’ through design. This therefore calls for an active involvement of professional (and non-professional) spatial designers as regards floods, a hybrid that requires an “andscape” approach to be consciously and comprehensively designed (as illustrated in Figure 43).

Riverine urban areas are definitely cities’ most expressive spots “where nature and artifice meet” (Lévi-Strauss, 1955, p. 127); hence, to be successfully designed within urban-regeneration interventions, the ‘natural’ and the ‘artificial’ as design inputs do need to meet, that is, to be jointly taken into account, as proposed by Prominski’s “andscape” perspective (2014). Based on the connections involving culture and nature, this unitary notion challenges the alleged opposition between urbanity and safety, and can thus be invoked as a means to overcome (or at least pacify) the pairs of opposites associated to urban floods: stability vs. disruption, permanence vs. destruction, preservation vs. change, durability vs. ephemerality.

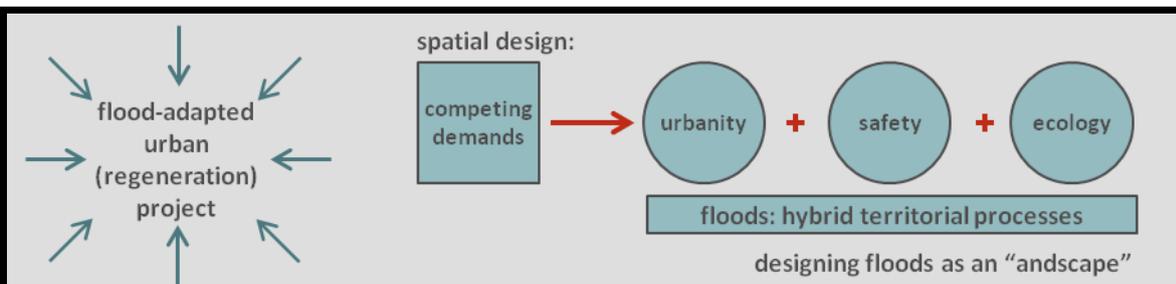


Figure 43: Enlarged role of spatial design in flood-adapted urban (regeneration) projects

Although ecology is also acknowledged in this scheme as an objective of spatial design, this facet is not covered in the thesis

Source: elaborated by the author

In fact, when designing urban projects in flood-prone riverine areas, designers are called upon to reinterpret and reconfigure the land-water interface, within which land is normally associated to urbanity (comprising both stability and safety), while water – although linked to joy, in its pacified states – is also connected to risk (instability) (see Figure 44). The hybrid floods somehow amalgamate this interface as one entity in itself, in which conventional design barriers such as the artificial or the landscape (‘nature’) are blurred. Through floods, an ‘and’ (instead of ‘either-or’) perspective should emerge to deal with the urban land-water interface (see Figure 45), in the same way heralded by Kandinsky (1927) almost one century ago within the artistic domain.

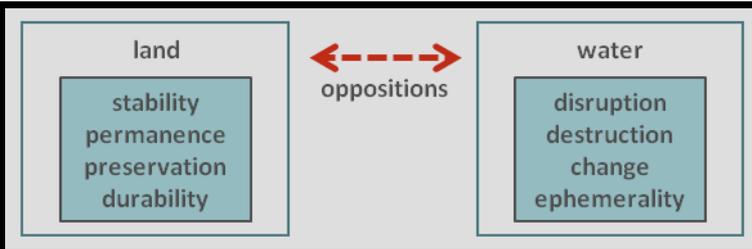


Figure 44: The oppositions inherent to the urban land-water interface

Source: elaborated by the author

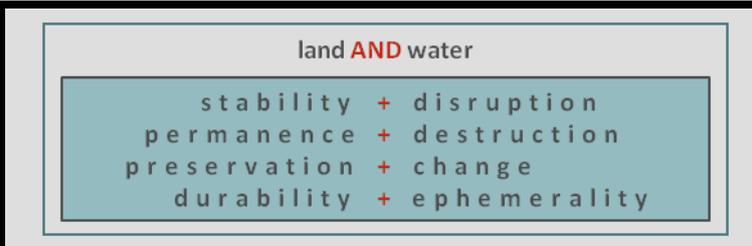


Figure 45: The urban land-water interface reinterpreted through an “andscape” perspective

Source: elaborated by the author

“Andscape” is here considered a mindset condition to successfully pursue ‘design and floods’, which may enable a progressive adaptation of the mainstream standpoint towards the land-water interface: from perceiving ‘the interface as an unstable zone’ to the recognition of ‘the instability (complexity) of the interface as an opportunity (source of richness) more than a problem’.

3 Research purpose and design

3.1 Chapter introduction

As argued hitherto, the relationship between riverine urban redevelopment and flood management begins to be mediated not solely by a flood-defence approach, in view of the emergence of a more integrative stance that aims to conciliate the demands of both urbanity and safety. In fact, in spite of being commonly associated with damage and despair, floods have been accepted in some urban projects as a dynamic factor contributing to the richness of the urban experience, being incorporated in an inclusive manner in their respective design processes. But how feasible is this perspective? How easy is it to transform inspiring adaptation images such as “absorbent city”, “tolerant landscape”, “amphibious territories” or “sponge urbanism”, into concrete liveable urban places? The ‘feasibility’ in which we were actually interested in this research does not refer to the functional adequacy of the selected flood-adaptation measures within a given urban project (although this is also an important topic), but is related to the overall (“andscape”) conditions behind the choice of such measures. That is, what could be the steps and decisions involved in the adoption of ‘design and floods’? Does the design process have to follow any predetermined course?

In line with the theoretical framework developed in the previous chapter (schematically presented in Figure 46), this study sought to explore the possible conciliation of the redevelopment of urban areas and fluvial floods, considering that spatial design may act as an adaptation and integration tool, potentially acknowledging the hybridity of flood processes and wider values linked to them. Our (empirical) qualitative research problem referred to flood adaptation through design, namely in the context of the redevelopment of flood-prone areas in urban riverside regeneration. This topic is anchored in the following contradiction: for the sake of safety, no occupation – that is, no urban redevelopment – ought to be favoured (when a flood-management standpoint is taken); yet, from the urbanity angle, such occupation may be desired. This (apparent) opposition between these two legitimate demands seems to be among the “territorial paradoxes that can only be solved through a cross-cutting and interactive approach” (Bonnet, 2016, p. 11).

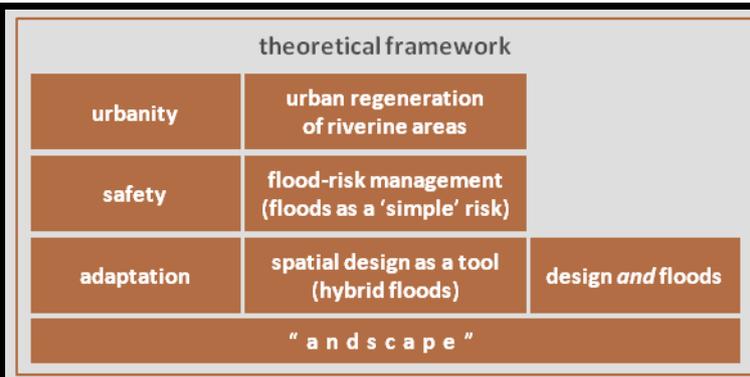


Figure 46: The thesis’s underlying theoretical framework

Source: elaborated by the author

This research problem contemplates several aspects worth being investigated, two of which are particularly relevant: first, one may be interested in identifying the concrete design means used to adapt physical settings to floods in urban-regeneration initiatives, that is, a ‘how to’ question. In this sense, the research output could be for instance an inventory of flood-adaptation measures and the structuring of typologies that emphasize the spatial relationships supported by different riverine floods, which would be a useful tool for spatial designers’ endeavours. Secondly, one may be interested in the overall backgrounds (social, cultural, technical, cognitive, economic etc.) underlying the assertion that indeed a flood-adapted occupation is feasible and can even have better urban results than other options that miss out floods. The main question here is then ‘how come’, which includes for example the more instigating exploration of the decision-making within the design process that enables the due consideration, negotiation, selection and finally implementation of such flood-adaptive strategies.

These two aspects – ‘how to’ and ‘how come’ – seem to complement each other, in terms of both flood risk and the design activity. For instance, the ‘how to’ issue (which was among our direct interests in the beginning of the research process) is more related to the objective facet of flood risk and to the sense of design as product. In contrast, the ‘how come’ issue is closer to softer dimensions of flood risk such as perception and acceptance, and to the understanding of design as process, the perspective that was ultimately pursued in the study. Actually, the ‘how come’ question concerns both the decision-making context and process (design as process), as well as the formal results engendered by them (design as product).

Our subjacent theoretical research problem thus refers to the relationships between design and floods. In an “either-or” stance (Kandinsky, 1927), one may say that the main design interest is the promotion of urbanity and this has no direct relationship with floods, viewed as transient episodes; rivers are therefore not supposed to co-design the urban (human) realm. On the other hand, from the same “either-or” standpoint, dealing with floods is geared towards the enhancement of safety, and this does not effectively interfere in the quality of the urban-realm experience. Even when recognized as hybrid phenomena, floods are most of the time conceived solely as a problem to be solved, in a way that disregards the other two veins attached to design (namely demand-structuring and sense-making) when floodable urban spaces are conceived. Is a reflexive relationship possible between design and floods that is not anchored in a dichotomic “either-or” perspective? How far can ‘design’ and ‘floods’ be integrated into a more holistic ‘design and floods’, whereby the hybrid floods can be comprehensively designed, while they may also have an active role within both the design process and its related output? Is it really possible to pursue fluvial-flood adaptation through design without adopting an “andscape” approach?

Given these empirical and theoretical problems, the research carried out had the general purpose of understanding the integration of fluvial floods into spatial design, while the expected outcome was to shed light on key issues or ingredients that may facilitate the successful pursuit of ‘design and floods’. The potential contribution of this outcome is the improvement of both design processes and products as regards flood-prone spaces within urban-regeneration initiatives; indirectly, it could (hopefully) also foster better awareness

and thus a more active engagement of architects and urbanists in flood-related urban projects. Besides the research purpose (expressed in the research questions and objectives), this chapter covers as well the research design⁸⁶, which comprises the main epistemological assumptions, the methodological choices and the overall procedures that underlie the formulation and implementation of the study (Groat & Wang, 2013). By using the term ‘research design’, we acknowledge, as astutely noted by Krippendorff (2007, pp. 76 *et seq.*), the fact that the structuring of all scientific enterprises indeed involves conception or a mental plan – for instance, the formulation of hypotheses or research questions, or the elaboration of analytical strategies –, even if this is often a hidden activity. The term here also stresses the evolving character of the study itself, which is well aligned with the constructivist paradigm eventually followed.

This chapter thus aims to go over the study’s overall mindset and the steps taken along the entire research path. Section 3.2 recapitulates the issues raised throughout the discussions of the previous chapter, presents the research questions to be tackled, delineates the objectives and the scope of the research and briefly introduces constructivism as the epistemological background of the thesis. Section 3.3 then justifies the choice of case study as the research method, while Section 3.4 details the case selection criteria, introduces the cases actually retained, and presents the data gathering and analysis procedures and techniques. Finally, Section 3.5 characterizes the three studied cases and also outlines the common structure that organizes the chapters (of Part II) dedicated to the analysed cases.

3.2 Research questions and scope

The previous introductory section added some new questions to the ones already raised along Chapter 2 (see Table 2). Taken as a whole, these preliminary questions express the primary intention of this study: to explore interlinkages between design and fluvial floods for the sake of urban life. Our research thus had an exploratory character, away from any explanatory endeavour usually attached to the “hypothetico-deductive model of science” (Flyvbjerg, 2006, p. 226). In fact, instead of testing a given hypothesis or identifying causal relationships between variables, the study was centred on the potential of learning about the research problem through the analyses of actual situations in which it is found (Stake, 2005; Flyvbjerg, 2006). Therefore, despite our clear focus, the ultimate research questions were somehow left open in the beginning, to emerge during the explorations along the development of the research⁸⁷. By following a loose research design, several questions could be addressed (how, when, who, what, why, where, whose, among others), all of them

⁸⁶ In very simple words, the case-study methodologist Robert Yin defines research design as “*a logical plan for getting from here to there*, where *here* may be defined as the initial set of questions to be answered, and *there* is some set of conclusions (answers) about these questions” (2009, p. 26; italics in the original).

⁸⁷ For the qualitative-research methodologists Michael Huberman and Matthew Miles (1994, p. 431), “‘loose’, inductively oriented [research] designs (...) work well when the terrain is unfamiliar and/or excessively complex, a single case is involved, and the intent is exploratory and descriptive”. In contrast, “[t]ighter [research] designs are indicated when the researcher has good prior acquaintance with the setting, has a good bank of applicable, well-delineated concepts, and takes a more explanatory and/or confirmatory stance involving multiple, comparable cases” (Huberman & Miles, 1994, p. 431). Although comprising more than one case, the design of our research is closer to the first type, since the cases eventually selected are not comparable, nor an explanatory and/or confirmatory endeavour was intended at the outset.

eventually converging to a broad understanding of the research problem. In any case, this study was not conceived as a means to straightforwardly ‘solve’ the research problem, nor to tentatively prescribe any design solution or answer; instead, it aimed at shedding new light on the research problem itself (thus allowing for it to be viewed through different lenses) and also at raising new (or perhaps unexpected) related issues.

Table 2: Recapitulation of the preliminary questions related to ‘design and floods’ raised hitherto

Section	Question
2.4	<ul style="list-style-type: none"> ▪ How to bring the urban-flood issue to the fore in a shared and open manner (not only focusing on its negative side)? (p. 52) ▪ How to articulate the flood adaptation of single buildings with the adaptation of the urban fabric (as a more complex system of networks and infrastructures) in urban-regeneration initiatives? (p. 52) ▪ What about the expected interactions between scales – building, plot, neighbourhood, city and river basin – in terms of flood adaptation? (p. 52) ▪ How to sensitize and articulate the multiple stakeholders involved in an urban intervention located in a flood-prone area (municipal authorities, water professionals, designers, civil-protection officers, final users etc.)? (p. 52) ▪ What are the possible means to deal with floods that achieve safety without being exclusively supported by defensive lenses, so that urbanity can also be enhanced? (p. 52) ▪ How to reach the appropriate solutions and negotiate them regarding all the legal requirements in place and assure as well their social acceptance (and thus their efficacy)? (p. 52)
2.5	<ul style="list-style-type: none"> ▪ “How is flood risk integrated into the design process for urban projects?” (Terrin, 2014, p. 8; quoted on p. 77) ▪ “How can cities strengthen their relationship with water and what types of planning methods do they use to develop their new architectural and urban spaces?” (Terrin, 2014, p. 8; quoted on p. 77) ▪ “What conceptual and planning innovations have allowed flood risk to be integrated into architectural and urban projects?” (Terrin, 2014, p. 10; quoted on p. 77) ▪ “What technical and building innovations are being used in architectural projects to solve flood-risk issues?” (Terrin, 2014, p. 10; quoted on p. 77)
2.5	<ul style="list-style-type: none"> ▪ What would be the “andscape” conditions, strategies and mechanisms that can make spatial design successful in pursuing flood adaptation within urban-regeneration projects? (p. 83) ▪ Shouldn’t the vulnerability component be tackled as part of the scope of action of professional spatial designers (architects, urbanists, landscape designers)? (p. 85) ▪ Why isn’t the vulnerability facet of flood risk explicitly explored as a remit of spatial designers, since their formal interventions have a crucial influence on the occupation and use – both quantitatively and qualitatively – of the territories? (p. 85) ▪ Are architects and urbanists up to the ‘design and floods’ challenge? (p. 87) ▪ Is flood vulnerability too big an issue to be dealt with by these professionals? (p. 87)
3.1	<ul style="list-style-type: none"> ▪ How feasible is this perspective [an integrative stance that conciliates urbanity and safety]? (p. 95) ▪ How easy is it to transform inspiring adaptation images (...) into concrete liveable urban places? (p. 95) ▪ What could be the steps and decisions involved in the adoption of ‘design and floods’? (p. 95) ▪ Does the design process have to follow any predetermined course? (p. 95) ▪ Is a reflexive relationship possible between design and floods that is not anchored in a dichotomic “either-or” perspective? (p. 96) ▪ How far can ‘design’ and ‘floods’ be integrated into a more holistic ‘design and floods’, whereby the hybrid floods can be comprehensively designed, while they may also have an active role within both the design process and its related output? (p. 96) ▪ Is it really possible to pursue fluvial-flood adaptation through design without adopting an “andscape” approach? (p. 96)

Source: elaborated by the author

The preliminary questions recapitulated in Table 2 can be grouped into two categories: “project questions” and “thesis questions”, using the typology proposed by Vial (2015). While the former refer to “formal, functional, spatial, technical (and more) issues” and correspond to “design questions”, the latter focus on more general “human, social or cultural issues”, being more accurately described as “philosophical questions” or “research questions” (Vial, 2015, p. 62). According to Vial, “a philosophical question is either a question on essence (...) or a question about causality or finality (...), while a project or design question is most often a question about the means of action” (2015, pp. 62-63). In any case, the same author argues that design questions can – and should – be transformed into research questions, yet without losing the particular “designerly way of looking at the world” (Findeli, 2010, p. 291), which was described in the beginning of Section 2.5 (see p. 53).

Following the suggestion of Huberman and Miles, we considered here that a research question does not necessarily correspond to a hypothesis but “represents the facets of an empirical domain the researcher wants to explore, setting priorities and foci of attention and implicitly excluding a range of unstudied topics” (1994, p. 440). The possible research questions evolved and were continuously (re)formulated and fine-tuned during the carrying out of the study. For example, our first tentative research question was: ‘how have urban riverfront regeneration projects and floods been articulated?’, which even after gaining an alternative version (‘how has flood risk been integrated into contemporary urban riverside projects?’) still seemed too vague to guide our research efforts (indeed, no plausible answers to these questions could be reasonably expected).

However, we were well aware that an exploratory study normally “starts without clear preliminary ideas, at best with vague suspicions” (Lans & Van der Voordt, 2002, p. 53), and that “sometimes the most interesting questions are found at the end of the project, when the researcher has become an expert on the subject” (Routio, 2007). Moreover, the definition of the research questions and objectives along the investigation revealed to be an important means to recognize the richness of the issues under study, even if this may have had the drawback of delaying the identification of key concepts and relationships. After an extensive and truly exploratory phase dealing concomitantly with contents of the literature, data of the selected cases and emerging interpretations, a more precise set of research questions was eventually retained to guide the study (or at least the reporting stage).

Aligned with the overall ‘how come’ question (as introduced in the previous section) and with our primary research aim (to understand the integration of floods into spatial design), our first research question was finally related to overall ‘design and floods’ backgrounds. It was structured as follows: considering that tackling flood vulnerability may be one of the remits of spatial designers and that spatial design can be pursued as a flood-adaptation tool, what can make it successful? In other words, **what are the critical elements that can make possible the full integration of fluvial floods in the design of urban-regeneration projects?** Three keywords in this question should be clarified: what is meant by ‘successful’, by ‘critical elements’ and by ‘full integration’? ‘Successful’ is here considered related to the degree to which spatial design concomitantly handles both urbanity and safety objectives. By ‘critical elements’, we do not mean formal (material) mechanisms to face floods (the ‘how to’ question expressed above), but the enabling mindset and values regarding both ‘design’

and ‘floods’ (each one in isolation), and also regarding the synergistic ‘design and floods’ (related thus to “andscape”). The interest in ‘critical elements’ was not related to a search for causal explanations, but to the uncovering of possible ‘favourable background conditions’ leading to better fluvial-flood adaptation through design. We were aware that given the context-bound condition of each situation subject to ‘design and floods’, these ‘critical elements’ would probably vary accordingly, but this did not affect the interest in unveiling some of them. Indeed, the identification of such ‘critical elements’ (or ‘favourable conditions’) is among today’s “burning questions in watercourse design and water space revitalisation”, as argued by Dreiseitl (2012, p. 5), who also stated that

[i]n accordance with contemporary expectations, we want rivers in good conditions and well-designed that, as living organisms, are also a fount of vitality for city dwellers. How are such aims to be achieved, what examples are worthy of emulation, and *what are the deciding factors of practical implementation?* [emphasis added]

By ‘full integration’, we mean the due consideration of floods as hybrids that deserve more than efficient technical solutions; therefore, ‘full integration’ means extrapolating the usual way of dealing with floods as a technical issue, to view them also as an asset with more profound social, aesthetic and/or ecological aspects to enrich the urban experience. ‘Full integration’ encompasses equally the consideration of flood risk’s three components altogether in their relationships, as well as other more subtle aspects such as flood-risk perception and acceptance. As a means to tentatively answer this first question, we established the following objective: to grasp baseline conditions, strategies and mechanisms that can actively foster flood adaptation through design in riverine urban-regeneration projects. It should be clarified that we were not in search of the ‘true’ or ‘good’ rules that would govern the proper (adapted) design of riverine urban projects; indeed, complexity, contingencies and contradictions are inherently linked to such locations and hence to such design situations. Thus, a successful flood-adapted urban project should at least make these conditions more tangible.

Our second research question focused on the prevailing stance towards floods, which could in itself be among the ‘favourable background conditions’ to pursue ‘design and floods’. Simultaneously related to the (hybrid) floods’ overall context and to the design process, such a stance encompasses, for example, how floods, with their intrinsic dynamics and contingencies, are perceived within urban projects: as a problem or as an opportunity? Framed as a problem, floods would simply call for a solution; while as an opportunity, they could be more broadly viewed as “potential resources for exploitation” (Pelling, 2001, p. 183), as already pointed out on p. 46, and they might thus open up new horizons within both the design process and the design output. In the latter instance, “water dynamics do become an element of design rather than a force to tame and hide”, as pointed out by Rossano (2015, p. 24) in his analysis of five major European flood-management projects. For floods to be actually explored as an opportunity, it seems that their temporality should be duly taken into consideration, as regards a riverine space’s regular uses and experience of sporadic events, both promoted through design.

The stance towards floods may also include the understanding of the timing when floods become a spatial-design concern in urban projects: is this right from the beginning, when

the project starts, or does it come into the picture later on? Accordingly, our second research question was structured as follows: **what are the possible (design) stances towards floods as regards adaptation?** In other words, what can be the place of floods in the process of designing riverine urban projects? Again, like fluvial floods themselves, the potential answers to this question are totally context-bound, but since we did not have any intention to formulate generalizations about the subject under study, the same reasoning taken for the previous question applied. This second question was then articulated with the following objective: to verify how fluvial floods are portrayed within design processes and outputs in urban-regeneration projects.

The third research question focused particularly on the prevailing stance towards spatial design itself, and was based on the assumption that design can be pursued as a process to ultimately handle (or ‘solve’) several problems at once, structure new demands (either constraints or opportunities) and add meaning to the urban experience. Considering the particularities of the hybrid floods and the floodable spaces, the third question was thus defined in the following terms: **what are the special roles (if any) played by the design activity when dealing with the regeneration of flood-prone urban areas?** It is reasonable to expect that such roles are possibly linked to the essence of design as a negotiation platform (Rossano & Hobeica, 2014; Rossano, 2015), but they may also be related to the standpoint chosen by design’s stakeholders. That is, the roles of spatial design might be different when it is carried out only to reach a final product (design as a blueprint, dealing strictly with ‘space’) than when it is performed as a valid means in itself (design as a process), “to make intelligible and share information and intuitions about the transformations of the sites” (Bonnet, 2016, p. 12).

An expressive example of the latter instance is given by the French workshop on risk-susceptible changing territories (“Territoires en Mutations Exposés aux Risques”), carried out between 2014 and 2015 under the coordination of the architect-urbanist Frédéric Bonnet. Such a workshop approach has been used by the French government since 2006 “to facilitate the emergence of a territorial strategy and to engage local actors in a project [i.e. design] process”, being the project “the instrument for integrating the different components of a territory” (MEDDE & MLETR, 2015, p. 4). According to Bonnet (2016, p. 15), in the 2014-2015 edition of the workshop, spatial design was

an occasion to blend the demands in a ‘horizontal’ manner. In an urban culture still marked by the oppositions (between the state and the municipalities, between the legal constraint and development), the debate around the design was able to transform many stances.

In that particular case, facing floods by crossing hazards and vulnerabilities in several scales has allowed flood risk (the main focused risk in four out the five studied areas) to be actually taken as a territorial asset (*atout*). Inspired by such initiative, the ensuing objective of the third research question was thus defined as: to characterize spatial design as a flood-adaptation tool.

Directly related to the previous one, the fourth research question concerned spatial designers in general – that is, the role of selected stakeholders (individuals, groups and

institutions), as well as the disciplinary expertise actively involved in such floodable urban projects. Is there any special role played by the professional designers when dealing with floods in the regeneration of urban areas? Although the main focus of our study was professional spatial designers, we did not neglect the fact that non-professional ones also can have an influential say in terms of ‘design and floods’. On the other hand, notwithstanding the shortcomings of a strict professional association to each of the flood-risk components as provocatively caricaturized in Figure 37 (on p. 85) and the inclusiveness needed by ‘design and floods’, how clearly is disciplinarity distinguishable in floodable urban projects? Which actors behave as orchestrators in terms of the linkages between floods and the proposed design?

For example, in the account of Rossano (2015, p. 24), the Isère Amont project has “placed designers in the difficult role of negotiators, trying simultaneously to increase risk awareness and acceptance for adaptation measures, temper out-dated faith in perfect technical solutions, and deconstruct false hopes of full [river] renaturation”. Considering the above issues, the fourth question was finally formulated as follows: **who are the key stakeholders in the process of designing flood-prone urban projects and which roles are fulfilled by them?** The intention here was to identify the main actors (besides the river in question) and their roles in the design process, and the most relevant disciplines informing fluvial-flood adaptation through design. The fourth research objective was hence to recognize which stakeholders and related disciplines have been enablers of an inclusive ‘design and floods’ perspective.

As previously indicated, each of these four research questions actually encompassed several more particular issues, which finally helped to trace and understand the major one. Table 3 summarizes the ultimate research questions, their respective focuses and their related objectives.

Table 3: Recapitulation of the thesis’s eventual research questions and objectives

Research question	Main focus	Objective
What are the critical elements that can make possible the full integration of fluvial floods in the design of urban-regeneration projects?	Background	To grasp baseline conditions, strategies and mechanisms that can actively foster flood adaptation through design in riverine urban-regeneration projects
What are the possible (design) stances towards floods as regards adaptation?	Floods	To verify how fluvial floods are portrayed within design processes and outputs in urban-regeneration projects
What are the special roles (if any) played by the design activity when dealing with the regeneration of flood-prone urban areas?	Spatial design	To characterize spatial design as a flood-adaptation tool
Who are the key stakeholders in the process of designing flood-prone urban projects and which roles are fulfilled by them?	Spatial designers	To recognize which stakeholders and related disciplines have been enablers of an inclusive ‘design and floods’ perspective

Source: elaborated by the author

The most important mainstays of the above questions and objectives are the understanding of floods as (often unconsciously) designed phenomena and the possibility of practising spatial design in a reflexive manner, two topics that are anchored in a constructivist

worldview. In fact, the affiliation of our study to this research paradigm was not defined *a priori*⁸⁸ (we started with no commitment to any specific paradigm, nor to any existing theoretical framework), but such connection emerged naturally (in a very constructivist way) as the study developed⁸⁹. This unintended choice became first manifest through the fact that the constructivist worldview seemed to somehow congregate some of the authors taken as references in the thesis: from more general thinkers such as Beck (1986; 2010) and Latour (1993), to geographers like Castree and Macmillan (2001), and to spatial designers like Prominski (2014) and Till (2009). Even the work of the case-study methodologist Robert Stake (2005), which provided some important practical guidance for our study, is based on this paradigm. At the same time, according to the characterizations put forward by Guba and Lincoln (1994, p. 112), our research goal was neither related to positivism (for which the inquiry aim is to explain the reality in order to predict and control it), nor to the critical theory paradigm (associated to ideological positions and geared towards the critique and transformation of structures).

Generally speaking, understanding a given situation (how it is so) is a key goal within constructivism (Guba & Lincoln, 1994; Stake, 2005), having in mind the assumptions that there are “local and specific constructed realities” (ontology) and that “findings are created through the interaction of inquirer and phenomenon” (epistemology) (Guba & Lincoln, 1994, pp. 112 and 107). Two other constructivism characteristics that were indeed present in our research are “the understanding that a research design may emerge as the research proceeds” and “the assumption that generalizations are not necessarily possible in all instances” (Groat & Wang, 2013, p. 84). Yet, we also became aware of some of the shortcomings of such worldview and its attributes, namely through the arguments regarding the constructivist standpoint towards nature presented by Noel Castree and Tom Macmillan (2001, p. 209):

The social constructionist arguments (...) have achieved two important things. First, they have shown the intellectual incoherence of imagining nature as essentially nonsocial. Secondly, they have also provided the political weaponry to attack the dubious invocation of ‘nature’ as a separate domain to which appeal can be made to legitimate existing or new economic, social, and ecological arrangements.

Although stressing that they disagree with outdated “versions of ‘natural realism’ that to this day animate both geographical and everyday imaginations” (Castree & Macmillan, 2001, p. 210), these authors wanted to go further, making (what they call) a “subversive” claim that

⁸⁸ The qualitative-research methodologists Egon Guba and Yvonna Lincoln define a paradigm “as a set of *basic beliefs* (or metaphysics) that deals with ultimate or first principles. It represents a *worldview* that defines, for its holder, the nature of the ‘world,’ the individual’s place in it, and the range of possible relationships to that world and its parts” (1994, p. 107; italics in the original); that is, such a worldview defines one’s ontological, epistemological and methodological assumptions. Although entirely agreeing with the first part related to ontology and epistemology, the qualitative-research methodologist Michael Patton (2002, p. 72) is more flexible as regards methodology; indeed, he considers that “at the pragmatic level of making concrete methods decisions, (...) a wide range of possibilities exists (...). The point is to do what makes sense, report fully on what was done, why it was done, and what the implications are for findings.”

⁸⁹ The main repercussions of this paradigm choice on our research were already presented in Chapter 2: see for instance pp. 29 and 33 as regards flood risk, and p. 53 as regards design.

both social constructionists and those natural realists they criticize actually have something in common. That common something is an inability to imagine human-natural relations in a nondichotomous way. Though social constructionists seem to breach the social-natural divide which organizes academic and lay thinking, they arguably go on to reinstall it at another level. What we mean is that bringing nature within the domain of the social simply shifts the causal and ontological arrows from one 'side' of the social-natural dichotomy to the other. The dichotomy itself arguably remains intact. [italics in the original]

This argument is of utmost importance for our research, since our own claim goes in the direction of favouring an inclusive (“andscape”) perspective as regards ‘design and floods’, which would be in contradiction (at best, or would be impossible, at worst) within such a strict constructivist standpoint. Indeed, it seems that even the actual materiality of fluvial floods (namely the triggering event of high waters) would also be taken as a ‘social construction’; few would deny that it might be influenced (at least partially) by human actions and/or inactions. Fortunately, the same authors present the “actor-network theory” (ANT) as a means to “think beyond’ the nature-society dualism” and “to see the world as hybrid, chimeric, complex, and entangled” (Castree & Macmillan, 2001, p. 210).

Initially developed within the science and technology studies, this theory considers that both humans and nonhumans (taken as ‘actors’ or ‘actants’) interact and thus form relational socio-natural (hybrid) networks that can themselves and by themselves explain their complex organization and contents, without following any preconceived “analytical frame of mind” (Yaneva, 2009, p. 276)⁹⁰. Therefore ANT implies not holding to a binary understanding of the world, which “ultimately forces the analyst to make a choice: to prioritize [the social or the natural] domain or actor on ontological, causal, or normative grounds”; all the involved actors are hence treated symmetrically, independently of their supposed ‘social’ or ‘natural’ essences (Castree & Macmillan, 2001, p. 213).

It is not difficult to realize that the core of this theory echoes the first of the two Japanese concepts that inspired Prominski (2014) to coin his notion of “andscape” (see Figure 23, on p. 72); however, despite the congruence of ANT’s arguments with the ones developed in the thesis, we did not follow its methodological guidance for several reasons. First, we did not want to focus on one specific flood-prone urban project, but more generally on the phenomenon of fluvial-flood adaptation through design; secondly (and more pragmatically), we only ‘discovered’ some applications of ANT within architecture and design when the study of our three cases was almost finalized.

At the same time, to be successfully carried out, the “mapping of the controversies” within the three selected cases would have required the use of some visualization tools not easily available (Yaneva, 2012); our access to such tools would have further delayed the development of the thesis. In any case, due to our interest in the design process as a whole (and not only in its output), part of the methodological steps actually taken (presented in Section 3.4) somehow touched ANT’s orientations, the most important one being the

⁹⁰ For a thorough introduction of ANT, see for example Latour (1993); for ANT in geography, see Castree and Macmillan (2001); for ANT in design and architecture, see Latour and Yaneva (2008), Latour (2009b), and Yaneva (2009; 2012).

acknowledgment of the river itself (a nonhuman actor) as an active agent in ‘design and floods’. This approach was finally consolidated in our first research question (see p. 102)⁹¹.

All things considered, the most significant implication of the adoption of the constructivist paradigm is perhaps related to the adequacy of the ‘measures’ aimed at the validity of qualitative research. While the quality criteria for a study following a positivist approach are normally based on the “conventional benchmarks of ‘rigor’” (“internal and external validity, reliability, and objectivity”) (Guba & Lincoln, 1994, p. 112), in a constructivist path such criteria are replaced by trustworthiness and authenticity (Guba & Lincoln, 1994; Patton, 2002). Although Guba and Lincoln recognize that the “issue of quality criteria in constructivism is nevertheless not well resolved, and further critique is needed”, they suggest that trustworthiness and authenticity are more adequately evaluated through credibility, transferability, dependability and confirmability (1994, p. 114). An attempt to translate these criteria into more practical terms is provided by the geographers Cathy Bailey, Catherine White and Rachel Pain (1999, p. 169):

[T]here is a need for most researchers to be more explicit about their research processes: to offer a rationale and further detail on issues such as respondent selection, key changes in research direction and analytical procedures. In this way, qualitative studies will be able not only to *demonstrate the relevance of the single case* (achieve *credibility*), but also to *move beyond it* (achieve *transferability*) with a *degree of certainty* (*dependability* and *confirmability*). [emphasis added]

According to the architects and scholars Linda Groat and David Wang, credibility can be pursued, for example, through triangulation (that is, using “a variety of data sources, multiple investigators, and/or a combination of data collection techniques”) and by “checking the data and interpretations with the respondents and groups from whom the data were solicited” (2013, p. 84). Transferability is, for the same authors, only achievable when a second context is relatively similar to the one from which the conclusions of a study were drawn upon (a condition that is not necessarily reasonable, as regards urban projects, given the diversity of the situations in which they unfold).

As for dependability, Groat and Wang suggest carrying out an “audit trail” to verify the consistency of the data, through the detailed recording and reporting of “all the processes by which data were collected, analyzed, and interpreted” (2013, p. 85). Finally, these authors argue that confirmability can be sought “through a combination of triangulation and reflexivity on the part of the researcher”, the latter requiring that he/she reveals “his/her epistemological assumptions, their influence on the framing of the research question, and

⁹¹ In order to make the full reasoning of Castree and Macmillan clear, it is necessary to mention that in the end of their text, these authors recognize some ontological, theoretical and political shortcomings of ANT itself; as a means to circumvent them, they propose a “weaker version of ANT” that, although remaining “critical of binarist thinking, of asymmetry, of limited conceptions of agency and of centered conceptions of power”, would equally “concede the following points: namely, that many actor-networks are driven by similar processes, notwithstanding their other differences; that these processes are social and natural but not in equal measure, since it is the ‘social’ relations that are often disproportionately directive; that agents, while social, natural, and relational, vary greatly in their powers to influence others; that power, while dispersed, can be directed by some (namely, specific ‘social’ actors) more than others; and that a politics of nature attuned to the needs and rights of both human and natural entities must ultimately be orchestrated through putatively ‘social’ actors” (Castree & Macmillan, 2001, pp. 222-223).

any changes in perspective that might emerge during the course of the study” (Groat & Wang, 2013, p. 86).

Although our questions and objectives were continuously reformulated throughout the study, and the underlying paradigm was ‘identified’ during the actual research, the general scope of the study remained stable since its inception. Our interest has consistently been the understanding of relationships between spatial design and adaptation to fluvial floods in the redevelopment of riverine areas, based on our interaction with and the analysis of European urban-regeneration projects. Therefore, some of the basic delimitations of the research were clearly defined from the outset, as follows. First, despite the diversity of flood types and in order to recognize rivers’ historical central position in the foundation of cities and their increasing importance nowadays for the quality of the urban realm (urbanity), the focus was on floods linked to fluvial dynamics.

Floods related to storm surges, taken as a particular river-flood type induced by maritime tides and strong winds⁹², were included (since there are floodable riverine zones being regenerated in many estuarine cities, such as HafenCity in Hamburg or Abandoibarra in Bilbao), but urban (pluvial) floods were not taken into account. This restriction was particularly important, since fluvial floods and pluvial floods, despite following the same hydraulic rules, have completely different natures in terms of hydrodynamics (velocity, duration, depth, flow content etc.) and predictability. Given these sharp differences, the responses to them and the possible adaptation means are also dissimilar, an aspect that seems to be commonly overlooked (or misunderstood) by non-experts (including many urban designers).

The focus on the European geographical context stemmed from the fact that floods are one of the main ‘natural’ risks in the European continent (EEA, 2010), and from the Community’s intention, since the 1970s, to be in the forefront of environmental initiatives, currently spurred by the worries attached to climate change (EEA, 2005; 2012). Moreover, the EU has also been taking proactive steps in the promotion of both flood-risk management and urban-regeneration initiatives (although the two domains have not been necessarily interlinked, as assumed in our research) (EU, 2007; EEA & FOEN, 2016). The European urban-regeneration projects to be studied were to be located in flood-prone areas (with an annual flood probability of 1% or less) and to present some adaptation to floods, while the interventions were not to constitute strict flood-mitigation projects.

In fact, due to their location and programme, some current flood-management initiatives happen to have multiple functions and an urban character, as it has been often the case within the Dutch “Room for the River” programme (Klijn *et al.*, 2013); yet, these were outside the scope of our research. At the same time, our study targeted pre-disaster situations (during which emphasis is put on prevention instead of response, recovery and rehabilitation), while the urban projects in question were to be either already implemented

⁹² More precisely, a storm surge refers to the “[r]ise in sea or estuary water level caused by the passage of a low pressure centre” (WMO/UNESCO, 2012, p. 333).

or ongoing. Other delimitations of the study are presented among the criteria behind the selection of the cases, in Section 3.4.

3.3 The case-study method

Given that the aim of the research was neither explanation of reality (in the positivist sense of identifying causal factors) nor the critique of an individual design process and product, but the understanding of a given issue (namely the possible articulations between design and floods), we chose as methodological approach to review some actual riverine urban projects in flood-prone locations. Since our research problem consisted in a contemporary phenomenon – fluvial-flood adaptation through design – in its own setting, with no control by the researcher, case study was considered the most adequate method to be followed (Stake, 2005; Yin, 2009). Originated in the social sciences, case study is a versatile research method that can be used with descriptive, exploratory or explanatory purposes (knowing that these aims can evolve and change in the course of a study). Indeed, when elaborated within an exploratory framework, a case study enables for example to identify pertinent variables of a given phenomenon and also to tentatively envision some relationships between them (in the sense of theory development) (Mills *et al.*, 2010).

A simple description of this method is presented in the *Encyclopedia of case study research*: “the art of case study is the art of telling the story of what is going on, what is most significantly meaningful, in the case in question. It is impossible for this to be the whole story, because there is always more happening than can be contained in a single narrative” (Mills *et al.*, 2010, p. 943). When using the case-study method the researchers’ intention is in fact “not to provide a definitive account but to venture a suggestion regarding the range of possibilities” within the phenomenon being investigated (Mills *et al.*, 2010, p. 944). According to Yin (2009, p. 46), there are four basic case-study designs, combining either a single case or multiple cases with the focus of interest in either one (holistic) or more (embedded) units of analysis (see Figure 47).

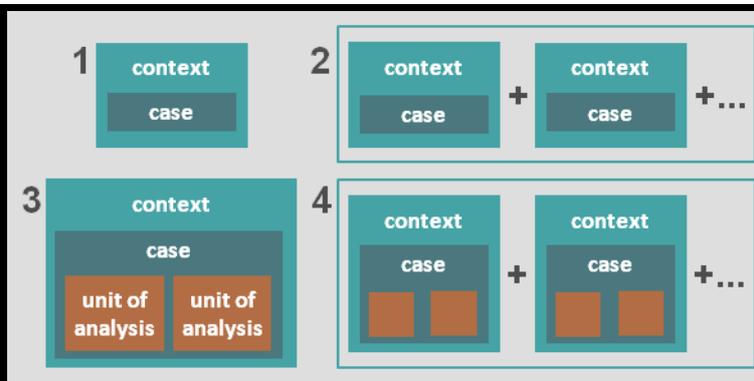


Figure 47: The four types of case-study design, according to Yin

1) single holistic case design
 2) multiple holistic case design
 3) single embedded case design
 4) multiple embedded case design
 Source: Yin (2009, p. 46) (modified by the author)

For Stake (2005), central to the case-study method is ‘the case’, defined as a functioning system restricted to a particular context (as shown in the figure above), with specificities rather than generalities. Therefore, the case study concentrates “on trying to understand *its* complexities” (Stake, 2005, p. 444; italics in the original), by meticulously recording the

“unusual and the ordinary” (Stake, 2005, p. 453) – that is, the uniqueness of the case. Descriptions are then used as means to understand the case, rather than to straightforwardly explain it, a description being “a reasonable [account] of the phenomena observed” (Huberman & Miles, 1994, p. 432). In fact, case studies produce “context-dependent knowledge” based on several sources of data (Flyvbjerg, 2006, p. 221), while the definition of what can be considered ‘the case’ depends on the research’s stance regarding its underlying “interpretive paradigm or methods of inquiry. Seen from different worldviews and in different situations, the ‘same’ case is different” (Stake, 2005, p. 460).

According to the economic geographer Bent Flyvbjerg (2011, p. 301), case studies “comprise more detail, richness, completeness, and variance – that is, depth –”, when compared with other research methods. Also, in contrast with experiments and surveys, which “need grounding in extended empirical knowledge before research is actually conducted” (Mills *et al.*, 2010, p. 178), case studies

start from the opposite direction. First, the researcher must get acquainted with the case, the context and significant processes, to be able to define appropriate procedures and ordering categories. This means that the case study approach consists of several phases of field inquiry and exploration aiming to complement analytical lacunae and to develop methodological procedures. Both this explorative attitude as well as the dynamic character of the phenomenon under study stress the necessity of employing different methods [that is, strategies] to be able to gain a meaningful and detailed picture of it. The researcher participates in the situation, takes field notes, talks informally with informants, conducts interviews, consults experts in the field, uses archives, and makes inventories of what is going on in the situation. These different data not only allow for different perspectives on the daily course of life, but the data can also correct and supplement each other (Mills *et al.*, 2010, p. 178).

Being well aligned with the constructivist worldview, case study was the method chosen in our research given its overall strengths: besides depth, “[h]igh conceptual validity, [u]nderstanding of context and process, [u]nderstanding of what causes a phenomenon, linking causes and outcomes, [f]ostering new hypotheses and new research questions” (Flyvbjerg, 2011, p. 314). Indeed, case study is considered by Groat and Wang (2013), in their *Architectural research methods*, as a ubiquitous research strategy in architecture that has the power to holistically integrate approaches as diverse as historical research, qualitative research, correlational research, experimental and quasi-experimental research, simulation research and logical argumentation (the ones presented in their book).

Moreover, case study is one of the most suggested methods in the architectural realm, being advocated by some related professional associations such as the RIBA and the American Institute of Architects (AIA, 2001; Till, 2005). These organizations consider that through case studies design professions such as architecture and urbanism can be improved both theoretically (in the scientific and academic sense) and practically (in their day-to-day practice). Writing on behalf of the RIBA, Till makes the following statement regarding architectural research (2005, p. 3; italics in the original):

Designing a building is (...) *not necessarily* research. The building as building reduces architecture to mute objects. These in themselves are not sufficient as the stuff of research inquiry. In order to move things on, to add to the store of knowledge, we need to understand the processes that led to the object and to interrogate the life of the object after its completion.

The author then suggests carrying out “an *archaeology* of the process of architectural production” to reinforce the architectural knowledge base, centred on a reflexive and comparative criticism that is not exclusively focused on the building as a product, but is also interested in the production (that is, design) process and the concrete “architectural performance” (Till, 2005, p. 4; italics in the original). Given their aforementioned strengths, case studies are useful means to accomplish this wide-ranging task. For Till, the advantage of case studies targeting the interactions between the stages of architectural processes, products and performances is that they avoid “the science/art and qualitative/quantitative splits, and [allow] interdisciplinary research into any of three stages” (2005, p. 5). Therefore, in his point of view, case studies allow a dynamic follow-up of the architectural production, recognizing that “each stage [leads] to another and, crucially, [creates] an iterative loop in which one stage is informed by another” (Till, 2005, p. 5). This reasoning converges with Traganou’s expectations as regards more comprehensive spatial-design studies (see p. 6), which would necessarily involve the assessment of “spatio-architectural praxes in the context of their broader socio-cultural nexuses” (2009, p. 180).

The choice of the case-study method was particularly important for our research, since it enabled a broad view of the targeted urban projects, by dealing concomitantly with historical, technical, aesthetic and social aspects of designing flood-prone spaces, and by crossing traditional disciplinary boundaries (and thus allowing us to catch multiple points of views). The main methodological support to actually conduct the case studies was gathered from Foqué’s *Building knowledge in architecture*, in which the architect and scholar takes as starting point the idea of design – that is, “the activity of transforming human space into a new and structured reality” (Foqué, 2010, p. 27) – as a third way (besides science and art) of inquiring the world.

Accordingly, the author advocates research through case studies as a means “to establish a knowledge base for the discipline of architecture” (Foqué, 2010, p. 11), as it used to have before its integration in the university realm, in which it has been struggling to legitimate itself as a scientific domain⁹³ (despite being a longstanding technical profession). To that end, Foqué’s book provides a theoretical framework as well as concrete tools to produce knowledge in architecture, either for teaching purposes or to advance the professional practice. His proposed method is anchored in pragmatic thinking, that is, in the belief that there is “a crucial unity between experience and the process of learning, and between conceptual thought and situational consciousness” (Foqué, 2010, p. 11).

In the first part of his book, Foqué (2010) presents a general theory of design, taken as architecture’s core activity positioned between art (epitomized by creativity and intuition and geared towards aesthetic experience) and science (expressed by the use of rational and technical thinking in the search of the ‘truth’)⁹⁴, two domains that have been

⁹³ This standpoint is also shared by the architect Mário Krüger (2001) in an essay about architectural research.

⁹⁴ As presented in his book, Foqué’s understanding of ‘science’ is indeed mainly associated to the ‘hard sciences’ and seems to follow a positivist view; nonetheless, the author considers that the world “does not merely exist, but is at the same time in a continuous process of being created” (2010, p. 45), converging with the research paradigm adopted here.

methodologically separated since the Enlightenment. For that reason, the author argues (2010, p. 26), the idea of knowledge was reduced “to rational thinking” associated with scientific research, thus undervaluing artistic inquiry and design thinking as valid means of knowledge generation. These three perspectives have indeed quite different rationales (some of their contrasting features are shown in Table 4). For instance, according to Foqué (2010, p. 41), the particularities of design thinking derive from the fact that it is “*per se* innovative, heuristic, and experimental, driven by empathy and focused on problem-solving”. Although this definition is mostly aligned with the first meaning of design as presented in Section 2.3, the author claims that design is also a communication activity that involves the creation of meaningful artefacts and should not be restrained by the *status quo*. In this regard, Foqué (2010, p. 99) complements that design thinking

essentially deals with complex and multivariate conditions, problems with multiple stakeholders, fuzzy boundaries, and the areas where solutions may be found between disciplines. Designers, and especially architects, are known for not limiting themselves to problems as ‘given’ in a well-established brief, but will always try to reformulate, restate, and discover problems not previously identified. (...) Therefore, designers should bring to the table a broad, multi-disciplinary spectrum of ideas from which to draw inspiration.

Table 4: The main features of three different knowledge-generation rationales

	Scientific research How things are	Research by design How things could be	Artistic production How I see things
Main features as regards the apprehension of the world	Observation Facts	Observation Facts, visions, beliefs	Observation Facts, visions, beliefs, reflection, interpretation, expression
	One hypothesis Explanatory model	Multiple hypotheses Exploring models	Individual hypothesis Questioning model
	Testing True or false Verification Objective Repetitive Universal Cause-effect	Testing Most desirable Verification and application Subjective Unique and not repeatable Contextual Coincidental	Testing pointless Individual Synergetic Questioning Confronting Visionary Communicative
	Scientific theory Static	Hypotheses in actions Dynamic	Hypothesis Perpetual
	Reality explained	Reality changed	Reality questioned
Main outcome	Technological application	Design application	Artistic interpretation

Source: Foqué (2010, p. 44)

In Foqué’s point of view, the design activity has three interrelated (but not sequential) ‘moments’: the structuring one, the creative one and the communicative one (see Figure 48), taken actually as design’s “driving forces” (2010, p. 54). In the structuring moment, design variables and their relationships are analysed and reorganized to compose a new whole and fulfil the design task. Such a reorder is supported by the creative moment, which is concomitantly rational and intuitive, while creativity is considered “not only related to the degree of originality of a designed product” but also “to the effectiveness of its technical and social functioning” (Foqué, 2010, p. 61). Within the communicative

moment, designers dialogue with the design situation and its context, consisting of both physical and non-physical elements; and as a consequence, the design activity “will always fluctuate between the analysis of objectively perceptible facts and the weighing of subjective value judgments” (Foqué, 2010, p. 43). Foqué considers that the communication moment gathers three different aspects: “the communication inside the designer’s mind and/or within the design team, the communication between designer and design context, the communication between designer and user/client” (2010, p. 76). Communication is thus a crucial aspect regarding the decision-making within the design process.

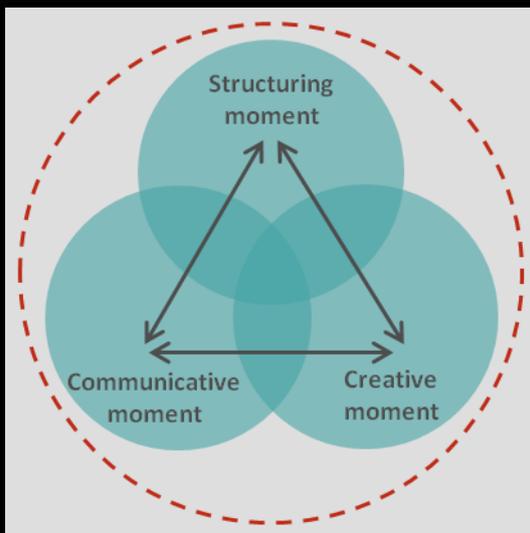


Figure 48: The three interrelated moments of the design process, according to Foqué

Source: Foqué (2010, p. 55) (modified by the author)

Although following such general framework, Foqué recognizes that each design process is actually unique and renders distinctive outputs. The author seems somehow puzzled with the interplays between variety and uniqueness in the architectural production, from overall design practices to architectural theories (with respect to what can be considered a good design), to participants (with their own value systems and interests), to issues at stake and to outputs. In this regard, Foqué (2010, p. 114) argues that in order to build knowledge, to critically think and to reflect methodologically in the architectural domain,

[w]e should try to understand how ‘architectural products’ come into being, the effects they cause on the environment, and the way they are used by the consumer. We should investigate through comparative studies to discover the differences and similarities of contemporary architectural discourses, giving ourselves a broadening insight into how the architect’s mind works, the methods he is using, and the paradigms to which he is indebted.

Foqué considers that in a given building the integration of its parts conforms “the essence of architectural design itself and the keystone needed to make the [spatial] transformation from analysis to synthesis”; understanding the “interrelated sub-solutions and decisions on both macro and micro levels” can thus lead to the discovery of the “essentially synergetic character of an architectural object” (2010, p. 124). Some of these integrated parts can be distinguished from each other, forming what the author calls the building’s “knowledge pockets” (briefing, designing, building and occupying – see Figure 49), that is, “data carriers [that] describe the building at its several levels and in its different states through time” (Foqué, 2010, p. 132). The relationships between these “knowledge pockets” will actually constitute what he metaphorically calls the “architectural DNA” and the “genome”

of a given building; in order to build knowledge in architecture, these “genomes” should be unravelled, then analysed, understood and made applicable to other design situations (Foqué, 2010, p. 133).

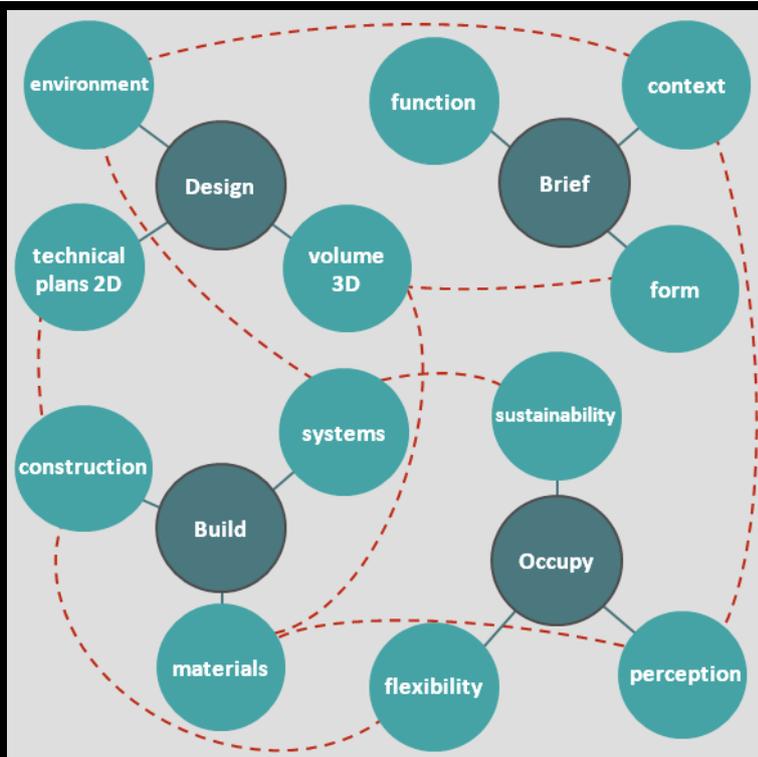


Figure 49: Foqué’s combination of “knowledge pockets” within the “architectural DNA”

The most relevant relationships between the components of the four “knowledge pockets” are depicted
Source: Foqué (2010, p. 136)
(modified by the author)

Based on this theoretical framework, Foqué proposes, in the second part of his book, a practical approach to disclose the four architectural “knowledge pockets” and the connections between them, through the carrying out of comprehensive case studies of some selected buildings. Case studies are then recognized as a privileged teaching method in other professional domains such as law, medicine and business administration; although following particular rationales in each of these disciplines, this method has steadily been supporting the development of their knowledge base.

Considering this fact, the author proposes using case studies to uncover the intricate decisions (including their motivations and consequences) that underpinned and led to the production of a given building, in an “attempt to reconstruct the design process” (Foqué, 2010, p. 119) and to bind the components of the architectural knowledge. According to Foqué, the “general starting point” of case studies is to understand emblematic architectural designs or, in other words, to figure out “how, in a best practice situation, problems are handled, decisions made, and solutions obtained” (2010, p. 151). This method is hence taken as a tool to meticulously examine the interactions between the context that fostered an outstanding design, the process incurred from its inception to its concretization and the resulting materialized product, as well as the interactions between the different involved actors.

In order to tackle the first part of this general aim and to actually elaborate architecture-related case studies, Foqué developed the multilayer analytical strategy named PCP, while

for the second part the author proposes the ACCU-A analysis, being both descriptive strategies to understand the architectural production. The PCP strategy focuses on the Product, the Context and the Process related to a spatial-design project, as well as on the relationships between these three domains (see Figure 50 and Figure 51). Within this strategy, the context component initially corresponds to the pre-project situation, which encompasses both static and evolving elements, mainly the area under intervention and its geographical and sociopolitical environments at different scales. This component thus comprises the overall historical, cultural, institutional and legal backgrounds of a given architectural project (Foqué, 2010). The context is as important here as it is for any phenomenon explored through the case-study method (as shown in Figure 47, on p. 107); therefore, buildings are understood as intrinsically associated to “their broader socio-cultural nexuses”, in line with Traganou’s suggestion (2009, p. 180) quoted on p. 109.

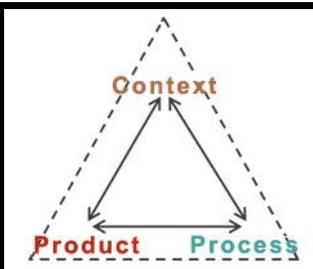


Figure 50: The three interrelated components of Foqué’s PCP analysis
Source: Foqué (2010, p. 196) (modified by the author)

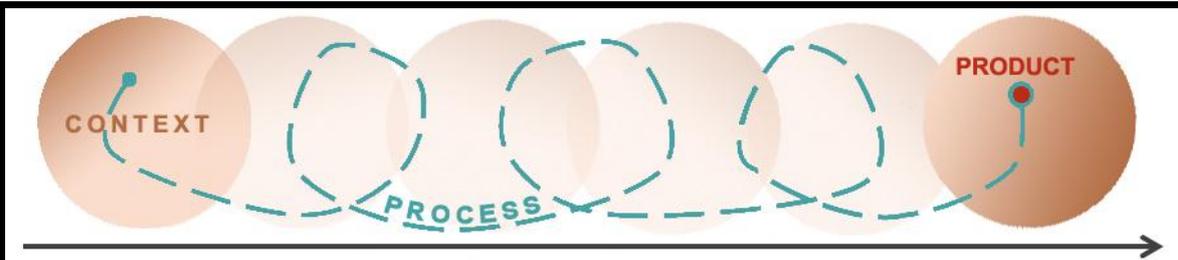


Figure 51: A more dynamic representation of Foqué’s PCP analysis

Although not clearly shown in this diagram, the designed product is also a dynamic component
Source: elaborated by the author

In its turn, the process component relates to the dynamic chain between pre- and post-project situations, and covers the identification of main events and involved agents, existing alternatives and crucial decisions made at different design stages. The process can thus be understood as both the design context in action (in other words, the expression of the context’s dynamism) and the way by which such context is imprinted into the product. The process includes, among others, the locational choices, the selection of the design team, the adopted work methods and the consultation of the involved parties and the duration of the different project phases. Finally, the product is the ‘internal’ sphere of the project, resulting from the interactions between context and process, and should cover functional, construction, formal and environmental aspects, as well as image-related, sensorial and cultural features and all their connections (Foqué, 2010). The emphasis put by Foqué on the design process goes beyond typical morphological analyses of design outputs as simple and hermetic ‘objects’.

Foqué's way of thinking is consistent with the RIBA's suggestion to thoroughly inquire about the three architectural stages: means of production (the design process), products (the actual buildings) and architectural performance (Till, 2005). As shown above in Figure 50 and Figure 51, the distinction between design's context, process and product is purely analytical, the frontiers between these dimensions being in fact blurred. For example, the pre-existing context is by no means permanent (it is even almost impossible to clearly identify its starting point); therefore the development of the context is equally part of the process. And since both the process and the product can be named 'design', as design (in its both senses) evolves and becomes eventually implemented, the design process and product also change the way through which the overall context is perceived and actually experienced (Foqué, 2010). Hence, all these three stages – context, process and product – eventually form the design process as a whole. According to Foqué (2010, p. 195), the design context

has a physical dimension but also a non-physical one that belongs to the level of ideas, norms, values, attitudes, and ideologies. Case studies in architecture should address these different layers. This means that product, process, and context are under investigation, not as separate entities but as mutually influencing constituencies.

Foqué (2010) suggests that the PCP strategy be complemented by the ACCU-A analysis, an acronym that stands for a design project's main involved stakeholders, whose actions uniquely inform the design process: the Architect (the design team actually), the Client, the Contractor, the User and the Authorities (see Figure 52). This analysis seeks "to get a clear picture of these stakeholders and the roles they have played in the process", as well as "to understand their individual assessment of the end product" (Foqué, 2010, p. 205), being thus a particularly appropriate strategy to address our fourth research question (see p. 102).

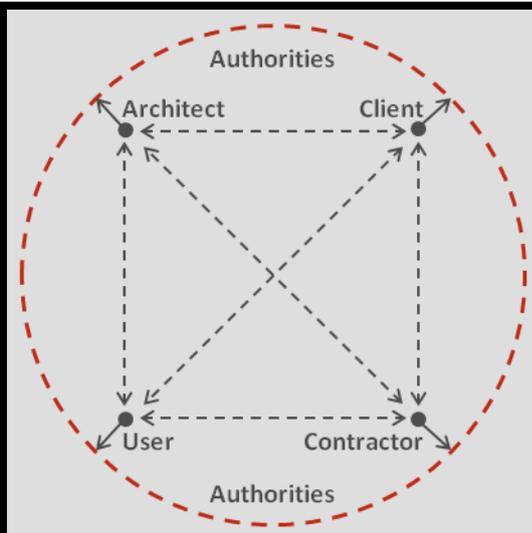


Figure 52: The components of the ACCU-A analysis
Source: Foqué (2010, p. 206) (modified by the author)

Although not following an anthropological perspective, Foqué's approach (namely the combination of the PCP and ACCU-A strategies) is based on the same pragmatic-thinking standpoint of Yaneva (2012) and gets in some instances close to her "mapping controversies" method. In fact, both authors share the view that buildings are the result of collaborative efforts more than the expression of individual "act[s] of 'creative force'" (Foqué, 2010, p. 53), and they are interested in understanding the motivations and

consequences of the design decisions involved in the architectural making as a whole (not restricted to formal and/or aesthetic considerations). Yet, Foqué's methods do not particularly seek to highlight the controversies within a design process but to extract more general lessons to be learnt (which can of course derive from the involved design controversies as well). In a way, the ACCU-A analysis stresses design's human dimension, imprinted in all its three facets, as depicted in Figure 53.

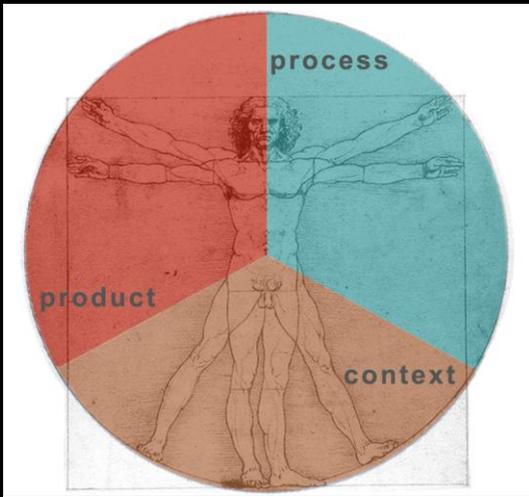


Figure 53: The human footprint on the three design facets

Source: elaborated by the author, based on Leonardo da Vinci's Vitruvian Man sketch (ca. 1509) and Foqué (2010)

In sum, according to Foqué (2010, p. 209), in order to effectively generate architectural knowledge from case studies,

[t]wo research actions have to be carried out. First, we must examine the interaction between product, context, and process – and how that interaction has contributed to the uniqueness of the solution. (...) Second, using the results of the investigation into the patterns of interaction among all participants, we must determine their influences on the product, context, and process. The comparison and combination of the outcomes of these two research actions will result in an overall conclusion about the case under study.

One should bear in mind that the case studies formulated using the PCP and ACCU-A strategies do not exactly aim to formulate generic and comprehensive design theories, given the acknowledgement of the uniqueness and strong context-sensitivity of the architectural products. Although case studies in general (and in architecture as well) can also be used for theory building, especially when comprising multiple cases (Stake, 2005; Yin, 2009; Mills *et al.*, 2010), some case-study methodologists (including Patton (2002) and Stake (2005)) recommend that generalization or theory generation should not be taken as the research's central aim when using this method, for such objectives may obscure some important features “for understanding the case itself” (Mills *et al.*, 2010, p. 448).

This fact can be considered a limitation of the method, just as other well-known downsides: “[s]election bias may overstate or understate relationships, [w]eak understanding of occurrence in population of phenomena under study, [s]tatistical significance often unknown or unclear” (Flyvbjerg, 2011, p. 314). These characteristics mostly appear as limitations when one tries to weight the case-study method against other positivist (or quantitative) approaches; yet, such a comparison is not relevant since the underlying epistemologies are different and thus incommensurable (Guba & Lincoln, 1994).

We were nonetheless aware about the following possible challenges when conducting case studies: the (unrestrained) access to data as a first step, and then the management of a (potentially) massive and expanding amount of data, related in our case to ongoing processes. While the former issue had direct repercussions in the selection of the cases (as presented in the next section), the latter implied the definition of the study's temporal boundaries and depth. Although intensity is among the main characteristics of case studies (Flyvbjerg, 2011), our research was not aimed at a comprehensive and deep scrutiny of the selected flood-adapted urban projects (as recommended by Foqué's PCP strategy), since the cases were to be analysed (and actually constructed) having floods as a primary lens. In keeping with Foqué's metaphor of the "architectural DNA" (2010, p. 132) (although such a metaphor might engender the misunderstanding that there must be some sort of 'deterministic' law in architecture), we could say that our interest was restricted to the 'genes' that would somehow exert some influence on dealing with 'design and floods' in a more integrated fashion.

The adoption of Foqué's approach in this research had some potential shortcomings, since his methodology was conceived with actual buildings in mind, that is, material situations to be analysed in all (or at least several of) their constituent layers, in contrast with our focus on urban projects that are (partially) under implementation. Not only was the building's scale completely extrapolated in our study, but its material reality was also (at least in part) lost. Regarding the different scales of the design situation, there are indeed theoretical and practical concerns when one intends to simply transpose architectural methods to the urban level, as duly acknowledged by Portas (2011), for urban projects have a much higher degree of complexity when compared to a single building's project.

Yet, the idea here was not to stretch architectural design methods to the city scale but to use the same general analytical framework to address urban projects, taken, just like buildings, as legitimate spatial-design outputs. This issue was posed to Foqué (personal communication, 24 September 2012), who asserted that

the application of the method within an urban-design context needs some deeper considerations and is at first glance not obvious. It is nevertheless a very interesting line of thinking. The method itself is more universal than presented in the book [*Building knowledge in architecture*], which concentrates on the architectural level. But on a meta level (the level of town planning), it is in my opinion perfectly possible to use the same methodology.

As for the second issue (materiality), the project itself was taken as the relevant output to be analysed, despite the fact that between the conception stage and the actual implementation a lot of design processes are still ongoing (indeed, the design activity does not abruptly stop when technical drawings are submitted and approved). The construction and occupation stages as valuable sources of architectural knowledge were unfortunately unavailable for two of the three studied cases (as presented in the next section). Given this limitation, one may consider not fully complete the case study that was carried out.

Yet, it still seemed useful to understand the overall design stages of flood-adapted urban projects that are previous to their implementation (it would be equally interesting to study

the future construction and occupation stages of the two cases in question when materialized in some years or decades). Moreover, within his teaching activities, Foqué himself applied with his students the case-study method to analyse unbuilt projects, without losing coherence (Foqué, personal communication, 24 September 2012). In any case, we were aware that the ‘plan’ as a design output is still a spatial proposal and represents more intentions than the potential meanings that actual spaces can eventually express.

In general, the major weaknesses frequently associated with qualitative research (which are also applicable for the case-study method) relate to its subjective character and include for instance the adoption of loose procedural steps and the lack of traceability, issues that were briefly tackled in the previous section. In order to overcome (or at least minimize) such disadvantages, after presenting the cases’ selection, the next section recapitulates the research steps actually taken, in order to convey the study’s ‘dependability’, which is one of the quality standards for qualitative research proposed by Guba and Lincoln (1994).

3.4 Research strategy and procedures

Through the in-depth study of a few selected cases, this exploratory research intended to illustrate the diversity of situations and design rationales encountered in urban riverfront projects in flood-prone areas. Therefore, the research aim was not to present ‘best practices’ (or to portrait some ‘representative’ cases) in terms of designing flood-prone urban spaces – even if this is the point of view supported by Foqué (2010)⁹⁵ –, nor to formulate generalizations about the subject under study, but to get new insights about it. In this sense the cases were not *per se* the central focus of the research, but they were taken as an opportunity to explore and understand the central issues (main circumstances, procedures, stances, stakeholders and mechanisms that can be behind the due integration of floods into urban projects through design), in line with what Stake (2005) defines as “instrumental case studies”. The methodological standpoint of the thesis was thus to carry out a multiple-case study with an instrumental role, whereby each case should be carefully developed in an independent way, in order to ultimately “identify patterns and themes” related to the issue of interest, and possibly compare them within the cases⁹⁶ (Stake, 2005, p. 474).

⁹⁵ According to Traganou (2009), one of the drawbacks of the great emphasis on paradigmatic cases in architecture scholarship is the oversight of the significance of the built environment to non-professional audiences. Moreover, since flood management has historically been a concern less of design than of other professional realms, it would be a real challenge here to define what could presently represent a ‘best practice’ in a ‘design and floods’ perspective. In any case, as stated by the same author, the “study of non-canonical cases (...) ([understood as] processes of spatial production and consumption beyond those concerning ‘exemplary’ architectural practices) can offer critical insights for aspects of practice that do not simply involve the form-giving function of the architectural profession” (Traganou, 2009, p. 179). On the other hand, in the strict flood-risk management domain, the cases that are more subject to research are those having undergone the biggest failure and damage, that is, the ‘worst cases’. In fact, as cleverly recalled by Di Baldassarre and colleagues (2014), since prevented disasters are often unnoticed, it is unusual to learn lessons from them, a point of view also shared by the political scientist Thomas Birkland (2005).

⁹⁶ In fact, this reasoning is similar to the approach taken for example by the architect Kevin Lynch (1960) in his seminal study on the image of the city, in which Boston, Jersey City and Los Angeles were used as reference cases, even if the author’s ensuing theoretical considerations could have equally been generated using any other large city.

A first step to identify potential cases was the contact established with key researchers in the fields of urbanism, geography, landscape and urban-flood management (in Portugal, France, Italy and the Netherlands) in order to gather their suggestions. Since this initiative did not generate any concrete feedback, the initial selection of cases was eventually based on secondary information found in research papers and reports, in addition to dissemination materials from related European scientific projects being carried out or recently concluded, such as “Freude am Fluss”, “FloodResilienCity” and “WaRe” (“Waterfront Regeneration”). As a result, 16 potential cases were screened (see Table 5), following the reasoning of “purposeful sampling”, which intends “to select information-rich cases whose study will illuminate the questions” being explored (Patton, 2002, p. 46). There was thus no intention to reach statistical representativeness in the selection process, as it would have been the case in a quantitative study (Huberman & Miles, 1994; Stake, 2005).

Table 5: List of the urban projects screened in the initial case-selection phase

Urban project	City (country)
Frente Ribeirinha de Almada Nascente	Almada (Portugal)
Scheldekaaien	Antwerp (Belgium)
Quimiparque	Barreiro (Portugal)
Bastide Brazza Nord	Bordeaux (France)
Parque Verde do Mondego	Coimbra (Portugal)
Westhafen	Frankfurt (Germany)
South Dalarnock	Glasgow (United Kingdom)
HafenCity	Hamburg (Germany)
Ivry-Confluences	Ivry-sur-Seine (France)
Parque das Nações	Lisbon (Portugal)
Stratford City (East Village)	London (United Kingdom)
Zollhafen	Mainz (Germany)
Les Docks	Saint-Ouen (France)
Siderurgia Nacional	Seixal (Portugal)
Les Ardoines	Vitry-sur-Seine (France)
Parque del Agua	Zaragoza (Spain)

Source: elaborated by the author

The potential cases ranged from typical urban regenerations (namely, the conversion of former industrialized areas into new dense districts) to green-riverfront initiatives (urban parks) also meant to instil new life in declining zones⁹⁷. When accessible, the data collected

⁹⁷ Because of the ancestral and intrinsic relationship between floods and urbanization in the Netherlands, Dutch cases were excluded from the outset, as they can be classified as “paradigmatic cases” (Mills *et al.*, 2010; Flyvbjerg, 2011). At the same time, the prevailing stance towards floods in that country has historically been defensive (thus of less importance for this research), even if some space is currently being devoted to river waters in recent flood-defence schemes (Klijn *et al.*, 2013; Rossano, 2015).

in this phase, gathered in a first table, contemplated for instance the main geographical characteristics of the city in question, a brief description of the related flood risk and the references to such risk in current local land-use planning instruments. A second table summarized each of the 16 urban projects, identifying the main flood-adaptation mechanisms and structures proposed to face floods within them; it also compiled the main existing (and available) bibliographical references and a first assessment of the feasibility of a full study of the case under consideration. These two tables (taken as completed in July 2012) are presented in Appendix A.

After this general screening phase, three cases were selected; the main criteria for choosing them derived directly from the predefined scope of the thesis (see p. 106). Not to make the research even more complex, cases from capital cities, as well as those urban projects partaken by two or more municipalities within metropolitan contexts (presenting hence disproportionately intricate institutional arrangements), were finally excluded, although some projects falling in these categories had initially been screened. A pragmatic additional criterion at this stage was data accessibility, which was among others linked to language limitations: not only should a reasonable amount of data be available (contacts with key informants in each of the three selected cases were made in order to ensure that beforehand), but also be in one of our work languages.

In any case, following Stake (2005), contextual and cultural diversity was considered a positive criterion within the purposeful sample sought, even if all the potential cases were under the same general European legislative umbrella. The actual sample was selected for its potential “to advance understanding” about the phenomenon of interest (Stake, 2005, p. 445), while each of the three selected cases was centred on a particular risk component: hazard, exposure or vulnerability (although this categorization was done only later on for analytical reasons, since their respective realities are in fact not so clear cut).

In the chronological order of their inception, the three selected cases were:

- the set of projects within the urban-regeneration programme Coimbra Polis, around the Mondego River in Coimbra (Portugal), mainly impinging on the containment of exposure (main design process held between 1995 and 2007);
- the master plan for the Scheldt Quays, along the Scheldt River in Antwerp (Belgium), an infrastructure aimed at both the protection against floods (a hazard-focused approach) and the strengthening of urban identity (main design process held between 2006 and 2010); and
- the *plan guide* for Bastide Brazza Nord, a neighbourhood bordering the Garonne River in Bordeaux (France), focused on the reduction of vulnerability (main design process held between 2009 and 2014).

Our sample was finally composed of three very different urban projects (which will be comprehensively introduced in the next section), in three diverse urban contexts. One is located in a global-port city in the north of Europe – Antwerp –, in which dealing with floods within urbanization processes has a long history (being therefore well consolidated). Another one is situated in a southern European town – Coimbra –, in which floods have historically had an important influence on both urban morphology and the flourishing of downstream agricultural activities. The third city, Bordeaux, geographically located

between the two previous ones (see Figure 54), has also been historically associated to its prominent trade port, used *inter alia* for the marketing of the region's world-renowned wine production. Such diversity had the potential to highlight more effectively the main issues being explored and thus to enrich the lessons to be learnt about 'design and floods'.



Figure 54: Location of the cities of the three studied cases

Source: Google Maps, © Google (modified by the author)

The three selected cases are neither 'typical' nor exactly 'paradigmatic' examples of dealing with floods through design⁹⁸; nonetheless they can be considered relevant in their respective context, in terms of both flood management and design reasoning. Indeed, floods are among the main 'natural' risks in Portugal (Equipa DISASTER, 2012), and are the most important one in both France (generating the highest damage) and Belgium (affecting the greatest number of people) (Salomon, 1997; CRED, 2014). As for design, the relevance of the three urban projects can be inferred by resorting to secondary sources. For example, the Scheldt Quays Master Plan and one of the sections of the Parque Verde do Mondego (the western entrance) were showcased in the *On site* publication (LAE, 2009), organized by the Landscape Architecture Europe Foundation (LAE), which aimed to portray "the state of the art in water landscape design in Europe" (Diedrich, 2010, p. 18).

Two projects from Bordeaux, indirectly related to the Bastide Brazza Nord case, were also presented in this publication: the Miroir d'Eau (water mirror, designed by Michel Corajoud, Jean-Max Llorca and Pierre Gangnet), on the left bank, and the open spaces for Bordeaux's tram (designed by BLP, Groupe Signes and Élisabeth de Portzamparc), partially located in La Bastide (on Bordeaux's right bank). Commenting on the projects included in this publication, the architect Lisa Diedrich (2010, p. 18) stressed that given the quality of their answers to the original design questions, "a lot of [these projects] merit disciplinary and cross-disciplinary research in order to sort out if and to what

⁹⁸ 'Typical' or 'average' cases may not always be rich sources of information related to the phenomenon under study (Stake 2005; Flyvbjerg, 2006). Stake (2005, p. 451) even suggests that "[s]ometimes it is better to learn a lot from an atypical case than a little from a seemingly typical case." It was also not the purpose of this thesis to judge whether any of the three urban projects was (or is) a 'paradigmatic' case of riverscape design (especially if design is understood solely as the resulting product). Yet, if we simultaneously take a process-oriented approach and flood-adaptation lenses to examine them, the three cases surely have relevant lessons to be explored.

extent they are resilient⁹⁹. If so, how, and if not, what could be improved?” This task was somehow embraced in this thesis, although our concern regards only floods among the overall water issues.

Being the most recent urban project in our sample, the case of Bastide Brazza Nord was still not as well documented by secondary sources as the other two urban projects during the elaboration of the thesis. Nonetheless, the relevance of this design proposal could be assessed through other valid means; for example, key members of the latest design team in charge of this *plan guide* (the consortium YTAA/MDP/Ingérop) recently won awards in recognition of their professional expertise. In 2011 the landscape architect Michel Desvigne (the head of MDP) received the French government’s “Grand Prix de l’Urbanisme”, while in 2015 the engineer Carine Dunogier (the head of a department at Ingérop Bordeaux) obtained the French government’s “Grand Prix de l’Ingénierie” and the architect-urbanist Youssef Tohmé (the head of YTAA) earned the “Médaille de l’Urbanisme”, from the French Académie d’Architecture. It is interesting to note that the prize awarded to Dunogier was related to her work in the Garonne Eiffel urban-regeneration project (located as well on Bordeaux’s right bank), of which floods were also a key issue¹⁰⁰. In its turn, Tohmé’s prize stemmed precisely from the *plan guide* for Bastide Brazza Nord, the first full-fledged urban-design intervention led by his practice.

Despite their particularities, these three cities share some general traits, common to many European cities: all of them experienced urban sprawl during the last quarter of the 20th century, incurring acute losses of inhabitants in their urban cores as compared to their peripheries. As a consequence, several problems (including imaged ones) were generated (or strengthened) in these city centres, in which most of the rich urban heritage is concentrated; accordingly, the three cities have recently embarked on urban-regeneration processes as means to be again viewed and experienced as attractive places to live in. Moreover, the three cities are all settled in a meander and prone to river floods (although overflows in Antwerp and Bordeaux are particularly related to the tidal character of their rivers); the flood processes in the three cities also share a main characteristic: they are usually of the slow-onset type, which gives enough time for warnings and evacuations when needed.

Regardless of these converging points, the premise of this research was that these three cities, their flood contexts (see Table 6) and the related urban projects are too different to be compared (see for instance Figure 55, Figure 56 and Figure 57, in which the maps of the three cities are presented at the same scale). Therefore, the comparative endeavour pursued

⁹⁹ Diedrich’s choice of the term ‘resilience’ here was possibly induced by the main topic of the “International Symposium on Resilient Water Landscapes”, held at the University of New South Wales (Sydney, Australia) in October 2009, during which she presented a European panorama of water-related landscape architecture and territorial strategies, illustrated with some of the projects selected by the LAE for its *On site* publication. Therefore, ‘resilient’ in this context probably means ‘successful water-adapted interventions’.

¹⁰⁰ In the words of the prize sponsor, the Garonne Eiffel urban project consists of “an ambitious challenge given the strong constraints: flood risks, existing infrastructures and their associated noise, and soil pollution. Engineering has found the solutions to turn these constraints into drivers for the urban development project by making flooding and water management core aspects of the project. Professional engineering has worked technical and managerial wonders to bring innovative solutions to [this] project” (DGE, 2015).

in the analyses only covered more substantive aspects (that is, essential principles) of the cases, which could tentatively be found in any urban project fostering ‘design and floods’. In fact, we considered that all the data gathered in each case had a value in itself and not exclusively in relationship with the value attributed to the same category of data in the other two cases. As argued by Stake (2005), the study of several cases does not necessarily imply comparing them; similarly to the objectives of generalization and theory generation, drawing comparisons may hinder extracting the most interesting aspects of a case, especially when these aspects cannot be found in the other analysed cases.

Table 6: Main characteristics of the three studied urban projects regarding fluvial floods

Urban project	Fluvial-flood type	Existing flood protection	Main flood process on site
Parque Verde do Mondego, Coimbra	Slow onset	System of dams + river training	Storage
Scheldt Quays Master Plan, Antwerp	Slow onset (with tidal influences) + storm surge	Quay wall and floodwall	Storage
Plan Guide Brazza Nord, Bordeaux	Slow onset (with tidal influences) + storm surge	Quay wall (in part)	Storage and transfer

Source: elaborated by the author



Figure 55: Coimbra’s urban footprint
 Source: Google Maps, © Google (modified by the author)

In the beginning of the research, the Coimbra case was intended to be developed as a pilot study, to structure, test and fine-tune data-gathering steps and instruments, as well as to delineate the analytical and reporting procedures for all the cases. Nonetheless, since the access to data on the Coimbra case took much more time than expected, we opted to initiate the cases of Antwerp and Bordeaux before the conclusion of the first one. Anyhow, the means for data gathering, analysis and reporting actually evolved during the research (as expected).

Moreover, the parallel study of the three cases was eventually fruitful, since the crossing of information and experiences allowed us to shed light on particular issues that would be less evident if treated and/or interpreted in isolation. In order to mitigate the main weaknesses usually associated with qualitative research (presented in the previous section, on p. 116), a case-study protocol was prepared as a methodological tool to anticipate the research's operationalization processes. The case-study protocol contained in particular the plan to gather data and the main procedures for its analysis and interpretation (Miles & Huberman, 1994).

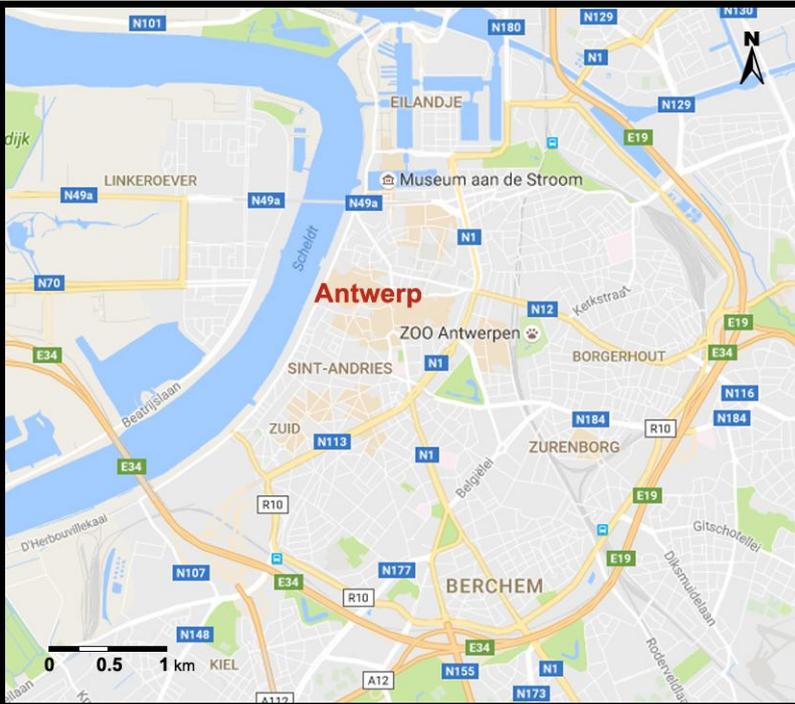


Figure 56: Antwerp's urban footprint
 Source: Google Maps, © Google (modified by the author)



Figure 57: Bordeaux's urban footprint
 Source: Google Maps, © Google (modified by the author)

According to Yin (2009), each case should have its own protocol, suited to its characteristics, to be updated as the research evolves. This dynamic instrument was indeed a fundamental means to keep the research works for the Coimbra case on track; yet, after the first rounds of data gathering, we noted that the continuous adjustment of the protocol would be a time-consuming activity with only minimal contributions to the research's results. Therefore, we decided to keep the Coimbra case protocol as a support instrument for the operationalization of the research, but not to maintain it fully up-to-date; only its elements that underwent major changes were reviewed since its first version (the initial Coimbra case-study protocol, in Portuguese, is presented in Appendix B).

The data sources used in each case study comprised wide-ranging written, graphical and audiovisual documents (including maps, planning regulations, photographs, design briefs, plans, sketches, technical drawings, reports, scientific papers, videos, minutes of official meetings, press releases), as well as observational field notes and the transcripts of interviews with key actors. Most of the data had a qualitative nature, although some quantitative information was also collected mainly to characterize the cases. Data from commercial architecture and landscape magazines – secondary sources that are not usually covered within the sphere of scientific publications – was gathered as well, in response to the relatively short life of 'traditional academic research' in those fields; yet, in recognition of the potential biases of these sources, they were only used to complement other data sources. Such use of several instruments to gather different types of data from various sources (that is, multiple triangulation) is totally in line with the case-study method, being an important means to validate the research's overall process and ensuing conclusions (Patton, 2002; Stake, 2005; Yin, 2009).

The main period of data gathering was from October 2012 to October 2015 for the Coimbra case, from October 2013 to July 2015 for the Bordeaux case, and from October 2013 to May 2016 for the Antwerp case. As expected, access to written, graphical and audiovisual data on the three cases was not equivalent regarding the urban project itself, its context and flood risk. Despite the fact that it was still not well documented by secondary sources, the Bordeaux case was the one on which the largest amount of data was made available, mainly thanks to the support received from some of the project stakeholders. Therefore, the primary sources for the Brazza urban project included some first-hand unpublished documentation, for example the archaeogeographical study for the right bank (Lavigne, 2010), the Agence AUC's preliminary redevelopment study (Agence AUC, 2010), the KCAP-led master plan for Brazza Nord (KCAP *et al.*, 2012a), the specifications for the buildings and the public spaces by the YTAA-led design team (YTAA *et al.*, 2013; 2014), as well as Artélia's updated study on floods (Artélia, 2013). In addition to these, many easily accessible institutional documents, produced by the administrations of both the municipality and the metropolitan area of Bordeaux, were also consulted.

In the Coimbra case, data on flood risk was much more accessible (through scientific articles and institutional publications) than data on the Polis Programme, even though the municipality keeps most of the related documentation; in fact, these materials have not yet been properly archived, which makes it difficult for them to be retrieved. In spite of this major constraint, the support of some municipality officers enabled us to access such

important primary sources as the full content of the first tentative master plan for the Parque Verde do Mondego (CMC-APOT, 1999) and of the two master plans elaborated within the Polis Programme (GBA, 2004; MVCC, 2004). Some as-built technical drawings (namely of the green park's section implemented on the right bank, of the centre for environmental monitoring and interpretation, and of the West Entrance of the park) were also consulted, just as the detailed projects for the green park's section on the right bank that was not implemented.

As for the Antwerp case, the language was quite an important barrier regarding the gathering of data about the related flood risk, while for the urban project great support was provided by both the municipality and the design team, who provided a copy of the master plan itself (PROAP *et al.*, 2010). This case was also covered through several institutional documents on both the design context and the design process (Stad Antwerpen, 2009; 2012; Stad Antwerpen & W&Z, 2011), as well as published accounts by some of the designers and the local promoters, such as Van de Put (2007), Nunes (2007; 2008; 2011), Teughels and Borret (2007), De Meulder (2008), Menegotto (2009) and Teughels (2011). These accounts were also considered primary sources for building the Antwerp case study, following the arguments of Mills and his colleagues (2010). Interestingly, concerning the wider urban context (for instance the urban-regeneration processes and their rationales), more data and information were available on the cities of Antwerp and Bordeaux than on Coimbra. Anyway, this perceived 'unbalance' regarding (access to) data represents the typical situation of multiple-case-study designs, in which the involved cases can hardly be scrutinized in the same intensity due to their own idiosyncrasies.

As mentioned, interviews with key informants from concerned organizations (mostly identified through snowball sampling) were another very important source of information; they were used to capture perceptions, attitudes, insights and facts related to 'design and floods' in each studied urban project. Having a semi-structured format, the interviews targeted design-practice professionals (11), local- or regional-administration officers (8) and stakeholders from other public bodies (3) (see the brief characterization of the interviewees in Table 7). Out of the 25 formal interviews (with 22 informants), 22 were conducted face-to-face while 3 were carried out by phone; they were sometimes complemented with some more informal *ad hoc* exchanges with the concerned informants and also with other stakeholders¹⁰¹. The list containing the names of the interviewees as well as the date and duration of each interview can be found in Appendix C, whereas a sample interview schedule can be found in Appendix D (a dedicated interview schedule was actually prepared for each interviewee).

All the interviews were recorded with the permission of the interviewees and later on transcribed by the author; for validation purposes (Stake, 2005), the interview transcripts were sent to the respective interviewees for a final check of their contents. Yet, feedbacks were only received for some of them (8 out of 25); in any case, it seems reasonable to interpret the silence of at least part of the informants who did not provide any feedback as a *de facto* endorsement of the contents of the respective interview transcript. Quotes from

¹⁰¹ The terms 'interviewee' and 'informant' were used interchangeably in this thesis.

the interviews were formatted in italics along the following text to make them clearly identifiable, and were kept anonymous even if this had not been expressly requested by any informant. Quotes from interviews that were not originally in English (and that were thus translated in the thesis) are also presented in their original language in Appendix E¹⁰². Since there was only one interview in Portuguese in the Antwerp case, we exceptionally used its contents along the text in English without presenting the original quote in Appendix E, in order to ensure coherence with the overall anonymity of the interviewees.

Table 7: Characterization of the interviewees

Interviewee	Coimbra	Antwerp	Bordeaux	Total
Background				
Architect-urbanist	3	5	3	11
Engineer or engineer-urbanist	3	1	1	5
Landscape architect	2	–	2	4
Other	1	–	1	2
Total	9	6	7	22
Professional role				
Head of a private practice	3	3	2	8
Senior collaborator in a private practice	–	–	3	3
Manager in a public body	4	3	2	9
Senior officer in a public body	2	–	–	2
Total	9	6	7	22

Source: elaborated by the author

Finally, the field study consisted of direct on-site observations and our related field notes (in textual or graphical format), covering for all three cases the concerned sites and their wider geographical contexts and, for the Coimbra case, the resulting physical artefacts. The constant and progressive production of memos and schemes was not only related to the field observations but also associated to the emerging interpretations, either during the first data analyses or following the interviews. In this sense, the information used in the thesis was indeed produced (and not merely collected) through the interviews, observations and regular memos, in addition to the traditional written and graphical documental sources.

Since the chosen method was the multiple-case study, the procedures for data analysis and interpretation for the three individual cases were the same. Following the guidelines proposed by Huberman and Miles (1994), the data-gathering phase was carried out as a primary data-reduction activity, and thus corresponded to the beginning of the analysis itself. Being done rather concomitantly, data gathering and analysis did not follow a unidirectional path but fed each other: for example, in some research phases, the analyses themselves naturally called for further exploring additional information. Overall, the unit of

¹⁰² Conducting interviews in Portuguese, French and English raised a concern about the appropriateness of key terms (due to cultural differences) and about the accuracy of translations. Indeed, to be in tune with the largest part of the literature reviewed (and also with the great number of interviews eventually conducted in English), we changed the thesis's writing language (from Portuguese to English) in the course of the data collection, although aware that some terms in English were not fully adequate for the realities of the Portuguese and French cases (starting with 'design' itself). In any case, writing the thesis in English increased the potential to share the reflections developed within it with an enlarged audience (including with most of the stakeholders related to the studied cases themselves).

analysis was the selected urban project (the designed product, mainly in its drawing format) and the design process that allowed its emergence. The Coimbra case was an exception, for two embedded units of analysis were considered within it: the Parque Verde do Mondego and the parallel requalification of the premises of the Monastery of Santa Clara-a-Velha, two distinct projects that nonetheless have some clear spatial relationships (as will be highlighted in Chapter 4). This embedded study was indeed a consequence of the field study, exemplifying how the operationalization of the research affected its structure. Furthermore, these two projects have already been implemented (differently from the cases of Antwerp and Bordeaux), implying thus various types and levels of analyses.

The analyses mainly consisted in the characterization, description and interpretation of the studied cases, using the PCP and the ACCU-A analytical strategies proposed by Foqué (2010), introduced in the previous section. Some additional considerations on the PCP and its actual application in this research may be useful at this point, taking into account the analytical distinction between design's context, process and product. As regards the context, although acknowledging that the economic and financial situation has a great importance for effectively pursuing a 'design and floods' perspective, this aspect was not duly focused in this thesis. Increased upfront costs are indeed often associated with flood-adapted design (Lamond & Proverbs, 2009; Jha *et al.*, 2012; CEPRI, 2015); however, data regarding costs, often perceived as 'sensitive', are not always easily disclosed.

At the same time, if one considers that the context component is somehow 'external' to the project itself (although the design process and product develop within it), interferences from professional designers on the context are only minor (if any). 'External' here means that the context is less controllable by the involved actors and is full of contingencies: an example of this could be the weight (and rigidity) of planning laws, which may limit the application of more flexible solutions towards floods. In any case, the overall contexts of the three selected urban projects were approached in the research mainly through document analysis and direct field observations.

Within our conceptual framework, the urban project itself was understood as a design process, and not only as a product. Since the process component lies at the interface between the overall context and the 'final' product, the hand of the professional designers can be noticed in this stage, although contingencies are still important drivers here for changing the course of the design output. The process component was mostly approached in this research through interviews and the analysis of documents, notably the design briefs, taken as sources of key information.

Being often the mainstay and a fundamental step of the design process itself, the design brief (also known as the project specifications) should not be underestimated (Foqué, 2010), since it synthesizes the overall demands and constraints of a given project, as well as its general principles and goals, previously debated and agreed upon by its proponents. At this point of the design process (that is, in the definition of the design brief), the programme is much more important than the ensuing spatial arrangements (Portas, 2003). These issues were particularly stressed by Till (2009, p. 169), for whom the formulation

of the brief itself can be even more important and creative than the conception of the related design product:

The brief is often seen simply as an instrument of rationality: how one can most efficiently get functions into rooms. (...) [B]riefs reduce architecture to abstract quantity, [being] then passed as fait accompli to the architect, who is left with little more to do than turn these systems of flows and efficiencies into plans (a mainly technical act) and then disguise the deficiencies of the process (and their own marginality within it) through dressing the building up in various skins (a merely aesthetic act). (...) [In contrast, the] creative brief is about negotiating a new set of social relations, it is about juxtapositions of actions and activities, it is about the possibility to think outside the norm, in order to project new spatial, and hence social, conditions.

Another concern related to the context and process components is the fact that they inevitably involve shedding light on the main political issues around the projects, particularly the ones that have influenced or even determined some of the design decisions; yet such issues were not taken as central themes of analysis, even though they were acknowledged when pertinent. On the other hand, one should bear in mind that the focused cases actually referred to fragments of broader regeneration processes in which the urban projects in question were encompassed; therefore, demarcating the ‘beginning’ or the ‘end’ of the studied (design) processes was not a straightforward task.

As for the product component, it was here taken in its strictest sense and comprised only the outputs of spatial design: blueprints and plans – that is, the idea to be implemented, and not the resulting concrete constituents of the space as designed (except, as already mentioned, for the Coimbra case). Accordingly, especially due to the different timings of the three cases but also to the fact that one of them was more physically accessible, distinct analytical points of view developed around each of them. In the Coimbra case the analyses were clearly *ex post*, involving both the design and its (almost full) implementation, while in the cases of Bordeaux and Antwerp the analyses were *ex ante*, covering no more than the design (processes and projects).

As a consequence, the application of the PCP analytical strategy in the latter cases was only partial, since the aspects related to the effective construction and occupancy of the designed products could not be considered, a limitation of the research that was already tackled in the end of the previous section (see p. 116). In any case, it is notable that in the product component the influence of professional designers is the greatest. Although the idea of the designers’ interference refers to the degree of influence they can exert over the decision processes, this does not necessarily mean that an urban-design project is (or should be) an individualistic or authoritarian activity. In fact, any urban project often has many stakeholders involved, being the decision-making naturally very complex. Even in the sphere of the product itself, in which many decisions are within the professional designers’ scope of action – at least in terms of the formalization of ideas –, they are never made exclusively by them.

The PCP and the ACCU-A strategies (Foqué, 2010) were applied in the research with the support of some analytical techniques suggested by Huberman and Miles (1994). For instance, the analysis was continuously conducted in parallel to data gathering, and

included three main steps: data reduction, information display, and conclusion drawing and verification (Huberman & Miles, 1994, p. 429). Data reduction consists in a process of selectively choosing the data to be considered pertinent within a given research. Here, the main data ‘filter’ was taking floods as primary lenses to analyse the urban projects¹⁰³, while other means used to ‘reduce the data’ included information summaries (in the format of tables, as the ones presented in Appendix F), and coding. The content analysis of the gathered information was more ‘informal’ than suggested by Huberman and Miles (1994). Indeed the first interviews from the Coimbra case were subjected to ‘formal’ content analyses with the support of a qualitative-analysis software programme (*MaxQDA*), but since the transcription task was totally carried out by the author it was felt that simultaneously transcribing and coding the interviews would be simpler, without resorting to any specialized tool (an example is provided on p. 371).

On the other hand, data display entailed the presentation of the reduced data in organized formats (either tables, diagrams or graphical schemes), as a means to highlight its meanings and the most important relationships (Huberman & Miles, 1994). As for drawing the study’s conclusions, the tactics used included the resort to comparisons (highlighting contrasts and convergences), the identification of themes, the clustering of concepts and the use of metaphors in an iterative mode (Huberman & Miles, 1994); the results of the application of these tactics constitute the core of Chapter 7. In order to allow the analyses to be confronted to the scrutiny of other scholars and enhance their credibility, interim conclusions of the research were presented in various scientific gatherings, notably the “VIII Colóquio de Geografia de Coimbra” (Coimbra, March 2014), the “5th International Conference on Flood Risk Management and Response” (Venice, June 2016), and the “IV Congresso Internacional de Riscos” (Coimbra, May 2017). Furthermore, the article “Design *with* floods: from defence against a ‘natural’ threat to adaptation to a human-natural process” (Hobeica & Santos, 2016), synthesizing the main arguments and tentative conclusions of the thesis, was also shared with some stakeholders of the three selected urban projects in order to gather feedbacks and validate its contents.

The initial analyses focused on each case individually, although they followed similar paths and structures, involving the characterization of the urban project’s context, the delineation of its timeline (with the identification of the main stakeholders and milestones regarding the design and decision-making processes), and the description of the project as the design output. Subsequently, it was possible to pinpoint main themes, that is, key ideas (or concepts) that supported the formulation of the urban project. A detailed narrative of each case was actually performed as an analytical strategy, as suggested by Yin (2009), although the overall analyses could have been even deeper if we had just one single case to explore.

The themes that emerged in each of the three cases were then clustered around the categories that represent the main focuses of the retained research questions, as a means to facilitate the comparison between the concepts and ideas stemming from the cases.

¹⁰³ The data-reduction procedure incurred an ambiguity: sometimes there was a large amount of materials concerning the urban project in question, but containing only minor references to floods; fortunately, this fact in itself could also be considered relevant information for our research.

Consequently, also following Huberman and Miles’s advices (1994), several tables and diagrams were prepared in order to arrange the relevant information in a way that would enable the identification of connections, relationships and contrasting patterns between them. Based on the results of these cross-case analyses, we could afterwards enumerate some possible ‘answers’ to our four research questions, referring to the phenomenon of fluvial-flood adaptation through design as a whole (and not to the studied cases themselves). In order to synthesize the knowledge generated along the research, we then used a metaphor envisioning a scale to qualify the different degrees of integration of floods through design.

To conclude this presentation of the overall methodological aspects of the thesis, Table 8 summarizes the relationships between the research questions, the objectives and the tactics followed, while Figure 58 recapitulates the general scope of the thesis and Figure 59 the design of the multiple-case study.

Table 8: Synthesis of the research questions, objectives and methodological tactics

Research question	Objective	Methodological tactic
What are the critical elements that can make possible the full integration of fluvial floods in the design of urban-regeneration projects?	To grasp baseline conditions, strategies and mechanisms that can actively foster flood adaptation through design in riverine urban-regeneration projects	PCP: characterization of the context and the process, mostly through the analysis of documents (with great emphasis on the design brief) and field observations
What are the possible (design) stances towards floods as regards adaptation?	To verify how fluvial floods are portrayed within design processes and outputs in urban-regeneration projects	PCP: description of the process and the product, through the analysis of documents and interviews
What are the special roles (if any) played by the design activity when dealing with the regeneration of flood-prone urban areas?	To characterize spatial design as a flood-adaptation tool	PCP: process description, through the analysis of documents and interviews
Who are the key stakeholders in the process of designing flood-prone urban projects and which roles are fulfilled by them?	To recognize which stakeholders and related disciplines have been enablers of an inclusive ‘design and floods’ perspective	ACCU-A and PCP: stakeholders identification and process description, through the analysis of documents and interviews

Source: elaborated by the author

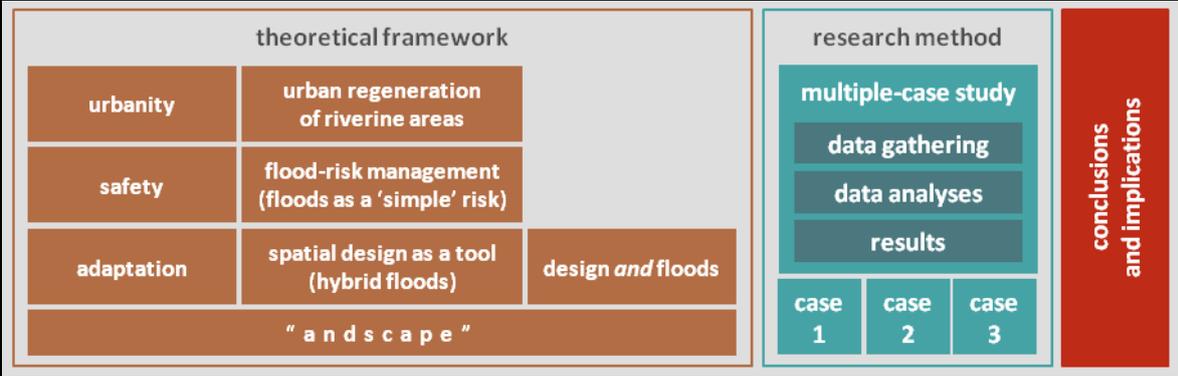


Figure 58: The general scope of the thesis

Source: elaborated by the author

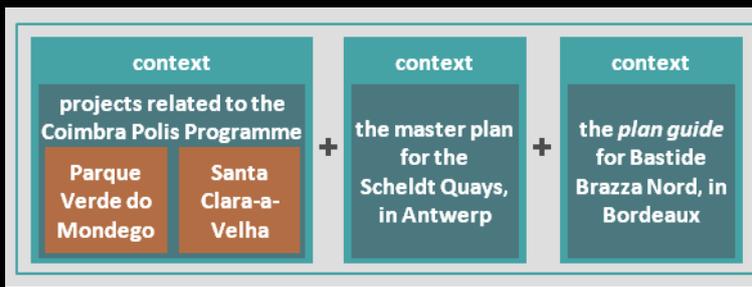


Figure 59: The thesis's case-study design

A multiple-case study comprising three cases, the first of which having two embedded units of analysis
 Source: elaborated by the author, based on Yin (2009, p. 46)

3.5 Characterization of the three studied cases

As already emphasized, it was not our intention to compare the three selected cases *per se*, since their time and space characteristics are too different for such a purpose; instead, the research aim was to extract from them some principles and variables (namely concepts) that possibly underlie any urban project being envisioned under an integrative ‘design and floods’ approach. Nonetheless, some relationships between the three cities and their respective projects could be recognized, parts of which are briefly presented in this section as a means to introduce the three cases. Thus, this section marks the transition between the overall background of the thesis and the stages (that is, the arenas, the actual grounds), in which each case will be, in a dedicated chapter, fully described and explored from a ‘design and floods’ perspective.

From a historical point of view, Antwerp and Bordeaux have in common the status of major port cities (which is usually associated to highly controlled riverine environments to enable efficient related infrastructures and activities), although in dissimilar stages of their development. While Antwerp is truly a city-port (the current area of the port is much larger than the traditional city) (Secchi & Viganò, 2009), Bordeaux’s ambience is strongly impregnated by its remarkable port-city past. In fact, having been fully relocated downstream (outside the city’s boundaries), the port of Bordeaux is today more a “port imaginaire” (Dumas, 2013, p. 22), although ocean liners still anchor in the city centre, contributing to keep this memory alive.

Both Antwerp and Bordeaux share the same open horizon brought by lifelong seaport activities, together with the recent relocation of numerous inner-city port infrastructures that left behind underused premises and intra-urban voids; these have been reconverted into other urban programmes and uses through urban-regeneration initiatives since the beginning of the 21st century (see Figure 60 and Figure 61). In its turn, Coimbra also used to house small ports along its riverbanks, when the Mondego was navigable, and the memory of this is for instance maintained through the ‘Basófiás’, a touristic boat that daily offers short trips to draw attention to Coimbra’s local riverine landscape (see Figure 62).



Figure 60: A former dock in Antwerp, converted into an event hall

A brownfield rehabilitation, in the Rijnkaai section, on the right bank
Source: author's archives
(9 May 2016)



Figure 61: Former docks in Bordeaux, converted into shops and restaurants

A brownfield rehabilitation, in Quai des Chartrons, on the left bank
Source: author's archives
(24 July 2015)



Figure 62: Newly built 'docks' with bars and restaurants, in Coimbra

A greenfield construction, within the Parque Verde do Mondego, on the right bank (in the background, Coimbra's foundational hill, marked by the university)
Source: author's archives
(4 July 2015)

The three cities also have in common the fact that, in the span of their centuries-old urban history, they have only recently leapt the river to occupy both riverbanks (the port in Antwerp and Bordeaux formerly occupied the oldest riverbank in a linear fashion). The ensuing relatively new urban segments (the left bank in Antwerp and Coimbra, the right bank in Bordeaux) have up to now kept a greener and less dense ambience than the three

cities' traditional centres, in which most of their rich built heritage is located¹⁰⁴. Nonetheless, some of the recent riverfront regeneration interventions in Coimbra and Bordeaux involve the two riverbanks; in fact, both cities aim to re-centre themselves around their respective river (CMC, 1993; Dumas, 2013).

With its urban fabric mainly developed in the 20th century following the principles of the Athens Charter, Antwerp's left bank is also now the target of a key dyke-heightening project that handles equally flood defence and landscape design (this project was not covered by our research). In their search for putting themselves on the map of contemporary cities that are attractive to live and work in, Coimbra, Antwerp and Bordeaux have indeed been rediscovering their riverfronts as valuable urban assets. For instance, these have recently been privileged locations for the erection of new iconic buildings (see Figure 63, Figure 64 and Figure 65), following the experience of many other European cities.



Figure 63: The Zuiderterras in Antwerp (right bank)
Designed by Bob Van Reeth, inaugurated in 1991 (the Scheldt riverfront has since then attracted other iconic buildings, such as the Museum aan de Stroom (MAS), designed by Neutelings-Riedijk Architects, inaugurated in 2011, and the port-authority headquarters, designed by Zaha Hadid, presently under construction)
Source: author's archives (11 May 2016)

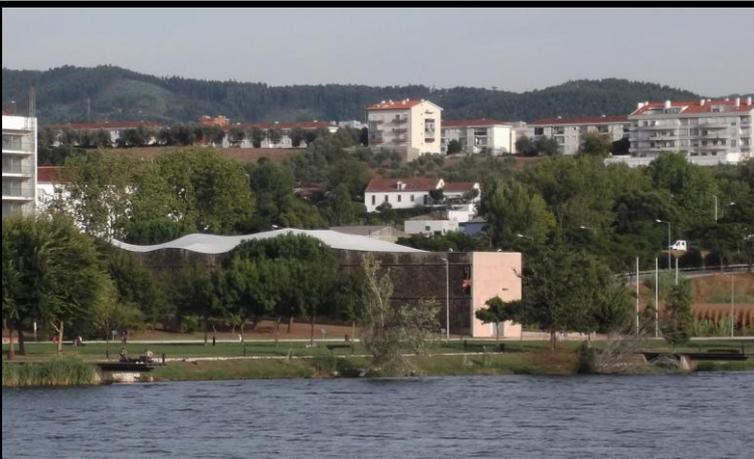


Figure 64: The Pavilhão Centro de Portugal in Coimbra (right bank)
Designed by Álvaro Siza, Eduardo Souto de Moura and Cecil Balmond (originally conceived for the "Expo 2000" in Hannover)
Source: author's archives (17 September 2016)

¹⁰⁴ Both the cities of Bordeaux and Coimbra comprise UNESCO World Heritage sites: the 18th-century riverfront and urban fabric that compose the so-called 'Port de la Lune', in the former; the historic premises related to the University of Coimbra, developed in different periods (notably since the 16th century), in the latter. Despite having some isolated buildings included in the UNESCO World Heritage sites, Antwerp's city centre as a whole is, since 2002, part of the official Belgian candidates to this UNESCO list (UNESCO, 2014).



Figure 65: The Cité du Vin in Bordeaux (then under construction on the left bank)
 Designed by XTU Architects, inaugurated in 2016
 Source: author's archives
 (23 July 2015)

Despite their marked differences in terms of size and urban culture, it is notable that the three cities have a 'human scale'; for the largest two, this is partially derived from their own geographical traits. In fact, even constituting metropolises in their own right (in terms of number and profile of inhabitants), Bordeaux and Antwerp still keep a sense of traditional European compact city, mainly thanks to the combination of the flatness of their territory and the predominance of low-rise buildings (of up to six floors). These two factors effectively dissimulate the extension of their actual functional areas, which presently extend far beyond their original city centres (see Figure 66 and Figure 67). In contrast, the much smaller city of Coimbra has a more diverse (one may say richer) geography, regarding both 'natural' attributes and 'human' ones (see Figure 62 above).



Figure 66: A segment of Antwerp's right bank, seen from the top of the MAS
 Eastward view, with the Eilandje waterfront neighbourhood in the foreground
 Source: author's archives
 (12 May 2016)



Figure 67: Bordeaux seen from the neighbouring hills
 Westward view, with La Bastide in the foreground and a segment of the left bank in the background
 Source: author's archives
 (28 July 2015)

As expressed hitherto, the Mondego, Scheldt and Garonne rivers are very important elements for the life and identity of the three studied cities; yet, the perceived dangerousness associated to each of them is quite different. Mostly due to the regulation works, the Mondego is perhaps now the most peaceful of the three rivers, enabling for instance swimming and the practice of several other water sports. In Bordeaux, even if a Garonne-crossing swimming competition is held every year (in May), the river does not invite people to enter it, mostly due to the strong tidal influences and the turbidity of its waters (“*a very violent river, loaded with mud, earth, debris*”, according to one of the informants). As for the Scheldt in Antwerp, several lifebuoys installed along the shoreline signal the real danger of entering the water; this is strictly forbidden, even in the ‘riverine beach’ on the left bank (“*only the feet can be bathed there*”, as stressed by an interviewee).

Like in the majority of European rivers that cross important urban centres, these three rivers have been regulated and managed for the sake of protecting the respective assets. In fact, the three studied cities are prone to river-related floods, closely linked in the cases of Antwerp and Bordeaux to the tidal character of the Scheldt and the Garonne (due to their proximity to the estuary, both Antwerp and Bordeaux are also susceptible to floods derived from storm surges). The three cities are moreover prone to pluvial (urban) floods, which are outside the scope of this thesis. In Antwerp and Bordeaux, the flatness of the territory and the high level of urbanization do not favour the easy evacuation of the rainwater into their main river, while in Coimbra urbanization also plays a key role as regards urban floods. Indeed, the large amount of impermeable soils and the poor capacity of the drainage systems (which have not been upgraded as fast as the urban development), coupled with the steady eradication of the minor streams that used to cross the urbanized area, are factors behind the increased flash-flood risk in the three cities.

As regards the focus of this research (fluvial floods), the situation in the three cities is relatively simple (although not at all comparable), since it is possible through forecasts to anticipate with reasonable accuracy the overflows of their respective river, which enables the issuing of early warnings to the concerned parties. Fluvial floods in Antwerp and Bordeaux can hardly be disentangled from the estuarine condition of these cities and the strong influence played by oceanic tides and storms (and this is perhaps a factor to encourage a more proactive behaviour). Yet, it is interesting to note that floods became an issue in different moments in the three cases: although being well-known in Coimbra (but taken as solved due to the recent implementation of a dams system upstream), floods only appeared as a real issue after a flood event. In contrast, the urban projects in Antwerp and Bordeaux took floods into consideration since the very beginning of the design process; floods were even among the main *raison d’être* of the Scheldt Quays Master Plan.

As for the selected urban projects *per se*, the Coimbra and Antwerp cases can both be considered typical riverfront regeneration projects: they primarily involve a linear public-space intervention along the river, with some sparse ancillary occupations. Revamping the overall urban image is a top concern in these two emblematic urban projects. On the other

hand, the Bordeaux case consists in the rehabilitation of an industrial zone that only happens to be located on the riverside (see Figure 68). This is indeed an attempt to reintegrate into the urban fabric a classic “bad place” (Viganò, 2012), which presently has polluted grounds and flood susceptibility as its main attributes, a transformation that also entails urban-image upgrading¹⁰⁵. The area has been as well a non-territory, a blank spot in Bordeaux since the gradual abandonment of the industries located on the right bank, whose riverfront has presently been the focus of urban-regeneration initiatives.



Figure 68: A typical view of Bordeaux's Brazza area today

Source: author's archives
(24 July 2015)

Despite the different programmes adopted by the selected urban projects, the same emphasis on investing in the urban setting as a tool for reversing population and economic decline has been shown in the three cities (although in a more explicit manner in the largest two). In a way, the Scheldt Quays today can also be described as a “bad place” or a non-territory, mainly due to the no-man's-land atmosphere that has prevailed there since the port's relocation to the northern part of the city (see Figure 69). Besides flood proneness, another ‘bad’ trait in the Antwerp case is the great number of vehicles regularly parked on the quays themselves, which does not favour the sense of urbanity.



Figure 69: A typical view of Antwerp's Scheldt Quays today

Rusty infrastructures, car parks and lifebuoys are among the quays' most prominent elements

Source: author's archives
(10 May 2016)

¹⁰⁵ In Bordeaux, the same role of emblematic public space by the river (attributed to the Parque Verde do Mondego in Coimbra and the Scheldt Quays in Antwerp) was given on the right bank to the Parc aux Angélique and on the left bank to the whole urban quayside, two relatively recent interventions that are nevertheless outside the scope of our research.

In Coimbra, despite being developed on a site, allocated to underused agriculture plots and much-coveted car parks, that could hardly be described as a “bad place” (see Figure 70), the projects within the urban-regeneration programme Coimbra Polis conform a relevant case study due to the fact that the city’s urban history is closely linked to the overflows of the Mondego River. The long-lasting battle against the waters is for instance best illustrated by the Monastery of Santa Clara-a-Velha since its foundation in the 14th century near the shoreline on the left bank. The contemporary project for the requalification of the Monastery, carried out in parallel to the Coimbra Polis Programme, was also included in our study. Not only is the chronological linkage between the two interventions relevant, but there are equally important spatial relationships between them, which will be fully covered in the next chapter.



Figure 70: A general view of the riverine site in Coimbra before the intervention

In the foreground, the old premises of the sailing club by the left-bank shoreline

Source: CMC’s archives, © Adelino Oliveira (17 May 2002)

Even if the three selected urban projects are in a central position regarding the urban area (the city and its functional hinterlands), they correspond to different geographical configurations, in terms of both plan and section (see Figure 71). While in Coimbra (where the Mondego’s width is around 180 m) the studied urban project connects the two riverbanks, in Antwerp it stretches longitudinally along the right shoreline. On the other hand, in Bordeaux, the urban project is a bit shifted from the water’s edge, although completely articulated with the riverine setting: the quays that flank the area are mostly occupied by a thriving private shipyard and used to put the newly built yachts into the river.

From the seven river crossings in Coimbra, one is a railway bridge, three are road bridges, two are pedestrian bridges and one is an urban bridge (for both pedestrians and cars). In Antwerp (where the Scheldt’s width is around 450 m), given the busy river traffic, there are no bridges linking the two riverbanks; instead, five tunnels, two of which exclusively for pedestrians, provide for their connection. In Bordeaux, five bridges cross the 600 m of the Garonne (including two road bridges and one railway bridge); the newest urban bridge is located directly in front of the studied urban project.

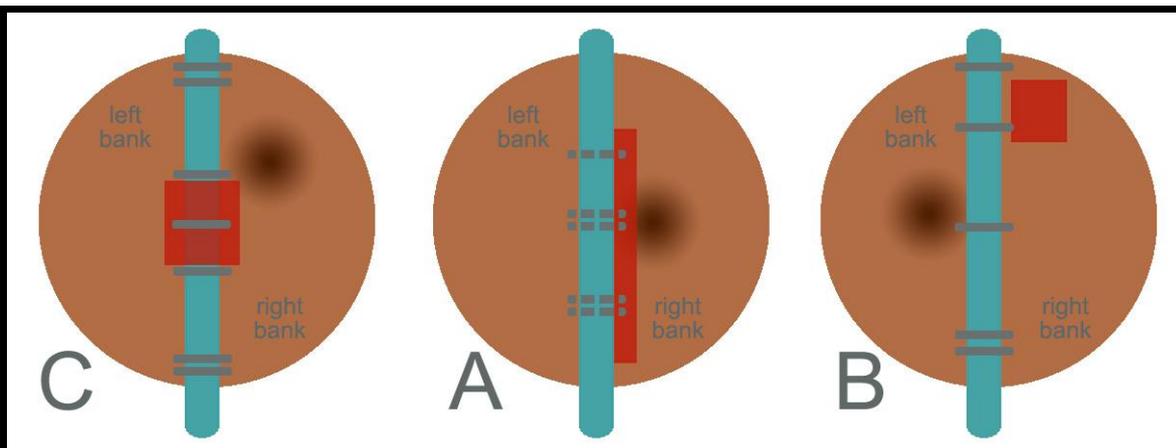


Figure 71: Spatial-characterization diagrams (plans) of the three studied cases

Legend:

- brown: municipality area (C: Coimbra; A: Antwerp; B: Bordeaux)
- dark-brown spot: the city's original settlement
- blue: main watercourse (C: Mondego River; A: Scheldt River; B: Garonne River); the three rivers run schematically from south to north
- grey: existing river crossings (dashed grey: underground crossings)
- red: site of the studied urban projects

Source: elaborated by the author

The studied river sections in the three cities have some similarities: quay walls were erected to protect their oldest parts (on the right bank in Coimbra and Antwerp, on the left bank in Bordeaux, although some segments on Bordeaux's right bank are also protected by quay walls). Apart from the central area on the right bank, which had its ground level elevated through several landfills during its lifetime, Coimbra generally has 'natural' riverbanks upstream of its oldest and central-most bridge; two markedly different city-river profiles thus coexist. The continuous silting process that has always characterized the Mondego's hydrological regime is the most important reason behind the gradual diminution of the water depth.

Thanks to the stable pond newly created in the city centre (and to the quality of the water), Coimbra offers excellent conditions for the practice of water sports, in contrast with the two other cities. In fact, due to the tidal influence, daily water-level variations in Antwerp and Bordeaux are pronounced (averaging around 5 m), which coupled with strong currents make the two rivers dangerous for people's access (information gathered from interviews). In any case, in the three cities, the riverside has been as a special site for more or less formal, ephemeral urban events (such as fairs, concerts and circuses). Such open-ended programme would be perpetuated in the cases of Coimbra and Antwerp, differently from the Bordeaux case, which is the only one where people are expected to actually live in a flood-prone zone. Issues such as evacuation and the provision of safe shelter, with no relevance in the other two cases, are therefore of utmost importance in the latter.

Other more or less unexpected links between the three cities were found in the urban projects themselves, somehow contributing to completing the circle. For example, the Portuguese landscape practice PROAP worked in both the Coimbra and the Antwerp urban projects, although it had a clearly more prominent role in the latter. During the international symposium organized in Antwerp in the framework of the preparation of the

master plan for the Scheldt Quays (in 2009), the then director of Bordeaux's architecture department, the architect-urbanist Michèle Laruë-Charlus, presented her city's riverfront-regeneration experience, pinpointing the main lessons learnt. At the same time, in one of the studies commissioned by Bordeaux Métropole on urbanization and sustainable development of flood-prone zones (CUB, 2010b), a section of Coimbra's urban project (the West Entrance of the Parque Verde do Mondego, on the left bank) was cited as an example of an adequate integration of floods through design. Moreover, the three riverine regeneration projects are part of a common ongoing movement, and none of them can be seen as a finished design product, even if the central parts of the Coimbra intervention have already been implemented (the two other cases are still in the beginning of their concretization).

This overview of the selected cases brings to a close the first part of the thesis ("Background"). The three following chapters, which make up Part II ("Stages"), aim at 'telling the story' of each of the studied urban projects (Stake, 2005), through the lenses of the hybrid floods¹⁰⁶. These chapters have a similar structure, closely linked to the PCP analysis strategy; thus, the section "Geographical and institutional contexts" explores the pre-project situation, presenting the spatial, ecological, technical, economic, cultural and administrative issues at stake. This comprises the city's historical background as regards its development in relationship to floods, the existing regulatory framework and the cultural inclination of the client (the contracting entity) to deal with floods, as well as its expectations (normally expressed in the project specifications). The section "Process timeline" focuses on the facts and events that have hitherto left their marks on the birth and development of each urban project. Therefore it scrutinizes the path from the design brief to the final design proposal, including the negotiations incurred during the process: what were the debated issues to be balanced against flood risk? Who participated in the negotiation processes? Which tools were used? It also examines the different design proposals prepared along the process. Each case study has a corresponding subsection within the "References" section, including both the quoted and the consulted documentations.

A great effort was exerted to make the section "Process timeline" simple (and not simplistic), notably by trying to put in a somewhat linear way the dynamics of very complex and iterative contexts and processes. The section "Resulting plan(s) and projects" reviews the design outputs, revealing how flood proneness was spatially dealt with and expressed in the respective proposals. In the case of Coimbra, this section reviews as well the actual implementation of plans and projects: the resulting riverine space already in place. The case of Coimbra may in fact seem unbalanced in relationship to the two other cases, not only due to the fact that the urban project has been partially concretized, but also thanks to a more thorough understanding of the historical roots of the flood issue in the city. Finally, the last section of each of the three chapters summarizes the respective case and puts forward some tentative conclusions, based on the concepts and ideas that have emerged from the qualitative analyses, and dialoguing with some relevant issues raised in Chapter 2 through the literature review.

¹⁰⁶ The three urban projects are presented chronologically, taking their initial formulation as their starting date.

Part II: **Stages**

Admire, my son, the divine wisdom that made

Admire, mon fils, la sagesse divine qui a fait passer les fleuves juste au milieu des villes!

Henry Monnier

the rivers flow right in the midst of the cities!

4 Polis Programme, Coimbra

Mondego's waters, 10 September 2016

4.1 Chapter introduction

It was only in the 1980s, when hard regulation works were finalized, that the Mondego River lost its fluctuating nature, which had up to then secured large unoccupied parcels within the city of Coimbra. A new landscape, with a permanent reservoir in the heart of the city, became the showpiece of a regional park project, spanning both riverbanks and reinforcing Coimbra's centrality. This park was the object of an international competition in 1995, won by Camilo Cortesão and partners, jump-starting a process of urban riverfront re-creation. The river regulation works also triggered archaeological investigations on the neighbouring medieval Monastery of Santa Clara-a-Velha, which had been partially submerged for centuries. The excavations were followed by the recovery of the ruins and the construction of an adjacent new building to host a related museum, through another international contest, won by Atelier 15. Owing to scale differences but also to heritage and symbolic values, the perspectives regarding flood proneness were quite divergent in these two projects.

It should be noted that it is not really precise to refer to the projects around the Coimbra Polis Programme as an urban redevelopment case in a flood-prone area, since their main output was a riverine park along the Mondego (land occupation, in this case, was barely changed) and only an institutional building was added in the site of Santa Clara-a-Velha. In fact, for most of the area, there was mainly a land-use change: from underexploited agricultural lands (principally orange groves) and informal car parks, occasionally used to host fairs and festivals, into a formal urban park. However, the combined output of the two projects represents indeed a typical 'urban project' of the last generation (Solà-Morales, 1987; Portas 2003), in view of the urban dynamics they have been stimulating in their surroundings since their inception, their intermediate scale, the public nature of the involved investments and the predominance of public uses within the intervened area.

Another important particularity of this case is the occurrence of a (unexpected?) flood event in 2001, rightly in the course of the development of the two projects, which was responsible for structural and programmatic changes in the design outputs. Although this was not properly a disaster from the city's point of view (it had only minor urban repercussions, while it strongly hit agricultural fields downstream), this event puts the Coimbra case in an interesting position, standing between a preventive and a reactive design proposal. In fact, the occurrence of this 'unpleasant incident' places this case in line with most studies about the relationship between risks and urban projects, which generally cover post-disaster situations. In such circumstances, issues such as risk salience and accountability usually come to the fore, differently from regular (non-disaster) situations. Regarding our research, this also had a positive repercussion on the availability of data about the river processes, since many hydraulic studies (including modelling) have been done after the event, such as Rodrigues *et al.* (2001), Santos *et al.* (2001; 2002), Cunha (2002), Tavares and Cunha (2008) or LNEC (2012).

This chapter aims to uncover the implications of floods in the elaboration of a major riverine urban project in Coimbra; besides the peculiarity of having undergone a flood during its development, two other main factors discern the analysis of the Polis Programme from the other studied cases. One is the temporal distance: this project as a whole is 20

years old now, a fact that could allow a more unbiased reading of both design processes and products by the stakeholders (assuming that the most relevant aspects were kept). At the same time, the overall European framework towards flood risk (which has influenced the elaboration of the urban projects in Antwerp and Bordeaux) has markedly evolved since the beginning of the 2000s, being now much more stringent. In Coimbra, some local regulations regarding floods have changed recently, as expressed in the revision of the city's land-use plan that came into force in May 2014. Secondly, part of the design proposal has already been implemented; therefore, this urban project still covers a *dessein*, but it also underlies a new urban reality, which can itself reveal other facets of dealing with floods through design. As a final introductory note, it must be mentioned that, by chance, the city (and notably the zone being studied) faced two other important flood events on 11 January and 13 February 2016, which have not only raised the visibility of the flood-adaptation issue locally, but have triggered a major discussion around the responsibility for the incurred damage. This chapter was then being finalized, and despite having experienced these events directly in the field, we decided to just add some hints in selected passages of the text, instead of completely rewriting it after a review of the most recent discussions.

4.2 Geographical and institutional contexts

Coimbra originally evolved as an urban settlement tangent to the Mondego River, in a configuration similar to the one of most European riverine cities, meaning that one riverbank was favoured as an optimal location, instead of having the watercourse rightly in the centre (see Figure 72). Due to geostrategic reasons, the Romans located the city on the top of a hill on the right bank, overseeing the river, in the transition between two distinct regional landscapes (Martins, 1951). An undulated surface marks the territory upstream (where the river runs in a narrow valley and the bordering hills have a very low permeability), while downstream the flatness of the alluvial plain becomes the most typical feature (see Figure 73 and Figure 74). This fact has at least two relevant implications: first, regarding river processes, this is a transition space of more complex water dynamics; indeed, the contrast between these two physical traits is a fundamental factor in the basis of the city's environmental-risks profile (Tavares & Cunha, 2008). Second, having both flatness and unevenness as material backgrounds, the city's landscape is potentially richer and more interesting from the *genius loci* point of view (Norberg-Schulz, 1979).



Figure 72: The settlement of Coimbra on the Mondego's right bank, by Pier Maria Baldi (1669)
Source: Sánchez Rivero and Sánchez Rivero (1933, n.p.) (watercourse highlighted in blue by the author)¹⁰⁷

¹⁰⁷ The water boundaries highlighted in blue by the author in this picture and some of the following ones are for illustrative purposes only; they do not intend to represent any accurate cartography of the respective river, nor of the flood-prone areas adjacent to it.

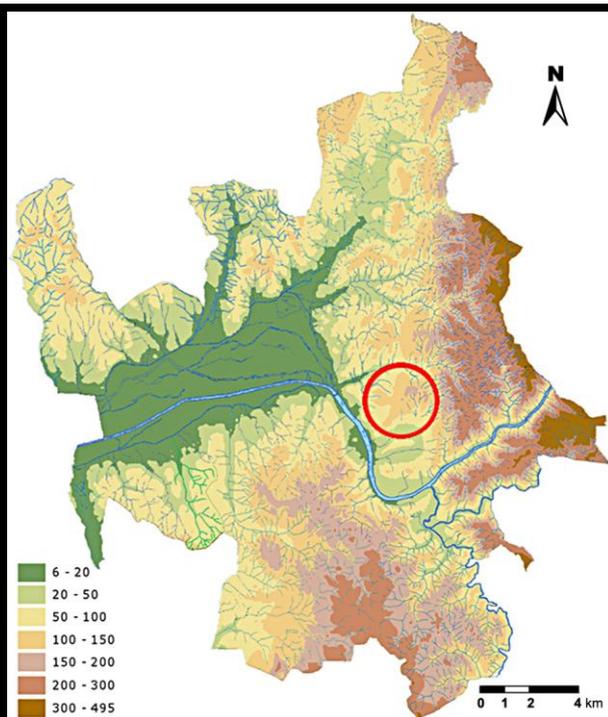


Figure 73: The topography and hydrology of the municipality of Coimbra

Legend:

- in red: Coimbra’s foundational hill
 - in dark green: the ‘Mondego fields’ (or Lower Mondego), a highly fertile agricultural territory
- Source: CMC (2013a, p. 18) and Tavares and Cunha (2004, n.p.) (modified by the author)

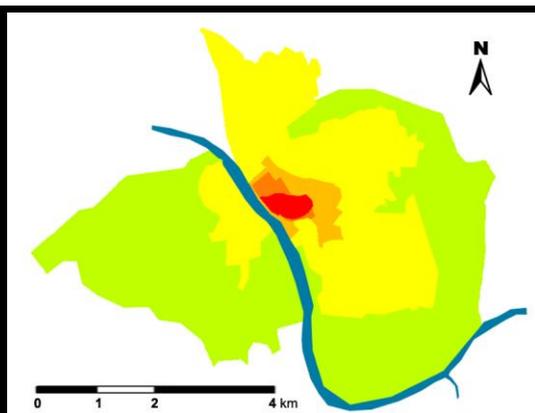


Figure 74: The evolution of the urban area of Coimbra

Legend:

- red: original settlement, in the middle ages (around 26 ha)
 - dark orange: 16th century (around 45 ha)
 - light orange: 19th century (around 120 ha)
 - yellow: mid-20th century (around 1,100 ha)
 - green: end of the 20th century (around 3,000 ha)
- Source: CMC (2013a, p. 103) (modified by the author)

During centuries, the city kept some distance from the Mondego as a defensive strategy to cope with the wide variations of its regime, which is typical of Mediterranean rivers¹⁰⁸: frequent high waters during the winter contrasting with thin summertime streams¹⁰⁹. Due to the characteristics of this fluvial regime (see Figure 75 and Figure 76), the Mondego River has been locally known as ‘Basófiás’, a nickname that stresses its buffoon character, as well as the idea that the river could not be trusted¹¹⁰. Nevertheless, after the occupation of the optimal site (the Alta, at the top of the hill, which would be enclosed by the city walls),

¹⁰⁸ The long-lasting history of Coimbra’s relationship with the Mondego River (including several flood events) is comprehensively documented; only a short summary of it is presented in this section. For more details and different perspectives, see for instance Martins (1951), Sanches (1996) or Alarcão (2008; 2012).

¹⁰⁹ As assessed in the mid-20th century, the span of the Mondego’s discharge could be as great as 3,000 m³/s, while the average discharge was 50 m³/s; the mean water level corresponded to 1.10 m (in relationship with the hydrometric scale of the Santa Clara Bridge), while it could reach more than 6 m in some cases of high waters (Martins, 1951). This same regime obviously applied (and still applies) to the non-regulated streams that flow into the Mondego River.

¹¹⁰ The term ‘*basófiás*’ was translated into English as “mendacious or charlatan” by the architect-urbanist João Paulo Cardielos and colleagues (2013a, p. 109), highlighting the ‘pernicious’ nature of the river as perceived by the locals.

the most natural expansion zone for the town ended up being the riverside (the Baixa, or Lower Town), outside these walls. The common population (mostly craftspeople and tradespeople) had settled in this location since the 10th century near emerging churches, following a spatial pattern of main lanes oriented towards the river (Alarcão, 2008). At the same time, a continuous slow-onset silting process and successive landfills have enlarged the flood-prone areas within municipal borders, some of them (the ones closest to the original city core) being occupied in the process of the city's expansion towards the riverside. Yet, the major part of the flood-prone territory nearby has remained essentially unoccupied during centuries; agriculture fields were their prime use.



Figure 75: The Mondego seasonally transformed into trickles of water (1950)

The Mondego's most typical appearance during summer, before the regulation works of the 1980s
Source: CMC's archives
(watercourse highlighted in blue by the author)



Figure 76: The Mondego's waters flooding Coimbra's left bank (1969)

The shown section is rightly downstream of the Santa Clara Bridge
Source: Paiva (2005, p. 86)
(watercourse highlighted in blue by the author)

Having been aggravated as early as in the 13th century as a consequence of deforestation and the intensification of agriculture in the water basin upstream (Martins, 1951), the silting process – originally a natural process related to the existing geological features – has been responsible for changing the level of the riverbed all along the watercourse. The impacts of this human-natural process were mostly felt in the floodplain downstream of Coimbra, in the rural Mondego fields. Nonetheless, in the Baixa, the *de facto* centre of urban life since the end of the 15th century, the ground level has been gradually raised to cope with floods. Such events could turn some streets in this area into actual water canals, a scenario that could also be experienced even in the mid-20th century (Martins, 1951).

The works for the replacement of the city bridge in the beginning of the 16th century were complemented with the construction of a defensive quay wall to protect such riverine area. Yet, the silting process was indeed further intensified with the ultimate transfer, in 1537, of the first Portuguese university from Lisbon back to Coimbra, and the ensuing urban development and increased demand for wood and stones as building materials (Alarcão, 2012). Related to the silting process mostly manifested on the right bank, an erosive process on the left bank had been noticeable in early times (even though the deposition of silts was also an active process on this bank). Despite having probably been linked to the right bank by a bridge since the Roman times, the left bank had always had a secondary character, being only sparsely occupied from the 12th century on by religious institutions in search of seclusion (Alarcão, 2008). These monasteries had attracted some minor housing and productive activities around them, but this was inexpressive when compared with the urban development of the Baixa¹¹¹. At the same time, investments in flood-defence structures were only proposed on the right bank, where the city was actually born.

It should be noted that the silting effects and flood damage have been really important in the cultivated fields downstream of Coimbra, more than in the city itself, where urban dwellers have been more or less used to Mondego's whims and have known how to behave in case of high waters. Therefore, floods seem to have been more an agricultural problem than properly an urban one¹¹². Yet, this had indirect implications for the urban life, since the city's economic activity had heavily relied on the cultivations of the Mondego fields (Martins, 1951). In any case, some direct material disturbance has also been felt. For example, different versions of the bridge within the municipality boundaries that has always linked the north and the south regions of Portugal have perished due to the river's hydrodynamics (Alarcão, 2012).

Several churches on both riverbanks have also lost the battle against the Mondego (see Figure 77), being the Monastery of Santa Clara-a-Velha, built in the 14th century on a small plateau on the left bank, the most emblematic example of them (Martins, 1951; Alarcão, 2012). Although partially submerged for centuries, the Monastery's church has to some extent survived to testify the power of the water (see Figure 78). Linked to the life of the Portuguese Queen Saint Isabel, this Monastery has become a highly symbolic cultural icon of the city and indeed of the nation, after having been gradually submerged due to recurrent flood events and ultimately abandoned by its nuns in the 17th century¹¹³ (Bandeirinha, 2009; Côrte-Real, 2009b).

The riverine urban culture was then closely associated with dealing with floods (which normally have a slow-onset character), as the Mondego and its tributaries cyclically

¹¹¹ The left bank (namely the Santa Clara borough) was only officially appended to the city boundaries in the 20th century; nonetheless, most of the area has kept an urban fringe status and a rural atmosphere even after this institutional integration.

¹¹² This position, which is surely debatable, relies mostly on the points of view of Martins (1951), Abreu (1967) and Sanches (1996); it is for instance not corroborated by the more urban-focused accounts of Alarcão (2008; 2012).

¹¹³ Since then, its church had been adapted to be mainly used for housing purposes, while the other monastery premises had mostly been demolished for the reuse of their building materials elsewhere.

disturbed the city's life. The destruction of buildings due to the overflow of smaller streams on the right bank (namely the Ribela, which used to flow into the Mondego outside the city walls, through the small valley in which the Sá da Bandeira Avenue is today located) is richly described by the archaeologist Jorge Alarcão (2008, pp. 18 *et seq.*). According to him (2008, p. 18), the remaining materials of the destroyed buildings in the Baixa were probably left *in situ*, since “the heightening [of the site level] was understood as a useful defence against floods”, being thus an additional factor (besides the silting process) in the overall elevation of street and building levels. The frequent occurrence of flood events had consequently sustained the idea that the river, owing to its capricious nature, should be tamed, an aim that has permeated all the city history and has been put into practice ever since the 16th century (Sanches, 1996).

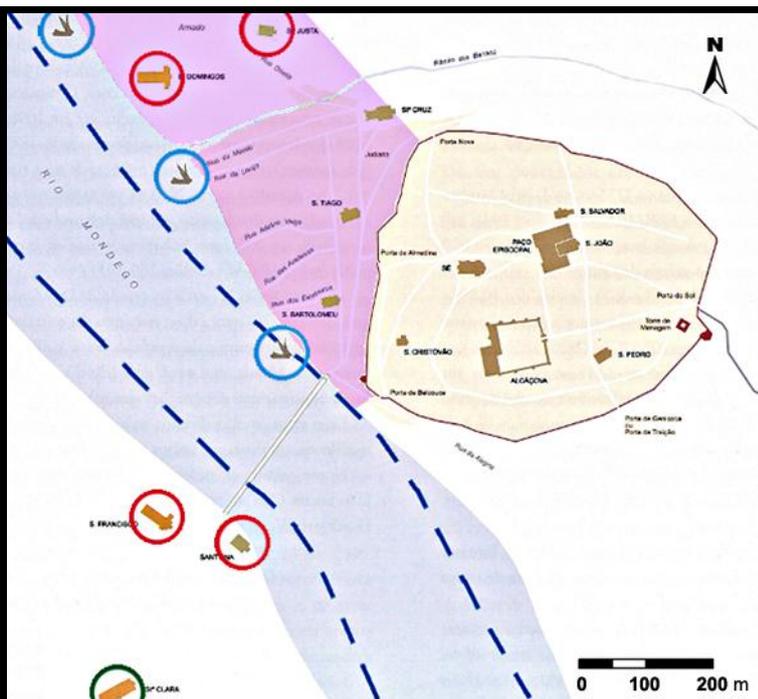


Figure 77: Coimbra's main riverine monuments and infrastructures in the 14th century

- Legend:
- red circles: churches and monasteries defeated by the water
 - green circle: the Santa Clara-a-Velha Monastery
 - blue circles: riverine ports on the right bank
 - purple area: the zone to be subsequently occupied by the Baixa
 - dashed blue line: the approximate stabilized borders of the Mondego at present

Source: Alarcão (2012, p. 20)
(modified by the author)



Figure 78: The Monastery of Santa Clara-a-Velha, partially submerged (2002)

Source: Côte-Real (2003, p. 43)

While previous interventions had taken a more localized approach (such as the construction of *ad hoc* dykes and landfills), a first major river-training initiative was led by

the priest and hydrologist Estevão Cabral at the end of the 18th century. At that time, the “correction of the river” aimed at “the defence of the fields” in the floodplain (Martins, 1951, p. 62) and consisted in the bifurcation of the Mondego, with the creation of a new artificial and straight watercourse parallel to the original one. The underlying idea was to concentrate the water flow that normally spreads in the floodplain as a means to intensify its velocity and thus promote the faster evacuation of its solid content. Between the resulting two watercourses, an 80-ha woodland was created with several ditches to store water during the river’s winter peaks. This woodland (today named Mata Nacional do Choupal) eventually acquired the status of natural reserve and has been functioning as a major rustic public space by the river in the city’s northwestern border.

Although incompletely achieved due to geopolitical reasons, the scheme of Estevão Cabral was initially successful (Alarcão, 2008), but the river was not permanently tamed and material damage was still experienced after that. For example, the ineluctable silting process was eventually the main reason for the loss of the Mondego’s navigation potential in Coimbra in the 19th century, which, although seasonal and based on small-sized vessels, was very important for the city’s economic development (Martins, 1951). Therefore, the fluvial ports that had marked the riverside in the past – as referred to by Alarcão (2008; 2012) and shown in Figure 77 above – have completely lost their functional role.

By the middle of the 19th century, a landfill on the right riverbank was created to provide safe grounds for the railway, an intervention that has in practice functioned as a dyke, sparing the Baixa from most floods due to the Mondego overflows. Yet, as a side effect, the minor streams that used to flow into the Mondego in that segment were either buried or canalized, a condition that is probably at the very origin of some of the current flash-flood hotspots in the city centre¹¹⁴. Likewise, the railway and the emergent industrial facilities that have accompanied it have since then functioned as a barrier between the city centre and the river. As a compensation measure for the loss of the traditional riverfront, the Manuel Braga Park was created in the 1920s in the southern part of that landfill¹¹⁵ (see Figure 79 and Figure 80); this riverine garden would mark the city’s expanded riverfront, now located outside its historical core.

In the beginning of the 20th century, there were important flood events, three of them exceeding 6 m in height in relationship with the hydrometric scale of the Santa Clara Bridge (namely in 1900, 1915 and 1924)¹¹⁶ (DGSHE, 1936, *apud* LNEC, 2012). The water level reached 6.48 m in January 1948, which is considered the most devastating flood event of the last century: its return period was estimated at 110 years (being thus slightly more severe than the centennial flood) (Santos *et al.*, 2002) and the corresponding flood discharge

¹¹⁴ Flash floods are indeed the most expressive type of flood currently occurring within the municipality’s boundaries (Tavares & Cunha, 2004; Paiva, 2005; Tavares *et al.*, 2013). And most of the flash-flood hotspots in Coimbra probably derive from the same starting principle: the systematic removal of space allocated to water variations (in this case, related to the Mondego’s tributaries).

¹¹⁵ The Manuel Braga Park would be the location chosen by the university students to host their academic festivals in the 1960s and in the end of the 20th century, a fact that has contributed to its degeneration.

¹¹⁶ The prominence of these water levels can only be duly assessed when considering that, in the 1950s, the high-water threshold in relationship with the aforementioned scale was just 2 m (Martins, 1951).

was higher than 3,000 m³/s (Louro & Lourenço, 2005)¹¹⁷. Even the Manuel Braga Park, recently built on a landfill, was inundated during that event, which was lately taken as the main local reference in terms of floods: the worst registered case, although not resulting in deaths or injuries, according to the *DISASTER* database (Equipa DISASTER, 2013).

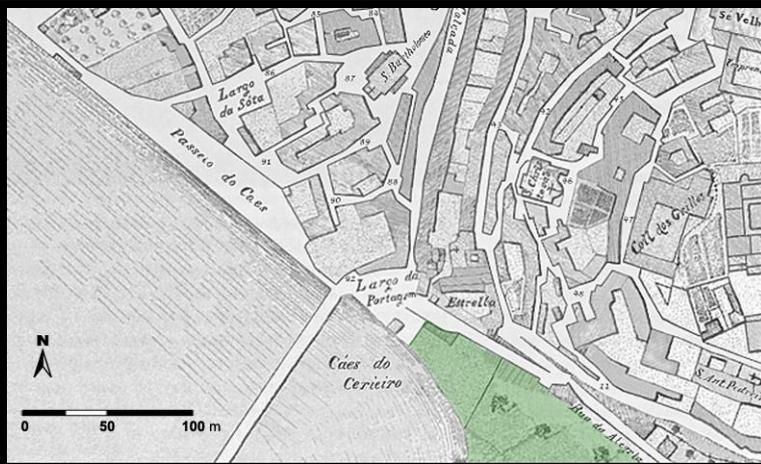


Figure 79: Plan of Coimbra in 1845, drawn by Isidoro Baptista

The green area represents the northern part of the site (not yet reclaimed) where the Manuel Braga Park would be located

Source: Alarcão (2012, p. 74) (modified by the author)

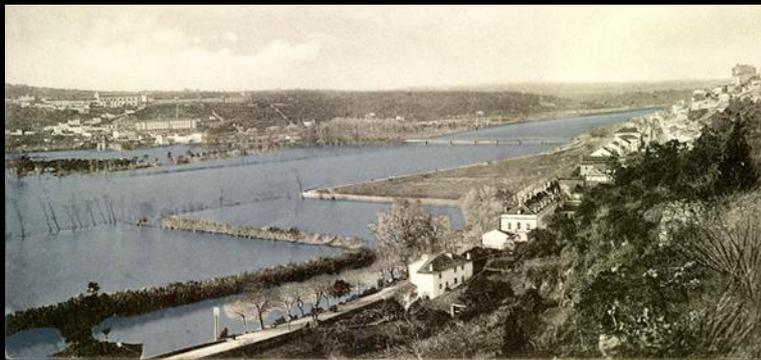


Figure 80: An overflow of the Mondego, in a postcard of the end of the 19th century

Only the landfill where the Manuel Braga Park would be located is not flooded in this segment of the right bank

Source: CMC's archives (watercourse highlighted in blue by the author)

After several planning attempts following the intervention led by Estevão Cabral, the 'full control' of the river was eventually accomplished in the 1980s with the hard-regulation works included in the Mondego's hydraulic exploitation plan (*Plano geral do aproveitamento hidráulico da bacia do Mondego*), elaborated in 1962¹¹⁸. Mainly triggered by the 1948 flood event, this plan comprised three dams upstream of Coimbra (Aguieira,

¹¹⁷ These figures are not at all consensual: for example, Sanches (1996, p. 99) considers that the 1948 event had reached discharge values slightly lower than the ones related to the 1-in-100-year flood, while the regional water agency informs that the 1-in-100-year flood discharge in Coimbra is around 3,400 m³/s (ARH Centro, 2011, p. 103). In its turn, the Portuguese Laboratory of Civil Engineering (LNEC, 2012, p. 13) presents 2,457 m³/s as the greatest flood discharge in Coimbra, reached during the event of January 1962. Yet, Louro and Lourenço (2005, p. 21) present the event of January 1977 as having a higher maximum instantaneous discharge (2,635 m³/s) than LNEC's figure for the 1962 event. Both values indeed appear, in the SNIRH database, as the two highest maximum instantaneous discharge figures measured at the Santa Clara Bridge (APA, 2016a): 2,457 m³/s reached on 2 January 1962 and 2,635 m³/s reached on 12 December 1976 (although the published data is restricted to the hydrological years between 1955/1956 and 1983/1984). And according to the Portuguese Environmental Agency (APA), the maximum instantaneous discharge value in Coimbra was 4,147 m³/s, on 29 January 1948 (Cláudia Brandão, personal communication, 8 September 2016), almost the same value presented by the engineer José Alfeu Marques (2017).

¹¹⁸ One should observe that throughout the city's history, river dynamics were seen as a kind of illness that necessarily had to be abolished. While the priest Estevão Cabral called his plan the "remedy" for the Mondego fields (Sanches, 1996, p. 25), Rui Sanches (1996), the main engineer behind the last regulation works, referred that this intervention was finally the solution for the "age-old problem of the Mondego" (as he titled his accounts of these works).

Fronhas and Raiva) and, downstream of the city centre, the Coimbra dam-bridge and river-training works, with a system of longitudinal dykes along the Mondego fields and some controlled inundation fields. This comprehensive scheme, whose sections downstream of Coimbra were (again) not fully implemented, should give response to several issues (namely flood control, irrigation, water supply and energy generation) and effectively decrease the centennial flood discharge in the city to 1,200 m³/s (Tavares & Cunha, 2004).

In the same vein of the previous river-regulation initiatives, the most significant aim this time was indeed to support agricultural activities in the Lower Mondego. These hydraulic infrastructures have afterwards made it possible to “significantly reduce the frequency and magnitude of large floods” around Coimbra (Santos, 2013, p. 465); and, as a consequence, floods stopped being considered a pressing issue and were mentally transformed into an unlikely one (Silva, 2004). The “hydraulic disorder of the river” (Sanches, 1996, p. x) was thus finally ‘solved’, and the Mondego River ended up ‘losing’ its fluctuating nature. And while natural dynamics of the river had up to then secured large vacant intra-city parcels on both riverbanks¹¹⁹, the Coimbra dam-bridge created a permanent 200-m-wide storage reservoir by the city centre (see Figure 81). According to Sanches (1996, p. 188), the ‘normal’ operational water level of this reservoir is 18 m, while 19 m is the maximum flood level tolerated by the system, corresponding to “the 2,000-m³/s flood discharge, which is the value of the millennial flood as modified by the reservoirs of Aguieira and Fronhas”.



Figure 81: The permanent reservoir created by the Coimbra dam-bridge (in the foreground)
Source: CMC's archives, © Adelino Oliveira (17 May 2002)

This ‘stable’ landscape prompted the city to rediscover its riverbanks not only as a primary location for leisure and recreation activities (in tune with the worldwide urban trend), but mostly as a landmark for a ‘new Coimbra’¹²⁰. The contemporary Coimbra thus crosses the river, not seen as a barrier any longer, and reflects itself on the left bank; having accumulated a rich built heritage during the previous centuries, what used to be a secondary bank deserved to be effectively integrated into the urban fabric. A new urban

¹¹⁹ The consequences of river regulation works on the intensification of the floodplain occupation downstream of the Coimbra dam-bridge (that is, outside the city’s official limits), as well as the impacts of the 2001 flood event on these areas, are outside the scope of this research. For information related to these topics, see for example Cunha (2002), Louro and Lourenço (2005), Paiva (2005), Paiva and Silva (2006) and Nobre (2010).

¹²⁰ This somehow reverberates Coimbra’s experience in the late 19th century, when the interventions in the riverine façade not only had an infrastructural approach, but also the aesthetic intention to create a new urban landscape that should put in evidence the importance of the city in the national context (Calmeiro, 2014).

image was thus to be devised, anchored in the recently created landscape that symbolized the control over the temper of the river.

The end of the regulation works ran in parallel to the beginning of the elaboration of the first *Plano Diretor Municipal* (PDM, the municipal land-use plan, started in 1984 and approved in 1994), in which the Municipality of Coimbra (CMC) set its main territorial ambitions (see Figure 82). The elaboration of this plan was imposed to the Portuguese municipalities by the national legislation, and followed the then traditional character of general urban plans centred on zoning policies and land-use restrictions, not intending to deliver clear and attainable urban strategies¹²¹. Early in the 1990s, the municipality had around 150,000 inhabitants, 70% of which living in the urban area corresponding to the official city of Coimbra (that is, 10% of the total municipality area) (CMC, 2006). Despite the apparent concentration indicated by these figures, the city, the largest one in the Centre Region of Portugal, suffered then from the urban dispersion of its functions (especially housing), coupled with a loss of population to the periphery and neighbouring villages (as experienced by most medium-sized Portuguese cities from 1974 on).

In that period, Coimbra also had a (quantitative and qualitative) deficit of infrastructures, illustrated for instance by the mobility problems in the inner city (subject to intense road traffic), which was partially reflected in the overall degradation of the central area and its public spaces (CMC, 1993). Thus, mostly as a repercussion of Portugal's accession to the European Union in 1986, the city had then made great investments in new urban infrastructures, related to both accessibility (such as roads or bridges) and urban equipment (for example sport and educational facilities, or shopping malls)¹²². Also to counteract the unfavourable circumstances, the municipality defined among its main urban goals the revitalization of the city centre, the centring of the city on the river and the expansion of the central area to the left bank (CMC, 1993).

An underlying idea here was, in the words of a municipal officer, the intensification of the “*level of urbanity*” in the area between the city's two bridges existing at the time. Due to their natural setting, large dimension and central location, both riverbanks upstream of the Santa Clara Bridge (within the city limits) should, according to the PDM, host a green park of regional reach¹²³. A riverine green park indeed constituted one of the strategic projects of the CMC; this large green axis should be then complemented by smaller landscape interventions around the streams flowing into the Mondego (namely Coselhas, Arregaça and Flores). The municipality's intentions related to the park included the provision of several cycling lanes articulating it with its surroundings, which would highlight the built

¹²¹ The strategies for the municipality would be subject to another plan, oddly commissioned only after the PDM, covering social, economic, cultural and environmental issues that yet have undeniable spatial expressions.

¹²² A new river crossing to the south of the city centre, anticipated in the PDM, was put in service in 2004: the Europa Bridge (renamed Rainha Santa Isabel Bridge), linking major regional roads; it is thus not an urban bridge.

¹²³ The idea for this large park actually derived from a design proposal of the mid-1980s, by the practice of the landscape architect Caldeira Cabral, for a private urban development on the right bank that included a segment of the future Parque Verde do Mondego (information from interviews). In that period, Caldeira Cabral's practice also made some landscape studies for the Lower Mondego and for the Santa Clara hill (the latter having eventually supported a more detailed study for the requalification of the Choupalinho, initiated in 1993 but not finalized).

heritage on the left bank. Two ponds, two mooring points, as well as the organization of the car parks, were also envisaged by the municipality, as can be seen in the suggested zoning and programme for the area (see Figure 83) (CMC, 1993).

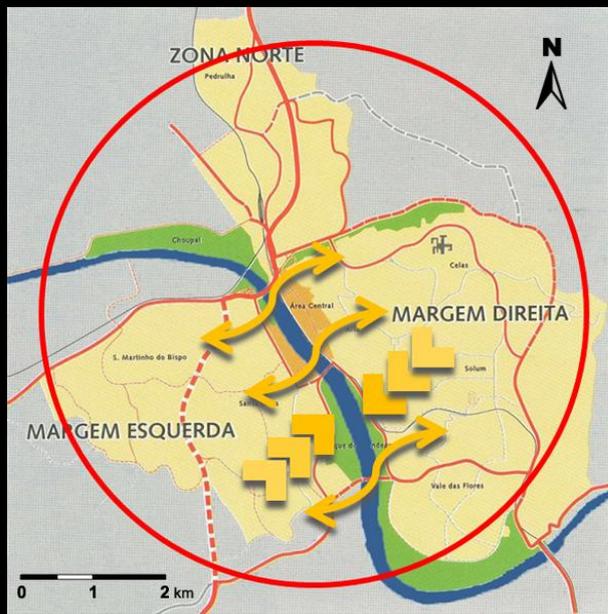


Figure 82: Planning scheme defined in the early 1990s for the city of Coimbra

Legend:

- light yellow: built-up (urban) area
- orange: central area (with its envisaged expansion towards the left bank)
- green: existing and planned urban parks
- thin arrows: intended link between the two parts of the city split by the river
- thick arrows: wished-for orientation of the urban façades towards the river

Source: CMC (1993, p. 18) (modified by the author)



Figure 83: The riverside park as envisioned in the PDM (1994)

Legend:

- beige: existing and planned residential areas
- light green: existing and planned urban equipment
- green: the Parque Verde do Mondego's intended area
- dark green lines: the defined perimeters for the design competition for the Parque Verde do Mondego (1995)

Source: CMC (1993, p. 35) (modified by the author)

It should be noted that most of the area allocated to the park on both riverbanks had then – and still has – a special status, being included in the National Ecological Reserve (REN), a restrictive instrument of land-use planning created in 1983 that encompasses both ecologically sensitive and risk-prone areas. This status was granted to this site owing to its permeability (which makes it an important infiltration area) and also to its susceptibility to floods. In any case, the implantation of a green park on Mondego's riverbanks would not contradict such status: special regulations attached to this REN segment in Coimbra have allowed the possibility of having compatible uses in this floodable area (the rules demand, for instance, the maintenance of permeability in at least 90% of the area) (CMC, 2011a) (see Figure 84). Also, from a wider perspective, the proposal of a riverine park rightly in the central part of the city could be understood as a spatial tool to counteract the urban sprawl issue, as an incentive for dwellers to live within the city limits. In this sense, the

park could indeed be seen as an urban ecological asset to deal not only with water issues but also with other environmental concerns.

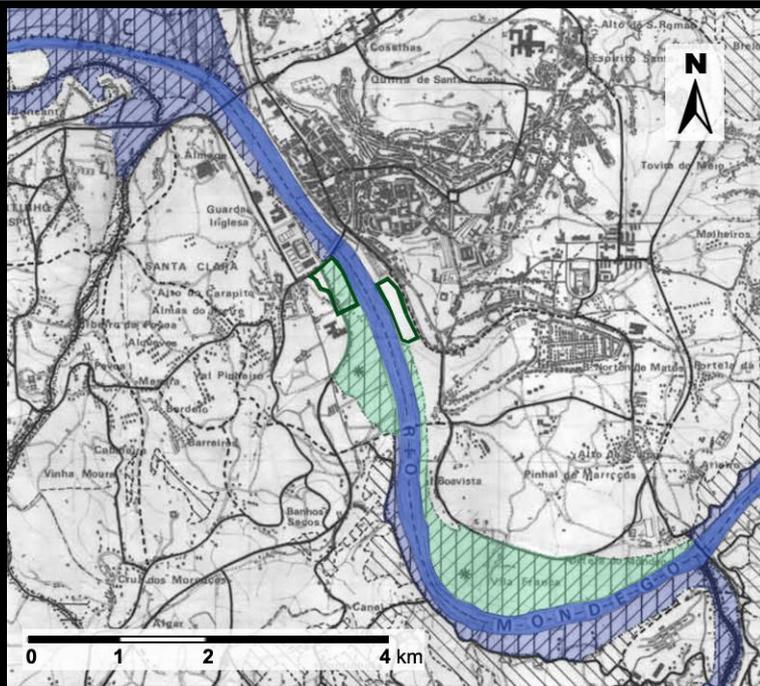


Figure 84: The REN's segments in the centre of Coimbra

The REN is one of the main restrictions within Coimbra's PDM (1994)

Legend:

– light blue area: water-related REN area

– light green area: the riverine segment of the REN subject to specific regulations

– green line: the defined perimeters for the design competition for the Parque Verde do Mondego (1995)

Source: CMC (2011b) (modified by the author)

An international public competition was then organized in 1995 for the first phase of the Parque Verde do Mondego (the Mondego Green Park), comprising two segments (around 7 ha each), one on each side of the river (see Figure 85). When fully implemented in the long term, the envisaged park would extend on the left bank from the Choupalinho, next to the Santa Clara Bridge, to the Lapa. On the right bank, the new park should somehow extend the riverine Manuel Braga Park, taking into consideration all the urban riverfront area within the city borders (up to the Portela Bridge). These limits in fact correspond more or less to the REN area subject to specific regulations, as shown above.



Figure 85: Coimbra's central riverside area at the beginning of the 1990s

Legend:

– orange line: Choupalinho

– yellow line: Manuel Braga Park

– red line: the defined perimeters for the design competition for the Parque Verde do Mondego (1995)

Source: CMC (1993, p. 38)

(modified by the author)

According to the design specifications, elaborated by CMC's territorial planning body, the project's main objectives included the provision of facilities to host activities related to sports (with an emphasis on water sports) and leisure, which would make the park a liveable and safe space. Priority should be given, in terms of phasing, to the left bank, for

which the project brief demanded, among others, a vast and polyvalent open space to host outdoor events (including a stage and some pavilions for commercial activities), to be located in the Choupalinho (CMC, 1995). On the right bank, leisure and commercial activities should be provided, while the existing car parks should be reorganized. On both riverbanks, the existing vegetation (notably the traditional orange groves) should be largely preserved (CMC, 1995).

Out of the five competitors¹²⁴, MVCC and PROAP were the ones whose proposals were considered by the evaluation committee as valid for a second stage in the design competition (although this move had not been anticipated in the competition brief). Among the considerations of this committee, the most expressive note (valid for both proposals) was the necessity to reinforce the global integrity of the park, duly respecting both the river space and the surrounding urban fabric. Therefore, the committee requested some modifications to the two proposals, as did the municipal land-use advising unit, which demanded that both projects should “search for a more naturalistic image [for the park] (even though the area subject to the competition should be considered, according to the project brief, as an area with intense use)” (CMC, 1996, p. 6). This means that the two design proposals should reduce the building occupancy and, specifically, that PROAP’s proposal should minimize the built elements to be located over the river; the green image should not only be pursued but firmly emphasized¹²⁵.

Yet, even before such modifications, the most suitable plan for the riverine park was the one presented by MVCC, according to the evaluation committee. After preparing an updated proposal and presenting it to a wider audience in a public session, this team ended up winning the design competition¹²⁶. It should be noted that the desire for naturalness expressed by the evaluators somehow contrasts with the fact that, in the competition brief, the ‘natural’ processes occurring in the area – including the flood susceptibility – were only indirectly referred to among the occupation constraints of the PDM. The definition of land-grading levels according to the new regulated fluvial regime was in fact included among the project’s expectations, but the floodable condition of the site was not at all emphasized in the competition brief (CMC, 1995). An informant thus observed, however, that the riverbanks’ susceptibility to floods was indeed foreseen within the competition process, but the prevailing flood studies at the time underestimated the risk, a fact that

¹²⁴ The design competition had the following participants: Alberto Souza Oliveira and Nuno Martins (independent architects), Aparte Consultores de Arquitectura Paisagista, Camilo Cortesão e Associados (later renamed MVCC), Lodo Arquitectura Paisagística and PROAP Estudos e Projectos de Arquitectura Paisagista.

¹²⁵ The core of MVCC’s response to the jury’s request is worth mentioning: “The creation of a natural image [for the park] does not imply concealing the insertion of the park in the city. It entails providing the physical conditions that would allow the development of natural species, showing up the relationship between city and nature, and ensuring that the park is used by the citizens as an alternative space for urban leisure. The envisaged natural image is to be achieved through the selection of the most suitable equipment, the reduction of built areas, the careful choice of the building materials and, fundamentally, the thorough study of pavement options. (...) The unusual length of the park (up to the Portela Bridge) allows the creation of areas with less intense uses and a lower degree of occupation on both riverbanks of its southern section; the first phase of the park, with its more urban character, is therefore intended as a gateway for that future section.” (CMC-APOT, 1996, n.p.).

¹²⁶ Interestingly, the subsequent design for the park was jointly elaborated by MVCC and PROAP, which was eventually invited by the MVCC to be in charge of the landscape aspects of their design proposal.

could somehow explain their optimistic stance about the controlled dynamics of the river and the related undervaluation of this topic in the competition brief.

In parallel to this local design experience, an urban-regeneration programme targeting Portuguese cities – the “Polis Programme” – was being formulated at the central government level, following the successful experience of the “Expo 98” interventions in Lisbon, through which great attention was given to the quality of the public spaces (Diário da República, 2000). Formally initiated in 2000 with the leadership of the then recently created ministry of environment and territorial planning, this programme focused on urban requalification and environmental upgrading, with the aim of enhancing the quality of life in medium-sized Portuguese cities, leveraging their development, and thus improving the country’s overall urban prospects. As simply stated by an informant, “*the Polis Programme, which was indeed a strategy for the medium-sized Portuguese cities, [intended] to apply the concepts of the experience of the ‘Expo 98’ in other cities of the country*”; this not only referred to the quality of the final urban output but also to the applied organizational model (which included partnerships in different governmental levels and new operationalization tools).

To this end, the Polis Programme targeted exemplary urban and landscape projects that would inspire subsequent local interventions (Partidário & Correia, 2004). In this framework, sea and river waterfronts were regarded as the main “environmental ‘anchors’” of the so-called “green cities”, which would contribute to boost both the attractiveness and the competitiveness of such urban centres (MAOT & CMC, 2001, p. 23). Coimbra was among the ten cities that, due to their “relevant role in the national urban system”, were chosen to be included in the programme’s first phase (Diário da República, 2000, p. 2107); this was a timely funding opportunity to put in practice some of the municipality’s ambitious urban projects. According to an interviewee, the slogan then chosen to synthesize the city’s ambitions within the Polis Programme was: “*one river, two riverbanks, one city*”, combining the idea of re-centring the city with the one of a closer and enjoyable riverfront.

4.3 Process timeline

The novelty brought by MVCC’s proposal was the inclusion of a foot and cycling bridge linking both segments of the park, an element that had not been anticipated in the design brief and that therefore carried with it “*the great risk of losing the competition*”, as stated in an interview (see Figure 86). Yet, a permanent footbridge over the river was already an aim of the municipality, as presented in a sketch in the official document publicizing the PDM (CMC, 1993), although in a different location: closer to the city centre, between the Santa Clara Bridge and the dam-bridge (see Figure 87)¹²⁷. According to an interviewee involved in the design of the green park, the stake of this project was “*to create a*

¹²⁷ Stronger urban relationships between the two riverbanks would be sought as part of the aimed at reinforcement of the sense of centrality in the area between the two existing bridges. A green park on the two riverbanks rightly upstream of the Santa Clara Bridge would thus symmetrically correspond to the downstream Mata do Choupal, both framing this central area with a more natural setting.

riverfront, which is, in fact, the goal of the great majority of cities in developed countries nowadays: to have urban leisure zones, with these great conditions provided by the water”.

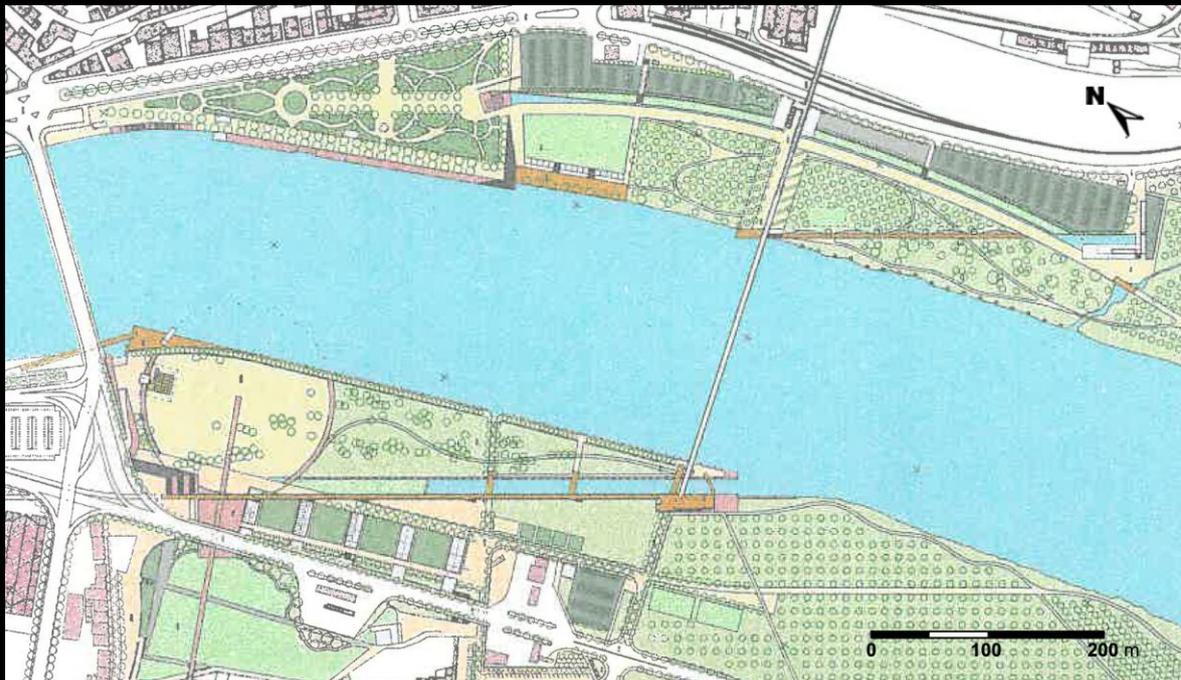


Figure 86: Plan of the winning design proposal for the Parque Verde do Mondego

This is the proposal that was revised to take into account the adjustments requested by the evaluation committee (April 1996); the water imprint (canals and ditches) is notable on both riverbanks, to be brought closer through a footbridge

Source: CMC-APOT (1996, n.p.), © MVCC (modified by the author)

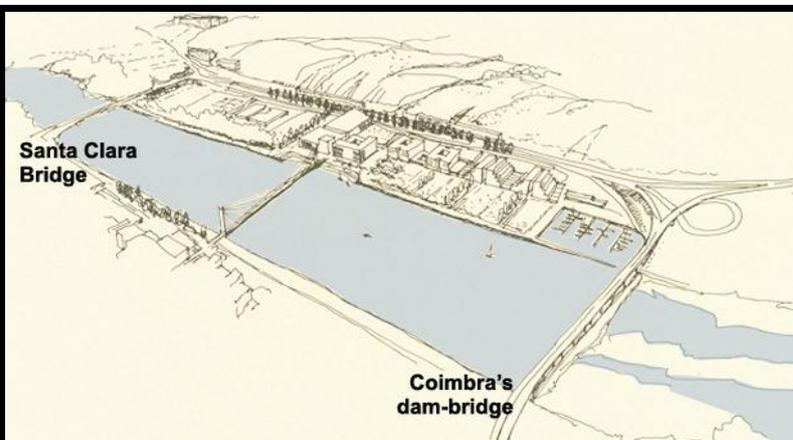


Figure 87: CMC's previous idea for a permanent central footbridge linking the two riverbanks

An urban façade for the left bank is also suggested in this sketch
Source: CMC (1993, p. 33)
(modified by the author)

As a consequence, following the programme stated in the competition brief, the design proposal made by MVCC included, on the left bank, new premises for the pre-existent sailing club, a restaurant and organized car parks. On the right bank, the major design output was the introduction of bars and restaurants with a terrace near the river (the so-called Docks), as well as a large fountain enhancing the connection between the new green park and the Manuel Braga Park (the pathway that starts near the fountain somehow extends the axis of the elevated park into the floodplain). In fact, besides the fountain, other water-related structures (namely canals and ditches) would be proposed to mark the landscape on both riverbanks.

The implementation of the park’s left-bank segment, set as the priority, was initiated in 1999, the same year in which the municipality’s territorial planning body prepared a master-plan proposal for the whole intra-city riverbanks, covering around 133 ha (CMC-APOT, 1999) (see Figure 88). Triggered by the plan for the first segments of the park, this master-plan proposal was done with the close collaboration of the architect Camilo Cortesão, as stressed in a note under the delivered scheme. In fact, as exposed in some interviews, this master-plan proposal basically joins the winning entry for the Parque Verde do Mondego with some plans for other sections of the Mondego’s right bank that had already been devised by MVCC, in the framework of former master plans for the southern part of Coimbra (see Figure 89).



Figure 88: Master-plan proposal for the entire Parque Verde do Mondego (1999)
 The green lines are the perimeters of the two segments subject to the international competition in 1995
 Source: CMC-APOT (1999) (modified by the author)



Figure 89: MVCC's specific master plans for southern sections of Coimbra

Legend:

- green: Vale das Flores neighbourhood (1991-1994)
- purple: University of Coimbra's second campus (Polo II, 1990-2012)
- blue: Quinta da Portela neighbourhood (1992-2003)
- yellow line: southern boundaries of the Parque Verde do Mondego on the right bank

Source: MVCC's website, © MVCC (modified by the author)

Although it indicated the expected location of some structures (e.g. the theme park or some playing fields, already anticipated in the brief of the 1995 competition), this master-plan proposal can basically be read as a normative document, stating the phasing of and integration between segments, and also some general planning rules (most of them already prescribed in the PDM). Actually, the existence of an approved master plan was a prerequisite made by the REN, endorsed in the PDM, for the “regulated use” of the area (CMC-APOT, 1999), an aspect that was indeed highlighted by some of the interviewees. Therefore, despite the demonstrated intention to define the whole park as the sum of spatially integrated parts, this master-plan proposal seems to have been done mainly as a means to substantiate the park's first segment being implemented at the time.

Nonetheless, the report of this master-plan proposal brought on its very first page an interesting statement about the nature of the park, which would be later transposed into several other planning documents: “[t]he future Parque Verde do Mondego, foreseen in the municipal land-use plan, corresponds to the old floodplain of the Mondego River, on the strips contiguous to the city of Coimbra” (CMC-APOT, 1999, p. 1). Being the sole explicit reference to floods in the whole document, this sentence contains three points that are worth highlighting. To begin with, it makes explicit the political will to implement the park as a strong urban ambition: the city ‘needed’ a riverfront, as most developed and attractive contemporary cities do. Secondly, the regulation works are taken as given; as a consequence, the notion of floodplain has become meaningless since river fluctuations are deemed eliminated. Finally, the sentence reveals the ambiguity of the park in terms of its location, partially in the urban centre and partially in the city fringe.

A diversified programme was proposed for this multifunctional park, in line with the 1995 competition brief, centred on the provision of support infrastructures for leisure and sport activities (also to cover the park's maintenance costs). Yet, 65% of the park should correspond to “informal green zones” (i.e. without any predetermined use), to abide by the REN rules (CMC-APOT, 1999, p. 4). In fact, involving third-party entities (the University

of Coimbra and the private sector) was the chosen strategy to deal with the vast area of the park, partially owned by the municipality. As expressed by an informant,

we had the impression that a riverfront extending up to the Portela Bridge, if kept solely as a public green space, could be excessive, with restricted use and maintenance problems. The plan hence included the idea of having some equipment (such as minigolf courses or swimming pools) that could be private but integrated into the whole park (having in mind that the public access to the river must be of course guaranteed all along the riverbank).

In terms of specific regulations, the 1999 master-plan proposal stated that buildings inside the park should be made of light construction materials (e.g. wood and metal sheets) or other easily removable materials (CMC-APOT, 1999). Also, masonry buildings would only be allowed when located at least 150 m from the river, as if a uniform linear distance between the buildings and the Mondego borderline was a sufficient criterion to protect them from high waters (thus understating the local topography and its repercussion on water dynamics) (CMC-APOT, 1999). In any case, despite the fact that these specific rules were indeed related to the site's susceptibility to floods, this aspect was not at all clearly stated, having hence to be read between the lines by sensitized people. And the Docks' complex, one of the main anchor attractions on the right bank, was actually allowed to be adjacent to the watercourse: its terrace even hangs partially over the river.

Although it has never acquired the status of a master plan in the legal sense¹²⁸, this master-plan proposal was used as a valid land-use instrument, at least to support the formulation of one of the park's main anchors on the left bank: the theme park related to science, culture and leisure, to be carried out by a municipal foundation (see Figure 90). The inclusion of such equipment in the Parque Verde do Mondego was highly influenced by the "Expo 98" experience in Lisbon, and the urban upgrade it had successfully induced in the Portuguese capital's northeastern riverine fringe. The attraction effect to be potentially generated by the theme park would therefore not only favour the use of the green park itself, but more comprehensively it would foster the urban occupation of Coimbra's left bank as a whole.

In fact, the theme-park proposal was closely related to the expectation of new real-estate developments nearby; and with the implementation of these integrated urban interventions, the city's gravity centre would be really displaced towards the river. Accordingly, if the left bank gained a more intense (and qualified) urban density, the rural ambience that had prevailed in this zone could be somehow reversed. In 2000, a proposal for the theme park was elaborated by the architect Manuel Salgado (then one of the heads of the RISCO practice¹²⁹); the complex would occupy around 120,000 m² (25% of which reserved for a pond¹³⁰), including a floating platform that would host some restaurants (a detail of the

¹²⁸ To be an effective master plan, this proposal had to be published in the Portuguese official journal (the *Diário da República*), which never happened, although all the required documentation (report, regulation and drawings) was approved by the municipal council in their meeting of 29 March 1999 (CMC, 1999). In any case, the interviewed municipal officers themselves did not recognize the proposal as an actual master plan, and merely referred to it as "*a master-plan proposal*", internally prepared by the municipality.

¹²⁹ The RISCO practice had previously co-authored an emblematic cultural facility, the Centro Cultural de Belém (1989-1992), and designed some public spaces within the "Expo 98" premises (1994-1998), both in Lisbon.

¹³⁰ The pond, with around 30,000 m², would be "the dominant imagetic element of the complex", and would "have a geometric and linear design that reinforces its artificial character" (RISCO, 2000a, p. 4).

programme and areas is shown in Figure 91). The area allocated to buildings was around 16,700 m², with an expected total gross built-up area of around 31,000 m².

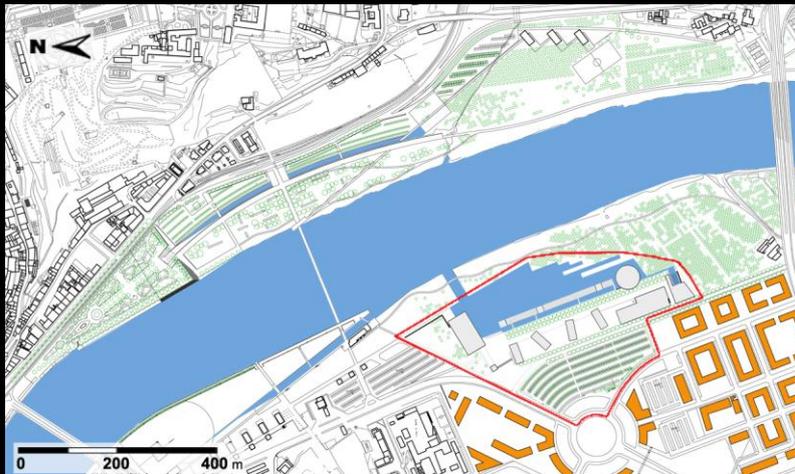


Figure 90: Proposal for the science, culture and leisure theme park (2000) on the left bank

Legend:

– red line: perimeter of the theme park as defined in the 1999 master-plan proposal

– orange: foreseen neighbouring real-estate developments

Source: RISCO (2000b), © RISCO (modified by the author)



Figure 91: Programmatic distribution of the science, culture and leisure theme park (2000)

Legend:

1) Entrance

2) Reception and administration

3) National museum of science and technology

4) Shops and restaurants

5) Multiplex (12 cinemas)

6) Fitness club

7) Theme pavilion

8) Riverine path

9) Pond

10) Car parks

Source: RISCO (2000a; 2000c), © RISCO (modified by the author)

Regarding flood risk, an interesting note appeared in the proposal’s report: the designers declared that, for this first draft design, they had not managed to obtain from INAG¹³¹ data regarding “Mondego’s behaviour and the possible flood risk (which is already minimized, since the report of the [1999] master plan states that the river has been trained through the latest regulation works)” (RISCO, 2000a, p. 1). Therefore, RISCO’s design team worked with the same data (and associated certainty) used by the municipality. Yet, they duly recognized the fragile character of the area in which the park would be located, and as a means to “minimize the presence of the new constructions”, only the complex’s entrance and two emblematic buildings would have a prominent design; the other structures would be somehow dissimulated within the overall landscape (RISCO, 2000a, p. 3).

¹³¹ INAG (Instituto da Água) was at the time the Portuguese body responsible for water issues.

Due to the preliminary character of this plan, no clue was yet presented on how such dissimulation would concretely relate to the adaptation of these buildings to face (probable) flood events. This theme-park proposal was fully incorporated into the expected projects to be carried out within the Polis Programme in Coimbra (see Figure 92), as expressed in the strategic plan jointly elaborated in 2000 by CMC's officers and the Parque Expo agency¹³². Officially published in 2001, the Coimbra Polis strategic plan duly took into consideration the PDM goals for Coimbra's riverside¹³³; the odd notion of "the old floodplain" of the river, taken directly from the 1999 master-plan proposal for the green park (CMC-APOT, 1999, p. 1), also appeared in this document (MAOT & CMC, 2001b, p. 25).

The area to be considered within the Polis Programme was then 80 ha, much larger than the two previous sections subject to the 1995 design competition, and encompassed the envisaged Parque Verde do Mondego and other urban interventions¹³⁴. Since most of these sectors had already been subject to design plans resulting from previous competitions organized by the municipality, the design teams already selected by the CMC were invited to submit reviewed proposals for enlarged perimeters. Therefore, two master plans would be then further developed within the Coimbra Polis¹³⁵: one for the Parque Verde do Mondego (by MVCC) and another for the Portagem – Avenida João das Regras axis (by GB Architects, the practice headed by the architect Gonçalo Byrne)¹³⁶ (see also Figure 92).

Limited to the south by the new Europa Bridge (then under construction), the green park itself would be split into five sections, two of them on the right bank and three on the left one. The first segment of the park on the left bank, already inaugurated in May 2000, should be "consolidated" (MAOT/CMC, 2001a; 2001b), meaning that the newly built structures in the Choupalinho would be further improved and complemented within the Polis Programme (see Figure 93). Besides the theme park, the southern section on the left bank would also comprise a centre for environmental monitoring and interpretation. Its northern section included the Santa Clara Garden, a small-scale green space in the vicinity of the ruins of the Monastery that, previously to the construction of the Inês de Castro

¹³² Parque Expo was the state-owned enterprise initially established to carry out the regeneration of Lisbon's "Expo 98" zone, and eventually became the most important Portuguese urban-regeneration agency, having worked for several cities all over the country and even abroad. During the lifetime of the Polis Programme, 22 strategic plans were elaborated by Parque Expo, acting on behalf of the Portuguese ministry in charge of the environment and territorial planning (Parque Expo, 2012b).

¹³³ Coimbra's PDM of 1994, the 1999 master-plan proposal for the Parque Verde do Mondego and the booklet *Urbanismo Coimbra anos 90* were included as annexes to the internal version of the Polis strategic plan (MAOT/CMC, 2001a), which also contained two additional sections in its public version: one related to the estimated budget of the overall intervention and another related to potential funding sources.

¹³⁴ According to the interviews, the municipality indeed wanted to accomplish the entirety of the green park through the Polis Programme, but since the potentially available funding would not be enough to fully cover its implementation, the area was then restricted to the most central zone (around 55 ha).

¹³⁵ Mirroring the situation of the 1999 master-plan proposal for the whole green park, the two master plans elaborated within the Polis Programme were never officially published, so they also did not acquire the actual status of master plan in the legal sense (even if the projects that they substantiated were partially implemented).

¹³⁶ The second master plan, covering mostly an area on the left bank near the approach of the Santa Clara Bridge, would primarily focus on mobility issues, with a special attention to the quality of the resulting urban realm. Its main proposal was a tunnel under the crossing of the João das Regras Avenue and Inês de Castro Avenue (both inner-city roads at the time, not properly urban streets), which would open up the way to the pedestrianization of the western part of the axis, in the surroundings of the monastery of Santa Clara-a-Velha.

Avenue on a dyke (in 1957) (Côte-Real, 2009), had been included in the floodplain of the left bank as a whole. Figure 94 below, an aerial view of the left bank in 2002, shows the significant amount of unoccupied space and also the emergence of some real-estate developments near the approach of the Europa Bridge.

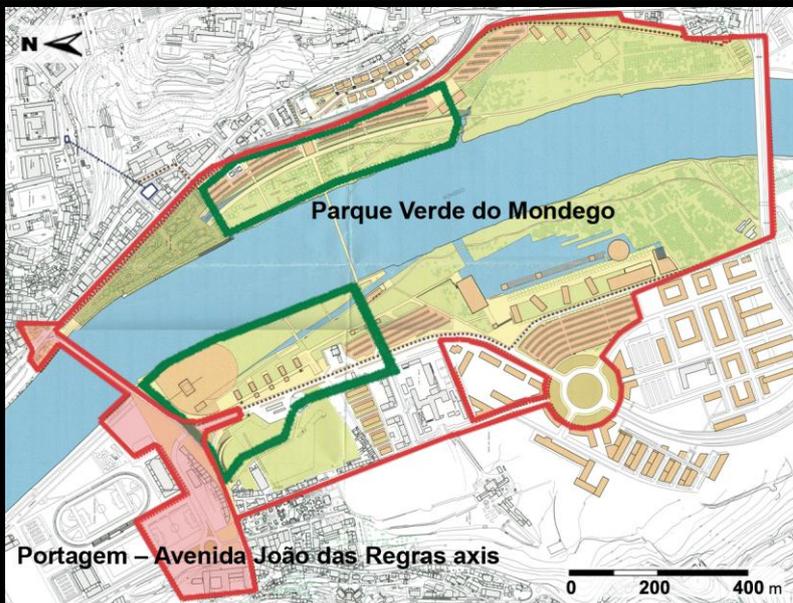


Figure 92: The two master plans of the Coimbra Polis Programme (2001)

They include the park's envisaged structures
Legend:

- red lines: boundaries of the Coimbra Polis Programme
- green lines: perimeters of the segments subject to the 1995 design competition

Source: MAOT/CMC (2001a, n.p.) (modified by the author)



Figure 93: First phase of MVCC's project for the left bank, partially implemented in 2000

The premises of Praça da Canção Square (in the Choupalinho) were to be further "consolidated" within the Polis Programme
Source: CMC's archives, © Adelino Oliveira (17 May 2002)

Somehow following the then recent experience of the Guggenheim Museum in Bilbao, the incorporation of a landmark building was proposed on the right bank: in this case, the pavilion that represented Portugal at the "Expo 2000" in Hannover, designed by the architects Álvaro Siza and Eduardo Souto de Moura, and the engineer Cecil Balmond (see Figure 64, on p. 133). Later renamed Pavilhão Centro de Portugal, this building would be located in a central position, next to the approach of the footbridge. The Polis Programme also included the upgrade of the Manuel Braga Park, while the southern section of the right bank (in the foreground of Figure 95) would keep a more natural atmosphere, even if some sport fields and an unspecified urban equipment would also be introduced there (MAOT/CMC, 2001a; 2001b).



Figure 94: The left-bank segment to be developed under the Polis Programme

The area corresponding to the Lapa (in the foreground, to the south of the bridge under construction), which had previously been included in the 1999 master-plan proposal (see Figure 88 above), was then excluded

Source: CMC's archives, © Adelino Oliveira (17 May 2002) (modified by the author)



Figure 95: The right-bank segment to be developed under the Polis Programme

Two streams (Arregaça and Vale das Flores) flow into the southern section of this segment

Source: CMC's archives, © Adelino Oliveira (17 May 2002) (modified by the author)

The Polis Programme was also taken as a timely opportunity to make viable some costly projects that the municipality by itself would not easily implement in the short term, such as the footbridge proposed by MVCC in 1996, or a cable car linking the riverfront and the top of Coimbra's main hill. In an unusual move, the two master plans and the ensuing projects had to be elaborated in parallel, since the Polis Programme had a strict implementation schedule. In order to run the strategic plan, manage the programme locally and also speed up the normal legal planning procedures¹³⁷, a public agency (jointly owned by the state, the majority shareholder, and the municipality) was created in March 2001: the Sociedade Coimbra Polis. Staff from Parque Expo with project management expertise were allocated to coordinate and supervise all the Coimbra Polis planning and implementation activities.

Following the same rationale of the 1995 competition brief, the flood issue was not put explicitly in the Polis strategic plan, but considered among the regular constraints already presented in the PDM (namely the REN) (see Figure 96). It is noticeable that a new riverine urban culture was then emerging in Coimbra, linked to the riverscape and its atmosphere, in which the left bank was effectively included. Yet, river dynamics were not

¹³⁷ For instance, a public presentation of the master plans is one of the requirements of the Portuguese planning law, but this was often waived within the Polis Programme in order to accelerate the overall process.

really part of this reality, as they were supposed to be controlled by dams upstream. The sole exception to this relatively static perspective towards the Mondego variations in the Polis Programme was the intention to commission a hydraulic impact study related to the sailing club's premises, whose planned location near the Mondego would be directly exposed to higher water levels (MAOT & CMC, 2001b).

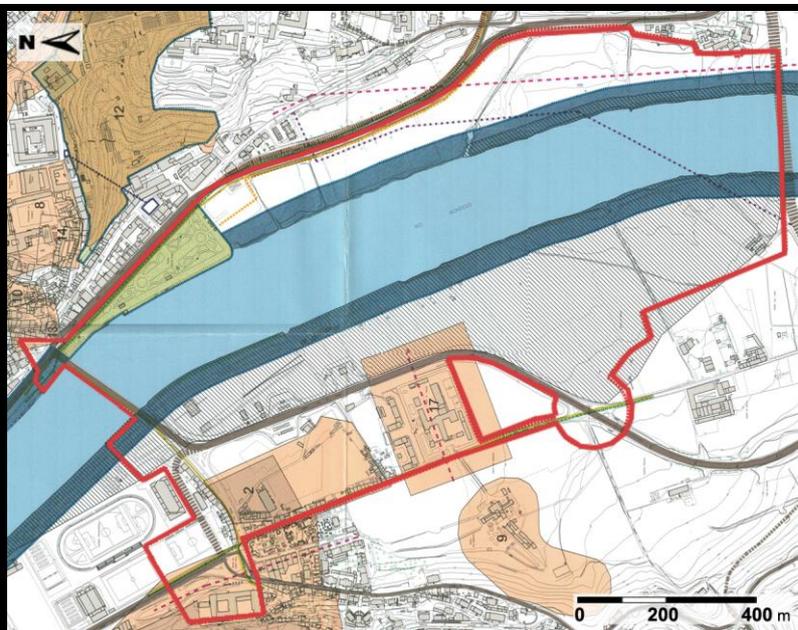


Figure 96: Synthesis of the PDM's constraints in the area of the Coimbra Polis

Legend:

- red lines: perimeters of the Coimbra Polis Programme
 - grey area: REN zone
 - dark blue areas: boundaries of the Coimbra reservoir (and protected riverbanks)
 - beige areas: built monuments
 - brown area: botanical garden
 - green area: Manuel Braga Park
- Source: MAOT/CMC (2001a, n.p.) (modified by the author)

As for the other buildings, they would be located in less flood-susceptible locations, except for the Docks' complex, which despite its implementation almost on the same level of the river on the right bank, would strangely not be subject to such an impact study. In fact, floods were not initially deemed an issue deserving any particular attention in the Polis Programme, as eloquently stated by one of the interviewed stakeholders:

All the flood situations [in each of the targeted cities] were more than studied when the Polis Programme was to be implemented. So we didn't have to study the flood issue; high waters in Coimbra were already studied (I wouldn't say adequately studied, but at least studied). So the strategic plan was done with the existing flood studies, we did not prepare any new flood study; otherwise, we would have spent four years to prepare such a study and four years more to elaborate the plans.

The regulation of the Mondego has also triggered archaeological works in the ruins of the Monastery of Santa Clara-a-Velha's church, initiated with the sponsorship of the IPPC¹³⁸, following a design competition in 1989 for the rehabilitation of the monument. The winning proposal by the architects João Rapagão and César Fernandes abided by the expectations of the design brief, which requested the improvement of the access to the Monastery while keeping its ground floor as it had been for centuries: under water (Côrte-Real *et al.*, 2002; Macedo, 2003; Côrte-Real, 2009b). Water, mud and litter that used to

¹³⁸ The IPPC (Instituto Português do Património Cultural) was the national body responsible for architectural heritage between 1980 and 1992, when it was succeeded by the IPPAR (Instituto Português do Património Arquitectónico). In 2007, the IPPAR was in its turn merged into the IGESPAR (Instituto de Gestão do Património Arquitectónico e Arqueológico). Finally, in 2012, architectural heritage issues fell within the remit of the Directorate-General for Cultural Heritage (Ministry of Culture).

occupy the site were removed for the realization of the archaeological works. Yet, a setback of the ongoing requalification works was prompted in 1995 with the unexpected discovery of the cloister's ruins in very good conditions (see Figure 97). Given the significance and high heritage value of the discoveries, the 1989 project was left behind and the archaeological study was further extended¹³⁹.



Figure 97: The archaeological works in the Monastery of Santa Clara-a-Velha in 1997
Source: postcard, © Teixeira Duarte

In terms of strategy to deal with the newly emerged context, three options were assessed by the concerned institutions, opening then a related public debate. The first alternative was to comprehensively register the discoveries and, after finishing the archaeological study, bury the site again to keep them safe; the water would be thus allowed to freely flow back into the Monastery's premises again. This option would be somehow equivalent to the previous context of the 1989 design competition, and would hence perpetuate the seven-century-long "decadent enchantment" of the site (Bandeirinha *et al.*, 2009, p. 3).

Following in some way a similar reasoning, the second option consisted in filling in the site again, after the archaeological works, but with clean (translucent) water in order to allow visits using boats. Such "romantic" choice (as qualified by one of the interviewees) did not properly account for the required maintenance needs, and was thus not really assessed as a valid option. The last alternative – the one with the highest investment cost but that favoured the experience of this historical legacy in its full potential – was to keep the Monastery in a dry environment as it was originally conceived.

After an intense discussion process involving several stakeholders (Bandeirinha, 2009), which included a seminar dedicated precisely to the water issue, the third alternative was finally chosen in 1998. Given that the monument is presently below the Mondego's level and that the process of water pumping used during the archaeological study was clearly unsustainable in the long term due to its high cost, a more enduring solution was needed to guarantee the envisaged dry condition. The adopted alternative was the construction of a

¹³⁹ For details of the archaeological process, see for example Côrte-Real *et al.* (2002), Macedo (2003), Côrte-Real (2009b) and the 2009 special issue of *ECDJ* (the journal of the Department of Architecture of the University of Coimbra) dedicated to the recovery of the Monastery of Santa Clara-a-Velha.

hydraulic containment curtain – “a kind of swimming pool or box in which the monument is kept dry” (as referred to by an interviewee) – around the Monastery complex (see Figure 98 and Figure 99). The cofferdam was thus conceived as a “genuine modern rampart that impedes the water from coming into the protected site. However, the site still relies on a few pumps that remove on a permanent basis the water that permeates underground”, as noted by Artur Côrte-Real (2009b, p. 79), the archaeologist who was in charge of the operation.

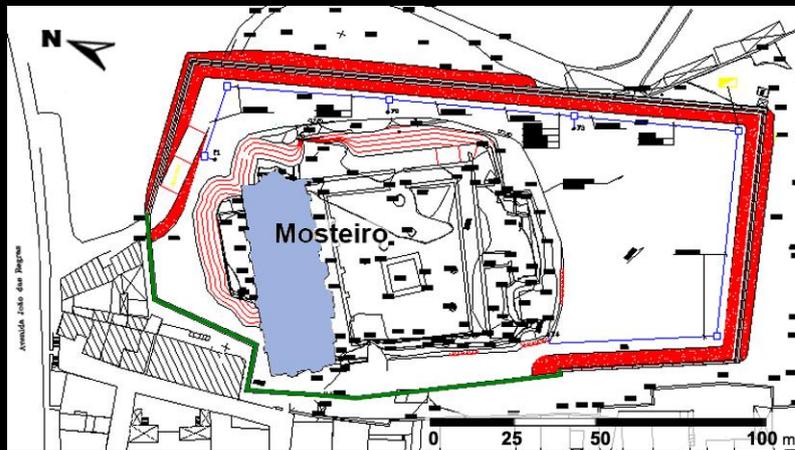


Figure 98: The Monastery of Santa Clara-a-Velha's cofferdam plan

Legend:

- red: self-hardening diaphragm wall
- green: reinforced-concrete diaphragm wall
- blue: the Monastery's church

Source: CMC's archives (modified by the author)

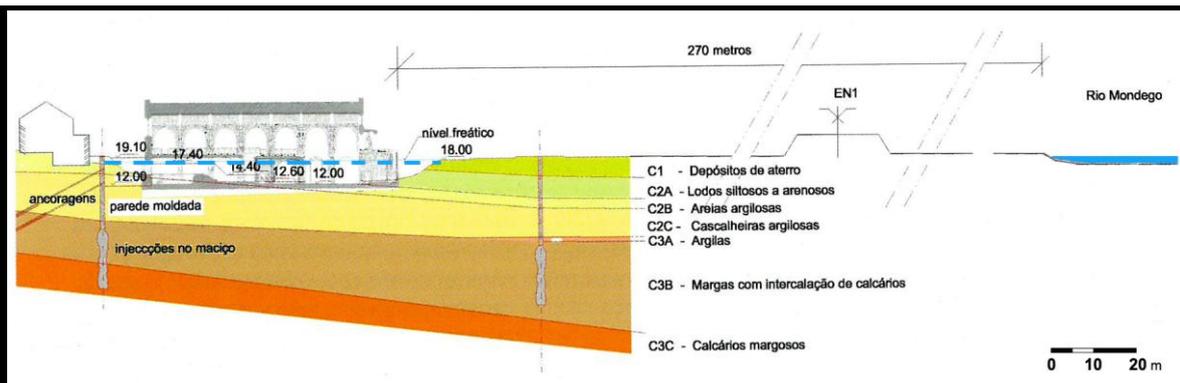


Figure 99: The Monastery of Santa Clara-a-Velha's cofferdam section

Source: Marques (2009, p. 50) (modified by the author)

The Santa Clara Garden (later on renamed West Entrance of the green park), in the vicinity of the Monastery, would also be developed within the Coimbra Polis Programme, having been included in the second section of the park on the left bank. According to the Polis strategic plan, the design of this public garden should be coordinated with the construction of the cofferdam, as well as with the new international architecture competition for another requalification project to adapt the complex to the dry condition. This competition, organized in 2001 after the beginning of the hydraulic containment curtain works and won by Atelier 15 (architects Alexandre Alves Costa, Sergio Fernandez and Luís Urbano), also contemplated the construction of a museum facility to host the recent archaeological discoveries on site.

The competition brief revealed an ambiguous positioning relatively to the water: its presence in the site should be highlighted, keeping “*the memory of the probable threat*” (in the words of an informant), while the cofferdam, necessary to ensure the new dry

environment (having thus the same role as the dams upstream of the city), should be, on the contrary, masked. In fact the cofferdam design cut the site transversally, somehow ‘deforming’ the experience of the space of the Monastery complex as it was previously conceived (yet, the possibility of future archaeological works was not jeopardized, since this was fully taken into account by the location of the cofferdam). As explained by the architect José António Bandeirinha (2009, p. 16),

[i]t’s a pity that the cofferdam was then considered not an integral part of the future solution, but rather as an abstract ‘technical’ enclosing of the site (the latter being, on the other hand, understood as ‘cultural’). We now know, just as we knew at the time, that this opposition, regarded as anodyne, is only so in appearance. The separation between what is technical and what is cultural does not exist, and it is for this reason that the design of the cofferdam seems too detached from the site recovery plan, thus creating the need for a cosmetic treatment (or even a mask), in sharp contrast with an intervention philosophy that antagonistically and radically favours lucidity, clarity and temporal and cultural continuity.

Technical (as well as cultural) issues were also a concern within the decisions regarding the occupation of the Parque Verde do Mondego. According to an interviewee who was then linked to the municipality, three major options had emerged within the technical meetings that preceded the formulation of the park’s 1999 tentative master plan:

- (1) no occupation whatsoever in the park, which should be thus kept as a ‘true’ natural space, in a way not to compromise its function as an area of greater water infiltration (this would have actually been the only option if the area’s specific REN status had not been previously negotiated);
- (2) minimum occupation with the provision of basic support facilities (such as public toilets) to encourage the use of the area by local citizens (more or less like the Mata Nacional do Choupal at present); or
- (3) some occupation with a few built attractions, considering two variations: (a) only light constructions (in order not to compromise the intended naturalness of the park) or, on the contrary, (b) only reinforced (flood-resistant) structures would be allowed.

As foreseen in the 1999 master-plan proposal, option (3a) was preferred by the concerned decision-makers, since they considered that the first two alternatives would not generate an ambience that could attract large numbers of visitors, and would thus fail to promote a new riverine urban culture¹⁴⁰. To this end, some anchor activities and amenities (such as restaurants and playing fields) should indeed be placed in the park, even though the area would remain a permeable and floodable one. Choosing option (1) or option (2) would have meant that “*people would experience the river with less intensity*”, as expressed by an interviewee, who also noticed that there was, at least theoretically, a fourth option: a park with an even higher occupancy rate, if, for example, the ground were elevated and the riverbanks stabilized with a wall.

However, this last alternative was disregarded since the beginning of the park’s planning process not only due to legal issues (it wouldn’t be allowed inside the REN zone) but also due to the fact that such a massive topography alteration would be in contradiction with the

¹⁴⁰ The only structure that would still be reinforced within this alternative would be the stage in the Choupalinho.

idea of bringing the river closer to the population¹⁴¹. Indeed, this last option would firmly contradict the envisaged natural and green image of the park, which had been strongly emphasized during the evaluation of the competition entries for the park's first sections.

Finally, all the three options mentioned above were finally taken into account in different locations: option (2) was chosen for the southern parts of the park to be developed under the Polis Programme (close to the Europa Bridge); while option (1) would correspond to the riverbank sections without any intervention, upstream of that bridge. This decision indeed was in line with the early idea that the plan for the park should consider a southward gradual move from a more urban atmosphere (close to the Santa Clara Bridge) to a more natural character, with the corresponding decrease of occupation and use intensities. As stressed by some informants, such a strategy was barely related to floods, but to the existing sense of urbanity; the envisaged natural image did not have thus a direct relationship with the acceptance of natural processes, at least related to water variations.

In fact, the fluctuating nature of the Mondego was assumed to have been lost with the regulation works, being then technologically controlled (that is, under human control), therefore not allowed to naturally play its habitual tricks any longer. Yet, a particularly rainy period from December 2000 to January 2001 showed that such assumption was somehow biased¹⁴². An “*unexpected*” flood event (at least from the point of view of several informants) on 27 January was responsible for shedding light on the limits of the existing flood studies as well as on a new type of ‘human-related river variations’, closely linked to the management of Mondego's dams, by EDP (the major Portuguese energy utility provider).

The peak flood discharges experienced during several days in that winter in Coimbra were much higher than the planned 1,200 m³/s for a flood probability of at least 1% per year (the so-called centennial flood), which is the maximum tolerable discharge regarding the river-training works in the Mondego's fields. In fact, this was the third time after the regulation works that such limit was surpassed, according to the data presented by Louro and Lourenço (2005). As for Coimbra's urban area, the peak of the discharge during this event reached 1,990 m³/s, which is very close to the planned limit of the hydraulic system to protect the city itself (that is, to the modified millennial flood discharge, as already mentioned on p. 153) (Rodrigues *et al.*, 2001, n.p.).

The water level in Coimbra slightly exceeded 21 m near the Europa Bridge (Santos *et al.*, 2002), which is 3 m higher than the normal level of the Coimbra dam-bridge reservoir and 2 m higher than the maximum flood level as previously conceived by the regulation works (Sanches, 1996). The left bank was more impacted than the right bank (see Figure 100 and Figure 101): the water level at the Choupalinho (which had already been slightly flooded on 7 December 2000 and 6 January 2001) reached 20.86 m on 27 January 2001.

¹⁴¹ Raising all the ground level of the park would be, as noted by another interviewee, the repetition of the same solution used at the beginning of the 20th century, when the Manuel Braga Park was built, under completely different urban and river conditions.

¹⁴² This period was indeed qualified as a hydrometeorological extreme by INAG; for instance, the cumulated rainfall in these two months reached a return period of 140 years (equivalent to a 0.7% annual probability of occurrence). For more precise hydrological and weather data, see INAG's related report (Rodrigues *et al.*, 2001).



Figure 100: The Choupalinho during the 27 January 2001 flood event

The first section of the Parque Verde do Mondego on the left bank, viewed from the Santa Clara Bridge
Source: Mateus and Cunha (2013, p. 42)



Figure 101: The Monastery of Santa Clara-a-Velha, under water again on 27 January 2001

Source: Mateus and Cunha (2013, p. 42)

An evaluation of this event made by a working group of local engineers concluded that the installed hydraulic system was able to minimize the negative impacts of the flood, even if it did not respond as expected (Santos *et al.*, 2001). They stressed that “[t]he safe management of a multi-purpose hydraulic structure involves the consideration of a number of (sometimes conflicting) interests and the search for optimal solutions that can only be found with the use of scientific criteria” (Santos *et al.*, 2001, p. 37), raising the issue of decision-making and accountability regarding the effective operation of the dams. Therefore, besides the extreme rainfall, the inadequate management of the dams system was considered an equally crucial triggering factor behind this flood occurrence.

Damage was particularly severe in the Lower Mondego (see Figure 102), which was flooded due to the collapse of dykes in several spots (Cunha, 2002; Louro & Lourenço, 2005; Nobre, 2010). According to Louro and Lourenço (2005, p. 20), despite being less exceptional than the 1948 event, the January 2001 flood resulted in more material losses than the former, due to the fading of the “flood-risk culture” that had prevailed among the population living in the floodplain before the regulation works. In fact, as an adverse effect of the river-training interventions of the 1980s, the floodplain has been more intensely (and not adequately) occupied; the gathering of more exposed (and more vulnerable) people and assets contributed to the accrued losses (Louro & Lourenço, 2005; Tavares *et al.*, 2013). In sum, all the three flood-risk components (hazard, exposure and vulnerability) played a key role as regards the severity of this flood event.



Figure 102: The Mondego fields during the 27 January 2001 flood event

View from Montemor-o-Velho
Source: Lúcio Cunha's archives

Besides some damage in the civil works being carried out in the park's first phase on the left bank (and apart from the damage experienced in agricultural fields downstream), this event triggered some structural and programmatic changes in the park's plan. Since the Polis strategic plan had already been finalized when the 2001 flood occurred, a series of negotiations between the concerned parties (including INAG, the nature conservation body and the civil-protection service) was needed in order to keep the previously agreed ambitions for the park. Some involved governmental institutions (mainly INAG¹⁴³) actually expressed their concerns about the plan and, as a direct consequence, "*the restrictions became even stronger*" (quote from an interview). The implementation of the park itself was put into question, in a very conservative attitude that was referred to as "*flood extremism*" by an informant. Indeed, the site's flood proneness did not need to imply simply leaving it underused forever. For instance, its transformation into an urban park would mean that there would not be people living inside its perimeter; therefore no loss of life would be expected when other floods happen. At the same time, having some carefully designed floodable built structures in it, the park would most probably only experience some minor material damage from time to time.

In an attempt to keep the plan alive, a specific hydraulic and hydrologic study was then commissioned by the Coimbra Polis Programme to the Department of Civil Engineering of the University of Coimbra (DEC-FCTUC), which, in its final version in 2002, defined more precisely the perimeters of flood-prone zones and the water heights within the Polis area, based on the 2001 event (Santos *et al.*, 2002). The modelling exercise was validated by means of replicating the exceptional 1948 flood (see Figure 103 and Figure 104). The study thus confirmed that the lamination effect generated by the hydraulic system in place had been correctly dimensioned to withstand events of such a magnitude (and even stronger ones, such as the event of 1948) without incurring floods in the Polis areas. It also suggested that part of this area (namely the Choupalinho) could be flooded every four or five years in the absence of the hydraulic system or in case of its ineffective management.

Therefore, the study stated that the current flood problem primarily lies in the management of the system, and not properly in a sub-dimensioned design, which confirms the previous

¹⁴³ The INAG was lately accused by the Sociedade Coimbra Polis of hampering the implementation of the plan, as reported by the press (Jornal de Notícias, 2004).

engineering assessment (Santos *et al.*, 2001). Another key factor identified was the overlooked silting process; dredging the riverbed in the city centre section (never done since the regulation works) was then mentioned as a means to reduce the impact of floods in the Polis area. Since the management of the dams system was considered sub-optimal regarding flood protection (due to the prioritization of energy generation, another main original objective), the authors presented in their conclusion the estimated flood levels and return periods as if the hydraulic system had not been in place¹⁴⁴.

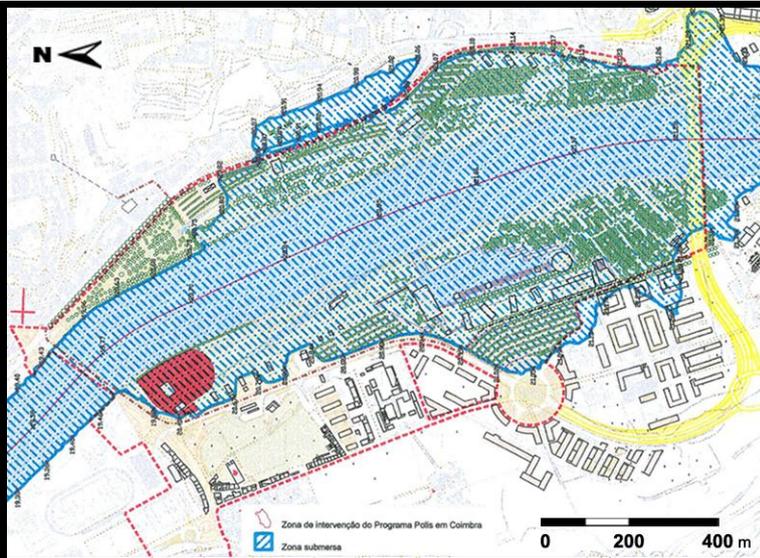


Figure 103: Modelling of the 2001 flood in Coimbra

Legend:
 – hatched blue: flooded area
 – dashed red line: perimeter of the area under the Coimbra Polis Programme
 – yellow lines: planned road system (including the new bridge)
 – red area: the Choupalinho
 Source: Santos *et al.* (2002) (modified by the author)

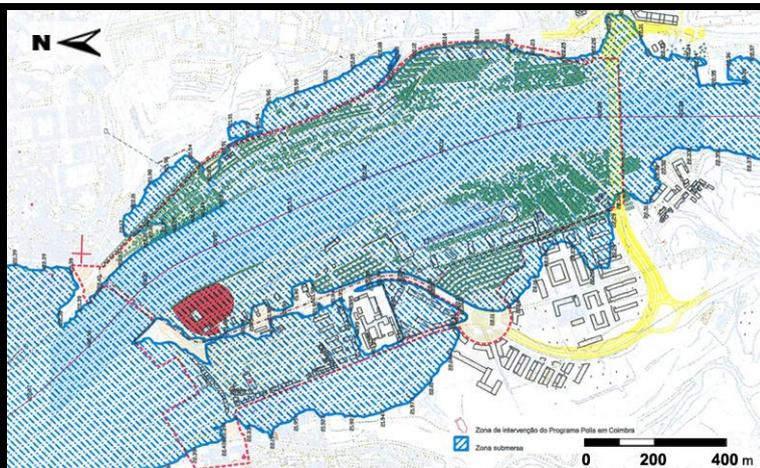


Figure 104: Modelling of the 1948 flood in Coimbra

This scenario does not consider the regulation works of the 1980s
 Legend:
 – hatched blue: flooded area
 – dashed red line: perimeter of the area under the Coimbra Polis Programme
 – yellow lines: planned road system (including the new bridge)
 – red area: the Choupalinho
 Source: Santos *et al.* (2002) (modified by the author)

Taking the January 2001 event as a reference and the performance of the hydraulic system during that occasion, the modelled flood-prone zone was much larger than the one previously mapped in the framework of the PDM and included within the local REN limits (see Figure 84, on p. 156); all the right-bank sections of the park were then considered floodable. In practice, this enlarged flood study somehow ended up substituting the specific hydraulic study intended for the sailing club (see p. 167); as stated by an informant, “*the 2001 flood itself was equivalent to a real-condition hydraulic study*” of this particular

¹⁴⁴ The definition of flood zones “ignoring the presence of flood protection structures” is actually the current practice in the United Kingdom, based on the fact that “defended areas still carry a residual risk of flooding from overtopping or breach of defences and [that] there is no guarantee that defences will be maintained in perpetuity” (RIBA, 2009, p. 12).

building, which was finally relocated inwards. Another main effect of this study was the adjustment of ground levels and uses within the Polis Programme's ongoing projects. The reference water level for the green park plan was thus raised accordingly: from 19 m, which was earlier defined as part of the achieved regulation works, to 21 m (based on an extrapolation of the maximum level reached in the Choupalinho plus a small margin). This new limit had in fact been imposed by the regional body in charge of environment and territorial planning (DRAOTC, at the time) in a memo to the CMC, issued in July 2001 (DRAOTC, 2001) (see Figure 105), to be applied within the Coimbra Polis jurisdiction (the document also recommended that 24 m be taken as the level of exceptional floods, most likely taking the 1948 event as a reference).

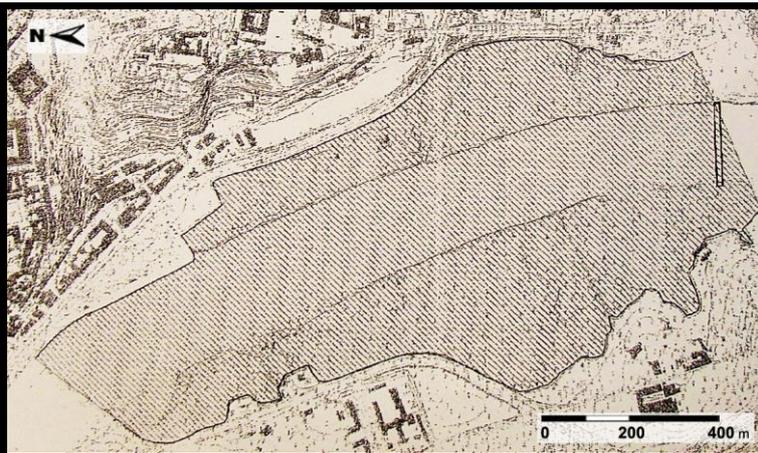


Figure 105: Extension of the January 2001 flood between the Europa and Santa Clara bridges

The hatched area indicates the estimated surface flooded on 27 January 2001, based on an extrapolation of the 20.86-m level actually reached near the then existing sailing club (upstream of the Choupalinho)

Source: DRAOTC (2001) (modified by the author)

Due to this adjustment (or using it as the main argument), some structuring facilities were left aside; in fact, as noted by one of the involved architects, “*the location of the area in a floodplain prevented the pursuit of most occupation types that were initially envisaged*”, even if the 2001 flood event was considered by this architect as simply a “*human error*” that could have been avoided. Although such evaluation may be justified, no one can deny the intrinsic human facet of riverine floods in general; for instance, someone else could also quite rightly point out that the deforestation and other interventions upstream in the Mondego basin are longer-term human errors. Anyway, viewing the January 2001 event as a potentially preventable human error does not help to challenge the misleading idea that floods can be enduringly avoided by technological means, and thus does not really favour an adaptive stance vis-à-vis this human-natural phenomenon.

What has changed after this event in the assessment of the flood proneness condition of the Mondego riverbanks? Differently from its tentative 1999 version, the 2004 master plan for the Parque Verde do Mondego (now issued within the Polis Programme) did emphasize flood issues; the flood-prone areas were indeed clearly presented in a dedicated drawing, although statically based on the 21-m reference level (as if the evolving river bed profile would not interfere in the flood levels) (see Figure 106). On the right bank, besides the Manuel Braga Park, only the areas that would be subject to land grading – namely the sites allocated to the Pavilhão Centro de Portugal (relocated southwards) and two greenhouses with an elevated passageway (now in the approach of the footbridge) – appear on higher grounds, safe from floods.

On the very first page of the master plan’s report, a note highlights that “[a]ll the interventions structured by this master plan take for granted the possibility of high waters of the Mondego River, since a substantial part of the area lies below the 21-m level, which was fixed as the level of highest waters”¹⁴⁵ (MVCC, 2004). Yet no hydraulic modelling taking into account the proposed layout of the park and the repercussions of the operation of the dams upstream is presented to support the pertinence of the design decisions. In the report section devoted to water and wastewater infrastructures, the “problem of the Mondego high waters” (MVCC, 2004) had a specific subsection in which two seminal documents on the subject were transposed: the conclusions of a preliminary version of the flood report by the DEC-FCTUC (dated September 2001) and, in its entirety, the aforementioned DRAOTC memo. The transposing of both documents was then justified by their intrinsic importance for “the decisions to be taken in terms of the occupation of the zone being studied, namely regarding its use by people and the safeguard of assets” (MVCC, 2004).

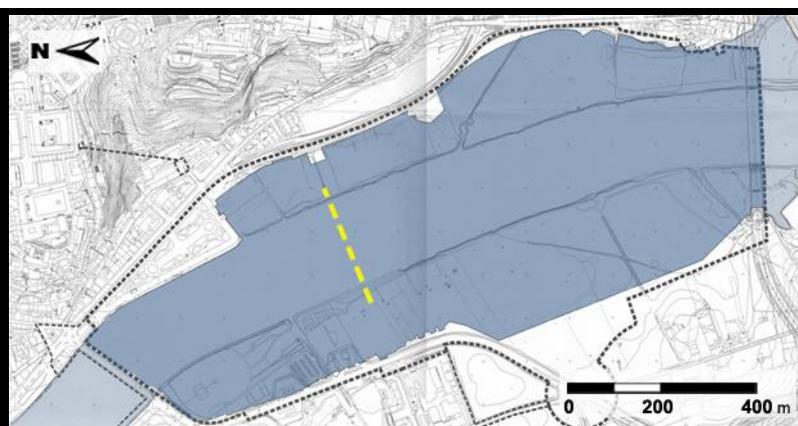


Figure 106: The flood-prone area within the Coimbra Polis Programme

The dashed yellow line indicates the location of the planned footbridge

Source: MVCC (2004), © MVCC (modified by the author)

The report thus clearly states that the occupation of this floodable zone is a matter of decision-making, as it is the case, obviously, in all other flood-prone cities and urban projects. Yet, one of the objectives of devising a master plan is precisely to support such decisions; but in this case no particular strategy or mechanism was clearly recommended to cope with (or to benefit from) floods. Instead, the authors urged for the strict compliance with existing regulatory requirements (that is, abiding by the standards already defined). Accordingly, the respect of the 21-m reference level (which was recommended by the concerned authorities, and not defined by the master-plan team itself) was vehemently stressed, without questioning for instance the effects of the ongoing silting process on the accuracy of such flood-safe level.

In any case, neither criteria nor orientations were suggested for the buildings intended to occupy the floodable areas (that is, with a ground-floor level lower than 21 m), such as the Docks or the sailing club. In this sense, all subsequent adaptation measures were to be individually thought of and proposed by the designers in charge of each specific project. According to an interviewee, the absence of recommendations regarding flood adaptation

¹⁴⁵ It is worth noting the composition of the ultimate design team of the master plan, led by Camilo Cortesão: MVCC (architecture and urbanism), PROAP Estudos e Projectos de Arquitectura Paisagista (landscape architecture), GNG.APB – Arquitectura e Planeamento (urbanism and traffic engineering), AMBIENTAR, Consultores em Ambiente (environmental engineering), Grade Ribeiro (hydraulic and infrastructure engineering), Silvino Maio & Lacerda Moreira Engenheiros Associados (infrastructure engineering) as well as individual professionals from law, economics and urban art.

in the park's master plan was probably a consequence of its elaboration in parallel with the related projects. In his own words,

as the projects were already taking this issue into account, we didn't feel the need to stress it in the master plan. I'm not saying that this is necessarily OK: maybe it was a mistake, maybe it should have been referenced in the plan; but as everything was being done at the same time, the issue was probably skipped in the plan, and hence tackled directly in the projects.

Being fully located within the floodplain (see Figure 107), the theme park, first sketched before the January 2001 flood event, had to undergo huge changes in terms of both programme (radically reduced) and overall layout (totally rearranged). In the report of a second proposal (dated December 2001), the designers stressed that, considering the final flood and water-level data, "all the equipment projects on the Mondego's banks should be reformulated" (RISCO, 2001a, p. 1). They also remarked that "from the outset" the fact that the area to be assigned to the theme park is precisely in the floodplain "discourages any construction" (RISCO, 2001a, p. 1). Yet, they argued, given the expectation of further (real estate) development on the left bank (outside the flood-prone zone), some buildings in the theme-park zone could still be thought of, in articulation with such urban extensions. Therefore, in the revised version of this plan, only two buildings – the museum and the theme pavilion – would remain, being relocated to the fringe of the site in a way not to obstruct the waters when the river overflows (see Figure 108)¹⁴⁶.

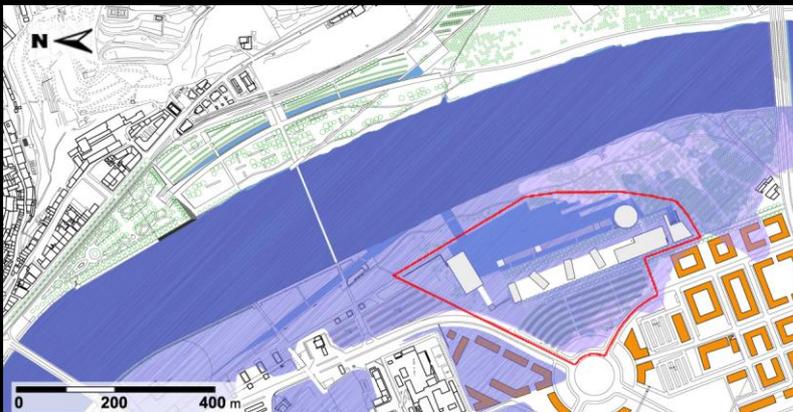


Figure 107: The initial proposal for the theme park overlaid with the 2001 flood map

Legend:

- red line: perimeter of the area allocated for the theme park
- white blocks within the red line: proposed buildings
- purple: floodable area

Source: RISCO (2000b; 2001b) (modified by the author)

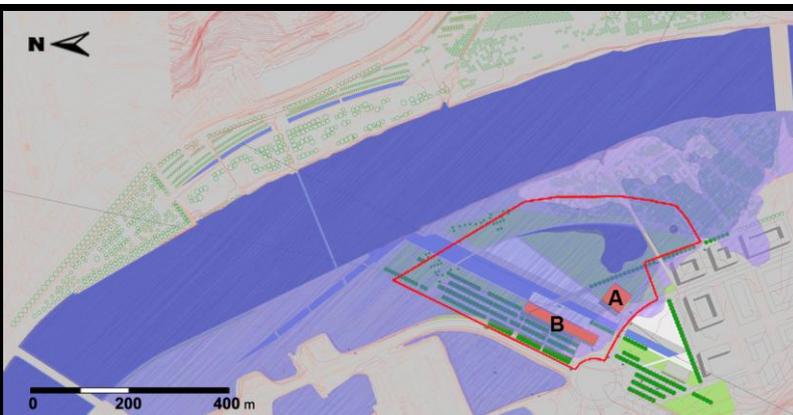


Figure 108: The second proposal for the theme park (2001) overlaid with the 2001 flood map

Legend:

- red line: perimeter of the area allocated for the theme park
- A and B: proposed buildings
- purple: floodable area

Source: RISCO (2001b) (modified by the author)

¹⁴⁶ The second version of the theme-park plan also included the 'new' flood map. Figure 107 and Figure 108 show the overlay of this map with both the former theme-park plan (of 2000) and the revised 2001 version, respectively.

Their ground floors would be elevated to reach the same level of the bordering avenue (therefore well above the 21-m threshold). No land grading was envisaged, and the use of the floodplain for car parks, accesses and public spaces would be totally compatible with the possibility of occurrence of future floods. In any case, the total built-up area of the theme park's complex was cut back by almost 70% and the pond was also reduced by 27%. Given the scope of the changes of the theme park's content, the last section of the report of the second proposal questioned the viability of the initiative, in view of the drop in the major sources of revenue previously envisaged (RISCO, 2001a). And indeed, according to the minutes of the municipal council session of 17 June 2002, the municipal foundation spearheading the theme-park project did not accept this second version of the complex, since it did not seem feasible from the economic point of view (CMC, 2002). The foundation still tried to find an alternative proposal for the complex, but it eventually considered that the implementation of the intended theme park in such location was not possible, mostly due to unavailability of (safe) space (CMC, 2002). Nonetheless, in the opinion of an interviewee, the main problem behind the implementation of the theme park was instead related to the inexistence of "*committed public and private promoters*", meaning that the articulation between the public and the private sectors was not effective enough to leverage it. Another stakeholder agreed by arguing that budget cuts were the major reason for abandoning the theme-park project. Ultimately, another anchor initiative (although with much smaller programme and areas) would be carried out, as will be seen in the next section.

4.4 Resulting plan and projects

All things considered, the Parque Verde do Mondego is a floodable riverine urban park (see Figure 109 and Figure 110), for which the main envisioned strategy was to restrain occupation: a straightforward action on the exposure facet of flood risk, with the minimization of the number of structures in the most susceptible locations. At the same time, the few proposed exposed structures were somehow adapted to cope with floods, as will be seen in this section. This stance was clearly asserted by an informant: "*basically, the main outcome of the 2001 flood event was the designation of areas where we could not make any intervention*". In any case, the master plan's final output is a 27-ha park that at least tolerates river dynamics, especially considering low-frequency events of larger magnitude: "*if there is water from time to time, one just avoids going there, or goes there using wellington boots; I just don't see any problem in this*", as posed by an interviewee.

Yet, it is interesting to note that, apart from the removal of the theme park as the largest intended infrastructure, the overall layout of the park was barely changed; in fact, the area occupied by buildings had already been kept to a minimum since the first proposal of 1996. The aim of getting the city closer to the river was nevertheless successfully accomplished, as the intense appropriation and use of the riverfront by Coimbra's inhabitants and visitors have been showing since the park's inauguration. In this section, through an analysis based on the gathered data (general documents, plans, interviews) and on our *in situ* observations (including those during and after the two flood events of early 2016), we will try to track how the flood proneness condition of Mondego's riverbanks was incorporated in the final plans and projects, paying special attention to the resulting space. Such analysis

pinpointed, for instance, that although the river is allowed to reoccupy the prairie during its occasional overflows, water was overall treated as a static element of the urban scenery. Hence, in spite of the achieved increased sense of urbanity on both riverbanks, the opportunity of designing floods in a proactive and integrated manner could have been more intensively fostered (even without compromising safety).

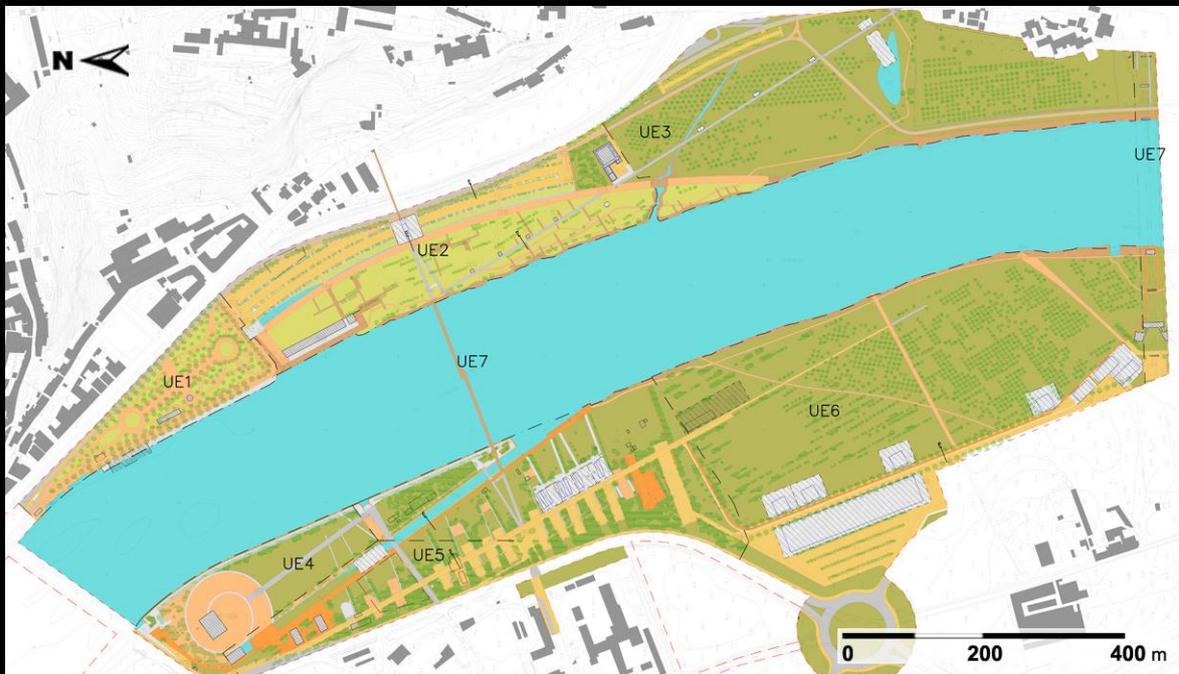


Figure 109: The final master plan for the Parque Verde do Mondego (released in 2006)

Source: CMC's archives, © MVCC & PROAP



Figure 110: Orthophotograph of the Parque Verde do Mondego (2010)

Legend:

- yellow line: boundaries of the Parque Verde do Mondego as envisaged in the Polis Programme
- dashed yellow line: southern limits of the actual Polis Programme intervention

Source: CMC's GIS database (modified by the author)

Figure 109 above shows that besides the five sections already presented in the Coimbra Polis strategic plan, the final master plan included two new implementation units (UE): the Manuel Braga Park (UE 1) and the two river crossings (UE 7). MVCC and PROAP jointly designed not only the master plan but also the detailed projects of UE 2, UE 4 and UE 5. The overall layout of the park was structured through long intersecting pedestrian and cycling pathways on both riverbanks (along which some buildings, small-scale modules and equipment were located, gathering diversified and mostly temporary uses), as well as through the footbridge, which is indeed the central tying element of the whole green park. Car parks, formerly the dominant use of this area, were allocated in the fringes of the site, keeping the riverside for the interactions between people and the Mondego.

As expected, the park's northern sections (UE 2, UE 4 and UE 5) have an urban character, concentrating more intense uses and regular activities (such as the Docks' complex with restaurants and the precinct for academic festivals), while the southern sections (UE 3 and UE 6) would mostly be subject to a landscape intervention organizing polyvalent open green spaces. Only a small fraction of UE 6 (corresponding to around 5 ha) has been implemented so far, even if the detailed plans for both UE 3 and UE 6 had been integrally elaborated, by the landscape practice NPK (led by the landscape architects Leonor Cheis, José Lousan and José Veludo), while the Polis Programme was still ongoing (see Figure 111). One should observe that UE 3 has been largely reduced and, in its southern segment, the use has remained as urban agriculture.

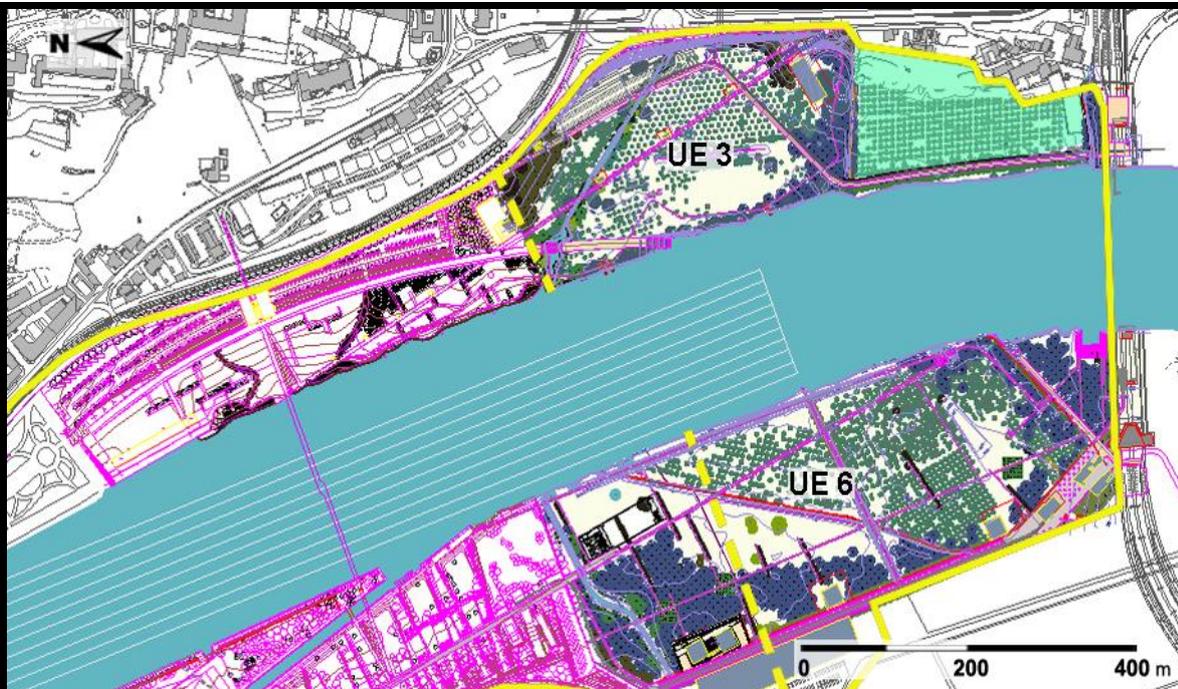


Figure 111: Site plan of the detailed project for two sections of the Parque Verde do Mondego

Legend:

- yellow line: boundaries of the Parque Verde do Mondego as envisaged in the Polis Programme
- dashed yellow line: southern limits of the actual Polis Programme intervention
- light green area: pre-existent agricultural fields, later on excluded from the park's initial boundaries

Source: NPK (2007), © NPK (modified by the author)

Regarding the park's sections already implemented, their simple and clear landscape design is dominated by the riparian vegetation, the park's element that has been mostly showing the evolving trait of nature, being presently a continuity factor for the whole riverbank, when considering both the sections with and without recent intervention (see Figure 112 and Figure 113). Nonetheless, the design largely demarcates that, differently from the Mata do Choupal, which is a clearly peripheral 'natural' park, the Parque Verde do Mondego is definitely an urban park: the newly established relationships with the urban context in which it is inserted (namely accessibility, permeability and interaction) have greater intensities; besides, the Mondego has indeed gotten closer to the city.



Figure 112: The Parque Verde do Mondego (UE 2) in 2007, on a sunny winter day

Note the still embryonic riparian vegetation three years after the inauguration of this section of the park

Source: MVCC's website



Figure 113: The Parque Verde do Mondego (UE 2) in 2015, on a summer day

The point of view is the same as the one of the previous figure; here, the vegetation completely dominates the landscape, while a segment of gabions (in the foreground) has been eroded by the river

Source: author's archives (4 July 2015)

The footbridge has had a fundamental role in the promotion of such stronger connection, but more intense links with the city around the park could have been further explored, especially on the left bank, where the bordering avenue (which was previously a non-urban road) still represents a barrier. Interestingly, people are now allowed to play on and enjoy the territory which was formerly a 'playfield' mostly reserved to the Mondego itself. The only vestige of the river's past capricious trait seems to be the Mondego nickname (Basófias), adopted as a tribute by the touristic riverboat that is now allowed to navigate its waters all the year round.

Also, the ‘stable’ reservoir was transformed into a privileged location for the practice of several water sports, which have been strongly contributing to the achieved liveability of the park (see Figure 114). The strengthened role of the river as regards the present ambience of the city was indeed remarkably expressed by an interviewee, who described the Parque Verde do Mondego not as two parallel strips along the river, but as a single wide strip that incorporates the river in its centre: “*the river, which is blue, is also the green park*”. Yet, this evocative image could have been more intensely translated into the actual design of the park, even if some water-related features were brought inside the park in different spots, since the first outlines (see Figure 86, on p. 159).



Figure 114: Sailors and the Basófilas boat benefitting from the stabilized riverscape
Source: author’s archives (7 July 2015)

In this regard, a stone fountain in the transition with the adjacent Manuel Braga Park, a linear ditch along the car parks and a pond, taking advantage of a small natural hollow in UE 3, were proposed in the master plan on the right bank, while a canal crosses diagonally the northern section of the left bank. It is noteworthy that in all these examples, water was included as a scenic element, often with a static behaviour and no evident relationship with the river dynamics. For instance, the most relevant locally existing tributary stream (the Arregaça, on the right bank), an obvious sign of the site’s close relationship with the water, was duly highlighted in the master-plan design, while the other minor streams on both riverbanks would be emphasized only in the detailed projects of the corresponding sections¹⁴⁷. At the same time, the two (usually dry) meandering trenches proposed on the right bank recall in a more naturalized way two pre-existing linear water-retaining structures; yet, the relevance of such elements in terms of flood mitigation is restricted to pluvial events and their own hydrodynamic characteristics.

On both riverbanks, a system of pathways was organized around vast lawned areas that allow diverse informal activities. In fact, even if buildings occupy only a small fraction of the park’s total area, the aim of maximizing permeability was further pursued; for example, the car parks’ pavements and the pedestrian pathways were built using permeable materials (gravel and a special porous asphalt, respectively) (see Figure 115). After the January 2001 event, instead of favouring light constructions (which could be easily repaired or replaced

¹⁴⁷ This was probably also a consequence of the parallel elaboration of plans and projects. In fact, the detailed projects for the sections in which all the tributary streams are located were subsequently elaborated by the landscape practice NPK, but only partially implemented.

if damaged) as envisaged in the 1999 master-plan proposal, the strategy chosen to cope with floods was the robustness of the built structures.

In this sense, an example mentioned during the interviews was the use of deep building foundations and resistant finishing materials, so that the constructions are strengthened to withstand future flood events. In line with this, part of the urban furniture (namely on the left bank) is allowed to be submerged without incurring great damage, a factor that facilitates both day-to-day maintenance and post-flood recovery (see Figure 116) – although, arguably, comfort and aesthetics were not equally handled in such design alternative.



Figure 115: The Mondego's water spreading over the permeable pathways

Despite their adequacy, the building materials used cannot cope with the massive volume of water involved in a riverine flood event

Source: author's archives
(10 January 2016)



Figure 116: The left bank's resistant benches, partially submerged during a flood

Source: author's archives
(14 January 2016)

On the right bank, the wide wooden staircase linking the elevated Manuel Braga Park and, at the river level, the new Parque Verde do Mondego announces the proximity to the river, inviting thus people to get closer to it. Next to this staircase, the Docks' complex, just by the river, is in an ideal location in terms of exploiting the riverscape, but in a most sensitive one in case of high waters (this was made even clearer during the two flood events of 2016). While the complex's orientation parallel to the river was most likely conceived as a way to maximize users' and operators' benefits, this has a favourable side effect regarding floods, since the buildings do not obstruct the river flow during high waters, as stressed by some informants. In the same vein, it would also be possible to infer that the openings along the complex (between restaurant units) contribute, in a probably unintentional way,

to the promotion of some hydraulic transparency, potentially favouring the retreat of water after floods (see Figure 117).

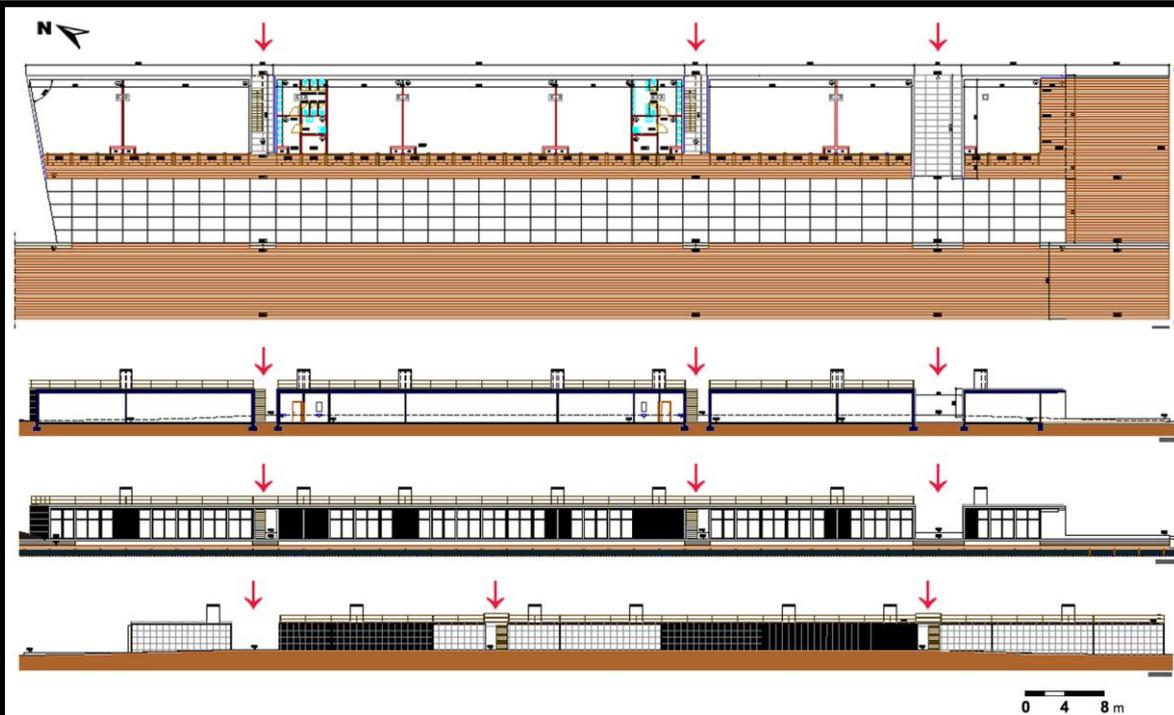


Figure 117: Plan, longitudinal section and two elevations of the Docks' complex

The red arrows indicate the openings along the complex

Source: CMC's archives, © MVCC (modified by the author)

In fact, the Docks are among the main structures that have been experiencing some disturbance during minor flood events since the opening of the park¹⁴⁸. In any case, the Docks' building, which was initially designed just over the water, was raised by more than 50 cm in order to be kept in its intended location (otherwise the water agency wouldn't have allowed its construction). The Docks' terrace was finally designed with two levels: one by the river (a permeable wooden deck through which the river water can be seen) and another one a little bit higher and slightly tilted (paved in part with screed, in part with permeable wooden slabs) (see Figure 118). As explained by one of the stakeholders,

the Docks, for example, were raised by 30 to 40 cm in comparison to their level in the initial project. Of course the result was much less appealing (30 cm close to the water is a big difference); the Docks before were strictly in the continuity of the water, but we had to include a few steps to elevate them a bit. (...) Indeed, the likelihood of flooding with a 30-cm elevation is far lower than without it; therefore it makes sense.

¹⁴⁸ According to two employees who have been working at a pub in the Docks since the opening of its activities (in 2005), they have always been timely informed, by civil-protection officers, when the Mondego was expected to rise (which happened almost every year since 2006), so that they could prepare in advance to have water inside the building. Before 2016, the water level had at most reached 30 cm, and as a consequence they only had to clean the premises after the events, without any significant damage nor major interruption of operations. Such water levels inside the Docks' complex sharply contrast with those reached during the 2016 floods: 85 cm on 11 January and 150 cm on 13 February (heights measured by the author). The first value is consistent with the figures reported by the Portuguese society of engineers: maximum discharge of around 1,500 m³/s at the dam-bridge, and 19.56-m water level just after the Santa Clara Bridge (Ordem dos Engenheiros, 2016, p. 10). According to Soldado (2016c), the Docks' premises have been hit by floods 15 times since the commissioning of the restaurants' operations.

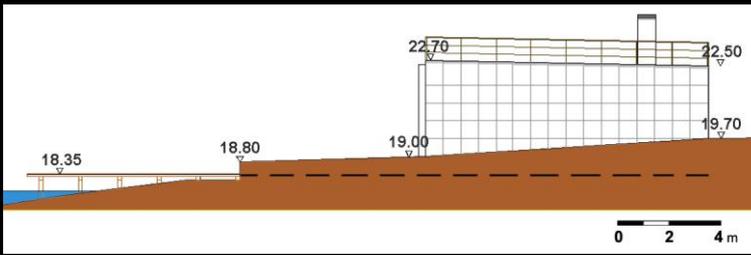


Figure 118: A transversal section of the Docks' complex, showing the split terrace

The dashed line indicates the envisaged level of the Docks' building before the 2001 event

Source: CMC's archives, © MVCC (modified by the author)

Yet, if going beyond the aesthetic dimension and considering other functional aspects, one may say that in this case the designers' response to the flood constraint had even an unintentional positive side effect through the achievement of a more organized layout for the terrace. In fact, the strip closest to the river, dedicated to sitting, eating and contemplating, has gained from being distinguished from the more hectic upper level, intended for circulation (see Figure 119), while the resulting overall space has not lost its riverine appeal (see Figure 120). In any case, the previous quote from an interview clearly shows both an acceptance of changes in the design of the Docks due to floods and an understanding of the rationale behind this. Such observation was even complemented by another informant in the following terms:

The restaurants were finally located at a level that allows the water to flow over their terrace. It is normal that in a normal year the water level reaches the terrace; it was designed taking this into consideration. The green park itself was conceived in such a way that if there is a flood it functions as a buffer for the ensuing waters.



Figure 119: The two distinct ambiences of the Docks' split terrace

On a competition day, even the calm space closest to the river became a busy spot

Source: author's archives (12 September 2015)

The latter interviewee indeed highlighted the acceptance, in the Docks' terrace, of floods themselves and their potential disturbance, a stance that was generally agreed on by all the interviewed stakeholders. However, this shared statement strikingly contrasts with two facts, both related to third-party interpretations. On one hand, it is notable that among the several written articles in architecture and urban-design publications (including some prepared by the park's designers themselves), the floodable nature of the park is barely mentioned¹⁴⁹, as if this

¹⁴⁹ See for example Milheiro *et al.* (2006), Krauel (2008) or Fernandes and Cannatà (2009).

aspect was not in the very essence of this riverine intervention¹⁵⁰. On the other hand, images of the flooded Docks' terrace have been overtly used by the media (at both local and national levels) as a sign of greater risk or even of failure¹⁵¹, revealing an enduring sharp divergence between the lay and the more engaged points of view (see Figure 121).



Figure 120: The Docks' complex seen from the Santa Clara Bridge
Source: author's archives (13 January 2013)



Figure 121: The Docks' terrace during a minor flood, on 10 February 2014

This scenery is commonly presented as a failure, and not as an adaptation strategy

Source: TVI24 (2014)

One can infer from this association ('flooded Docks equal failure') that the possibility of having a riverine park that tolerates flood events may not be completely accepted as a design goal in this particular context. One may thus ask: what would then be the fate of floodable riverine urban areas (in Coimbra and elsewhere) when even a green park is perceived as an inadequate design choice within them? In fact, minor flood events might be happening more frequently than previously expected, in particular due to the aggravated silting conditions; the absence of dragging since the commissioning of the dams upstream may be interpreted as a human inaction that has been steadily increasing flood risk locally.

¹⁵⁰ The sole references in this regard are LAE's and PROAP's accounts of the protective role of the West Entrance in relationship to the Santa Clara-a-Velha site (LAE, 2009; PROAP, 2010a). Despite having highlighted the floodable nature of the site, the assessment of the Parque Verde do Mondego within the 2010 edition of the Public Space Competition (organized by the Centre de Cultura Contemporània de Barcelona) did not explore, for example, the park's overall behaviour during floods (Bravo Bordas, 2010).

¹⁵¹ See, for instance, the accounts of a sequence of minor flood events in the beginning of 2014 in several newspapers, such as *As Beiras* (2014), *Correio de Notícias* (2014), *Diário de Coimbra* (2014) or *Público* (2014), apart from the several news related to the two 2016 floods (although differently from all the previous floods since 2001, the latter events can hardly be qualified as minor ones).

Yet, such passive behaviour was not anticipated during the design process, which somehow took the riverbed level for granted.

For example, similarly to the other buildings within the park, the electrical sockets were safeguarded in the Docks, being located at least at 1 m above ground, a measure that was nonetheless not enough to withstand the highest water level attained in February 2016 (see Figure 122). Also, according to an interviewee, a particularity of the Docks' design is the use of the same longstanding principle of the housing units in the Baixa: *“the Docks' building has some gadgets, some small profiles with floodgates to be put on the doors when the water rises more than expected”*. Yet, this information was not confirmed through *in loco* observations; in addition, resorting to such movable devices was not considered a truly effective strategy by the same informant himself, who complemented: *“anyway, I think that what they basically have is a disclaimer saying that the restaurant operators will not blame nature for spoiling a French-fries machine when the water rises”*¹⁵². What this quote from a 2013 interview clearly shows is that water levels as the ones experienced in 2016 were taken as inconceivable during the design process, and thus not considered at all (even as a remote possibility). Unfortunately, the January and February 2016 floods caused the damage and indeed complete loss of much more than *“a French-fries machine”* (see Figure 123)¹⁵³.



Figure 122: Highest water levels reached in the Docks' complex during the two 2016 flood events

Source: author's archives (21 February 2016)



Figure 123: Outdoor damage incurred in the Docks' complex during the January 2016 flood

Source: author's archives (14 January 2016)

¹⁵² Besides such disclaimer, the restaurant operators (as well as the swimming pool operator) were supposed to have flood insurance to face the potential damage engendered by this kind of events (CMC, 2016a).

¹⁵³ The damage inflicted by the February 2016 flood on municipal assets (mostly on the ones located by the river) was assessed by the CMC at almost two million euros (CMC, 2016b).

Going back to an overview of the structure of the park on the right bank, in the vicinity of the Docks' complex a big green bear looks after a small playground that draws together children and parents on dry days. In terms of floods, this focal sculpture could have been explored for sensitization purposes had it been planned to also function as an informal flood-metre. In fact, during regular low-intensity flood events, the legs of the green bear are quickly submerged, a fact that could have been without doubt anticipated (see Figure 124).



Figure 124: The green bear reached by Mondego's waters during a minor flood on 4 January 2014

Source: Público (2014), © Adriano Miranda

In practice, the Docks' building, their terrace or the green park itself have been overall taken as indicators of the rise of the Mondego, especially by the media (as mentioned above). Along the right bank, several segments of the shoreline, which has been stabilized with gabions, presently reveal the erosive work of the river; and since this has not been countered with timely reparations, the borderline keeps being redesigned after each flood event (see Figure 125).

A more direct contact with the river is fostered by six wooden piers that project themselves over the river and constitute pleasant platforms for fishing, sport activities and contemplation. In fact, these are the sole structures in the park in which the riskiness of Mondego's riverbanks was (cautiously) explored as a design input (see Figure 126). Yet, some involved entities have expressed their concern related to the risk of drowning, although this issue is not particular to Coimbra and the Mondego, but, in different degrees, inherent to any waterfront. As satirized by an interviewee, somehow unburdening himself,

I remember that at a certain point I had to spend some time trying to convince some well-intentioned people that it was not necessary to fence the shoreline in order to impede people from throwing themselves into the river. (...) Some people thought that, since the area would now have users, the river had to be fenced (as a matter of fact, it would be even nicer if we fenced the entire Portuguese coastline in order to impede people from falling into the sea...). You know, common sense is very hard to obtain, it takes a lot of time to be established; normally people don't have it.

As a means of reinforcing the unity of the park, the wooden piers were also integrated in NPK’s detailed design for UE 3 on the right bank (9 ha, not yet built), which follows closely the general layout anticipated in the master plan, with just a few alterations (see Figure 111, on p. 180). For instance, the pond near the library, envisaged in the master plan, would be eliminated, in order to highlight the Mondego as the sole expressive water body in the park’s premises; in its place, NPK suggested using typical swamp vegetation, adapted to the site’s floodable character (NPK, 2007). Moreover, instead of resorting to gabions to define the borderline, they proposed to use concrete slabs, more in line with their design of UE 6, on the left bank (also not yet built).



Figure 125: The impact of water and time on the Parque Verde do Mondego’s right-bank segment

Source: author’s archives
(8 July 2015)



Figure 126: A warning on the risk of drowning, near one of the right bank’s wooden piers

Source: author’s archives
(24 January 2016)

Linking the two riverbanks, the footbridge designed by the engineers Cecil Balmond, Adão da Fonseca and Arup AGU eventually became the park’s most impressive landmark (Jegundo, 2006; Lopes, 2006). Its design consists in two parallel segments, projected one from each of the two banks. The apparent mismatch between these two lanes is only denied towards the middle of the river, where both sides get wider in order to establish contact and unite, at a spot that converts the footbridge “into a destination itself” (Balmond Studio, 2006), extrapolating thus its primarily functional role. Interestingly, the stairs of the footbridge approaches on both riverbanks become temporarily inaccessible throughout ‘trivial’ high-water periods; during the episodes of January and February 2016

(which cannot be classified as trivial floods), not only both stairs but also the left bank's footbridge ramp itself went under water (see Figure 127).



Figure 127: The footbridge approach on the left bank can become inaccessible during floods

The pedestrian link between the two riverbanks was also broken in January and February 2016 due to the presence of water in the tunnel under the Inês de Castro avenue
Source: author's archives
(11 January 2016)

This fact may raise two opposite interpretations: first, one may think that if flood proneness had been fully incorporated in the design of the bridge (that is, reflected in the adjusted location and height of its approaches), the possibility of using it to cross the river during flood occasions might have been considered and such disruptions could have been avoided. On the other hand, the interruption of the pedestrian link between the two riverbanks may be simply regarded as a way to acknowledge floods as disturbing events (as they normally are) and thus to accept the transitory and intermittent presence of Mondego's waters in the park. Actually, such perturbations probably do not represent a real problem, given the occasional use of the park (especially on winter days, when floods might be expected) and the footbridge (which after all is not a local critical transport infrastructure).

None of these two hypotheses is favoured in our analysis; in fact, the occurrence of floods since the park's inauguration does not provide clear clues about the due consideration of the behaviour of the whole park (not only of the footbridge itself) during these events. Yet, we can affirm that the consulted documents related to the plans and projects elaborated for the park do not account for different water levels. That is, the sole scenario considered consists of the 'normal' 18-m level of the reservoir, while the expected 'maximum' flood level (21 m) was only taken to define the areas where constructions should not be pursued (with a few exceptions, in which some adaptive measures were fostered). As such, as far as revealed by the master-plan documentation, no hydraulic modelling was performed to investigate the park's overall behaviour under different water-level scenarios. Despite the January 2001 event, floods – minor and/or significant ones – within the park area were not proactively anticipated within the design.

Having most of their areas dedicated to temporary activities or greenfields, the premises of the Parque Verde do Mondego on the left bank are somehow closer to the river and have a plainer design, when compared with the right bank. In fact, through an artificial canal, the river itself symbolically penetrates into the park, up to a small pond next to the northernmost building, which congregates several support activities for the nearby open-air stage (backstage, toilets, administration etc.). The Choupalinho's segment was flanked by a pathway with riverine trees just nearby the water, being now a favourable spot for fishing.

The precinct of the Praça da Canção Square (which was mainly conceived to host large events such as student festivals, circuses or amusement parks, being thus able to be temporarily fenced) was paved with gravel, a material that can withstand both water and the intermittent heavy loads related to its intended uses (see Figure 128). Some water-sport facilities were placed on the river itself, nearby a small paved beach, which invites people to enter into Mondego's cold but rather clean water (see Figure 129); this is indeed the main entry point of athletes and amateurs with their equipment (rowing, sailing, windsurf, paddling etc.).



Figure 128: The left bank's Choupalinho, planned for more intense (albeit temporary) uses
Source: author's archives (8 July 2015)



Figure 129: More direct contact with the water is propitiated on the left bank
Source: author's archives (4 July 2015)

Land grading around some major trees gives dynamism to the lawn (which was mostly kept flat on the right bank), and this creates some interesting spots near the river for sunbathing during winter or, conversely, for escaping from the direct sunlight during summer. Other spaces not related to the water – a camping area, a skatepark, a playground for children and a picnic zone – were placed a bit far from the shoreline, closer to the park's vehicle access, contiguous to the bordering avenue. The structures that would host more intense and/or frequent uses (an administrative building, a tramway shed and five unspecified urban equipment, all of them not yet built) were located in the fringes of the floodable area, while the sailing club's building, the swimming-pool complex and a (still unbuilt) restaurant on stilts were placed rightly within the floodable area (see Figure 106, on p. 176, and Figure 109, on p. 179) (MVCC, 2004).

The sailing club clusters in fact the premises of three different water-sport entities, their buildings being mostly dedicated to the storage of small vessels and sport-related equipment, a use that is in principle not at all vulnerable to floods. In a previous version of the plan, these facilities were situated very close to the shoreline, almost on the same parcel where they were originally installed (see Figure 70, on p. 137, and Figure 86, on p. 159). Yet, after the 2001 flood episode, the buildings had to be moved back a little to comply with the new requirements (although in terms of flood behaviour, the distance itself is less important than the overall morphology of the floodplain).

According to an interviewee, this shift from the immediate shoreline was the source of complaints from the sailing club's members, and a lot of negotiations were hence required to resolve the final location. Finally settled not so close to the river (and thus not representing any significant barrier effect vis-à-vis rising waters – see Figure 130), the sailing club's facilities have the same orientation parallel to the river as the Docks' building on the opposite bank. However, contrary to the Docks, these premises can be qualified as “resilient buildings”, using RIBA's nomenclature (2009, p. 25), since they can easily recover after floods, as it was the case during both 2016 episodes (see Figure 131).



Figure 130: The sailing club's new premises (during the January 2016 flood event)

The new location as close as possible to the Mondego's waters
Source: author's archives
(11 January 2016)



Figure 131: The straightforward recovery of the sailing club's premises after the January 2016 flood

The day after the flood peak, the facilities and equipment only needed to be cleaned up
Source: author's archives
(12 January 2016)

The swimming pool facilities, which should be located as close as possible to the shoreline according to the master plan's report (MVCC, 2004), were as well placed backwards due to flood concerns. As stressed by a stakeholder, “*things were generally moved back; for example, the envisaged swimming pool (which was finally implemented) (...) had to be distanced, but in the original design the swimming pool was very close to the water (which was also much more interesting).*” In fact, according to the initial design proposal, these facilities could have benefitted from the river itself (its water), as it is the case for instance of the Marzili swimming pool in the Aare River (Bern, Switzerland) or the Badeschiff swimming pool in the Spree River (Berlin, Germany).

Such retreat could have been even stronger had INAG's concerns related to this equipment been fully accounted for; however, the CMC (2004) argued that such exposed location (at about 50 m from the river) was necessary in order to achieve the urban and environmental requalification objectives attached to the Polis Programme (see Figure 132). And since the swimming pool would be a leisure equipment closed during the winter, the CMC (2004) also recalled that “people's safety would be guaranteed during flood situations”. In any case, the final envelope of the swimming pool, as it was conceived by the architect Paulo Albuquerque, is mostly hydraulically transparent, not blocking the natural water flow during high waters.

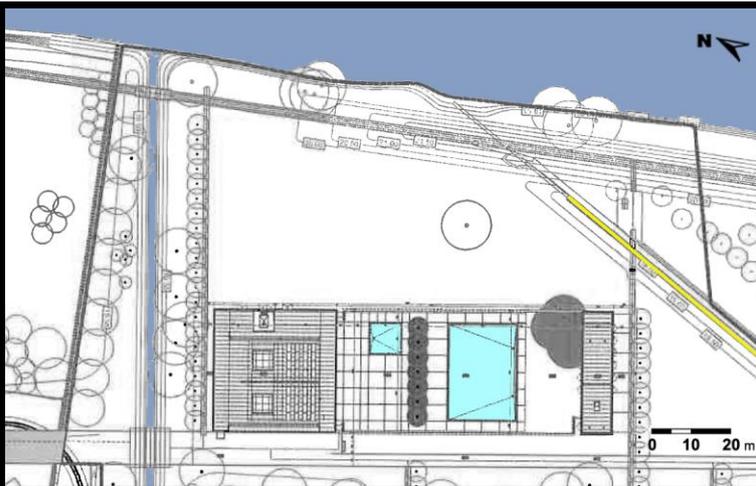


Figure 132: The final plan of the swimming pool's complex, located at 50 m from the shoreline

Legend:

- blue: the Mondego and one of its minor tributary streams
- light blue: swimming pools
- yellow line: a former flood-protection wall

Source: CMC's archives, © NPK & Paulo Albuquerque (modified by the author)

On the left bank, the most impressive ‘retreat’ was experienced by the theme park. In this particular case, a flood-adapted structure did not seem to have been posed as a valid option after the 2001 event, even if the park's scientific vein would have been totally in line with a more integrative approach to floods. As a consequence, in the space formerly allocated for this large infrastructure, the master plan of 2006 proposed a sequence of four smaller modules to host cultural and ludic activities, in the fringe of the flood-prone zone, and a bigger building outside the floodable area, without specifying its precise use (see Figure 109, on p. 179) (MVCC, 2004). Since then, only one structure was actually built in this space: the Exploratorium, a sort of science museum for children (previously located in the premises of the municipal library – Casa Municipal da Cultura), which in a way recaptures the programme and the scientific focus (the human body) of the theme pavilion of the former theme park. The initial section of the Exploratorium, inaugurated in 2009, occupies two of the smaller blocks (900 m²), while its second section corresponds to the larger building anticipated in the master plan (1,800 m²).

Together with the municipal swimming pool, the Exploratorium is presently one of the anchors of the Parque Verde do Mondego on the left bank, although its spatial articulation with the park as a whole does not seem to be well defined. Contrary to the previous theme park that had clear and strong relationships with the Mondego (see Figure 90, on p. 163, and Figure 108, on p. 177), this smaller project, as conceived in the final master plan, has completely disregarded the advantages of being located in a riverine park. For instance, water was barely explored in the space around the building, which hosts some outdoor educational activities.

And since the intensification of urban occupancy in this section of the left bank did not happen (yet?) as expected, the Exploratorium somehow remains an isolated structure, connected neither to the park (to which it turns its back), nor to the city fabric nearby, which is still marked with a strong rural atmosphere. In any case, the possibility of experiencing floods was dealt with in the Exploratorium's project through the elevation of its smaller blocks (see Figure 133 and Figure 134), thus abiding by the generic requirement set in the master plan. As explained by an interviewee, *“despite the fact that the first section of the Exploratorium is located in the floodplain (yet, in accordance with the master plan), the core activities were planned on or above the 21-m level; this was one of the measures taken to protect from the flood effects.”*

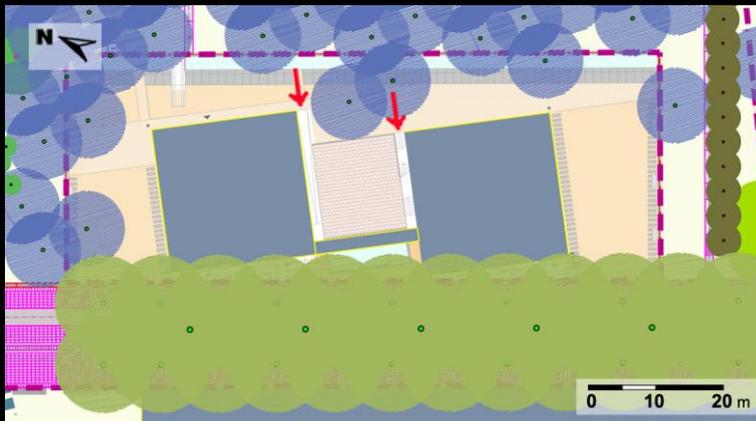


Figure 133: Ramp and stairs to reach the 21-m level in the Exploratorium (plan)

The red arrows indicate the accesses to the first two blocks from the lower level

Source: CMC's archives, © Sítios e Formas



Figure 134: Ramp (in the foreground) and staircases to reach the 21-m level in the Exploratorium

Source: author's archives (12 January 2016)

The swimming pool and the Exploratorium were in fact the only components of the park's UE 6 that were implemented during the Polis Programme. In any case, NPK's proposal for this area was mainly a landscape intervention, in line with the natural ambience intended for the sections closest to the Rainha Santa Isabel Bridge. The detailed project kept some of the existing walkways, all the natural draining paths and the overall orange orchard structure (NPK, 2007) (see Figure 111, on p. 180). Two water-related elements were in principle also highlighted in this project: an existing stream, which was previously relegated, now borders the swimming pool facilities, and a former flood-protection wall (which used to protect agriculture plots) structures a pathway that crosses diagonally this park section (see Figure 132, on p. 193). However, both are presently hidden by the existing riparian vegetation, revealing a sharp contrast between the good intentions of the design and the effective use and maintenance of this space.

Flood proneness was likewise a fundamental issue behind the decisions regarding the future of the Monastery of Santa Clara-a-Velha, whose site is susceptible not only to river floods but also to pluvial ones: the natural drainage of the nearby hill used to run to the Mondego directly through it. While the cofferdam protects the heritage site (the old church and the open-air ruins), the new museum facility, detached from the monument and thus outside the protected zone, was allowed to be built rightly in a floodable area. This was indeed the most coherent location to host a related museum, even if the site is prone to floods; besides, no other suitable location would be available near the monument. In this sense, to be protected from floods, the building was raised on stilts (see Figure 135 and Figure 136).



Figure 135: The new building that hosts a museum for the Monastery of Santa Clara-a-Velha
Source: author's archives
(13 January 2013)



Figure 136: The stilts fulfilling their role during the January 2016 flood
Note the interesting mirror effect created by the stagnant flood water
Source: author's archives
(11 January 2016)

The choice of this building typology was more a 'technical' solution than an 'aesthetic' option, as underlined by one of the designers (Costa, 2015) and also supported by one of the informants:

The museum is not raised on stilts to abide by modern architecture canons; it is this way because we acknowledge that once every 100 years a flood can reach its ground-floor level. All the important materials that can be damaged during a flood were located upstairs.

While this formulation clearly expresses the acceptance of floods, it also reveals that the common misinterpretation of the centennial-flood notion is not the prerogative of laypeople, being equally shared by well-informed professionals (more than one interviewee in the Coimbra case provide such illustrations). Yet, the same person specified: “[t]here is no guarantee that what was done will be completely effective [during a flood event]”, also recognizing that full knowledge and control of floods are indeed unattainable, a condition that had been assumed since the beginning of the archaeological works.

For instance, the temporary module used by the archaeologists during that time, located exactly where the museum’s premises would be built, had been elevated, being placed “over a mountain of stones”, a clear sign that, likewise, the design of the new building “had to be proactive”, as stated by one of the stakeholders. Also regarding the museum’s premises, another interviewee complemented by saying that

the building itself tells the story of the site; it is not by chance that it is raised on stilts. In spite of its contemporary nature, the building depicts exactly the still prevailing worries of escaping from the water (...). So the building is a contemporary landmark, but one that is imbued with the history of a flood-prone territory. Anyone who stares at that space should see that fleeing from the water was not only a concern of the nuns who used to live there, but also a present-day issue, and this was also duly taken into consideration in the design.

Besides the temporal continuity in the relationship with floods that the museum symbolically represents, its location in a floodable area had, of course, clear implications not only in terms of its design but also in terms of its actual construction. The building of its foundations was particularly complex, because, as stated by one of the interviewees, “the site was always full of water” (the water table is indeed very high), in such a way that the whole building process was qualified as a “torment”. For example, in the several occasions that the pumps broke down, the water percolated back into the site, delaying the related works in the old church and around it. Ultimately, elevating the museum building brought with it the possibility to introduce a reflecting pool near the cafeteria, mimicking the effect of the water when it used to occupy most of the Monastery’s domain (see Figure 137, Figure 138 and Figure 139).

The reflection produced during centuries by the still water (see Figure 78, on p. 150) is now performed on a daily basis by the glass façade of the new building, which has “turned into a kind of mirror of the scene that it observes” (Atelier 15, 2009, p. 14). Only very sporadically is it possible to experience similar mirror effects, when the stagnant flood water reflects the museum’s premises themselves, as it was the case in the two 2016 flood events (see Figure 136, on p. 195, and Figure 140 below). Not only is the new building a contemporary testimony that contributes to the maintenance of flood awareness, but the permanent exhibition that it hosts also stresses the significance of water during the Monastery’s lifetime. A small module, named the Water Memorial, partially hangs above the reflecting pool (in the foreground of Figure 139); a special documentary portraying the

whole process of emptying the centuries-old puddle is continuously screened in it during visit hours¹⁵⁴.

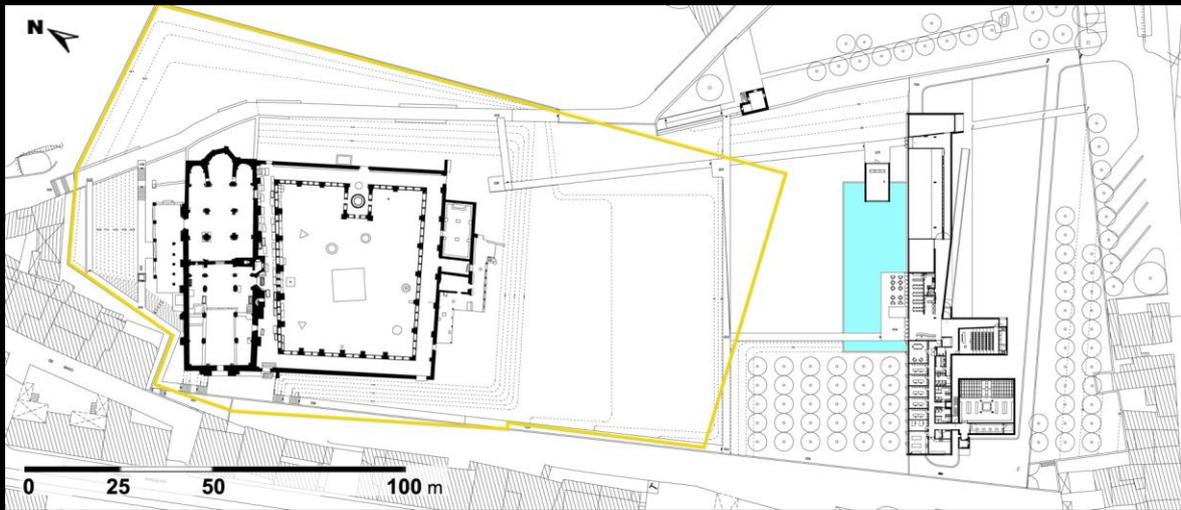


Figure 137: Plan of the Monastery of Santa Clara-a-Velha's complex

Legend:

- yellow line: limits of the cofferdam
- blue area: reflection pool

Source: Atelier 15 (2010a), © Atelier 15 (modified by the author)

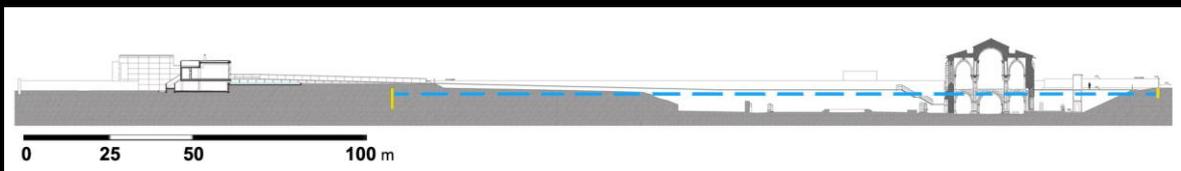


Figure 138: Section of the Monastery of Santa Clara-a-Velha's complex

Legend:

- yellow lines: limits of the cofferdam
- blue line: approximate level previously attained by the water

Source: Atelier 15 (2010a), © Atelier 15 (modified by the author)



Figure 139: The cafeteria's reflection pool recalling the centuries-old pond

Source: author's archives
(13 January 2013)

¹⁵⁴ The documentary in question is *Memorial à água – intervenções contemporâneas*, a 2008 17-minute production by Laranja Azul (Catarina Alves Costa and Catarina Mourão). As of September 2016, the Water Memorial has been closed and the presentation of the documentary to the visitors has thus been discontinued.



Figure 140: The entrance of the Monastery of Santa Clara-a-Velha's complex, flooded in January 2016

Source: author's archives
(11 January 2016)

As highlighted by an interviewee (and observed *in situ* by the author), shivering water reflections from the pool infuse into the Water Memorial during parts of the day, a fact that can be perceived, according to the sensibility of each visitor, either as a disturbing factor or as a lived expression of the water itself. Artificial water sounds also fill the overall space of the church's ruins, which, according to the proposed standard visit circuit, should be reached only after watching the water documentary. As explained by an interviewee, "*people who enter the church without having previously watched the film have a completely different sensation; the documentary has exactly this intention: to create sensations.*" Nevertheless, despite these past and present references to the presence of water in the site, the museum's exhibition (including the aforementioned documentary) completely overlooks the new 'technical-cultural' device – in the sense used by Bandeirinha (2009) – and the related negotiation process that have turned possible the experience of the Monastery in a permanent dry environment.

For instance, no clue is given to the museum's visitors on the issue, as if the water had simply and suddenly disappeared by chance. When questioned about this, an interviewee asserted that the cofferdam was indeed an important technical element for the project "*but perhaps not valued enough by the heritage community*". Such defensive structure was thus not only physically masked through land grading, but was also veiled from people's perception and imagination. Of course the cofferdam should not compete with the existing heritage monument, but being taken solely as a highly technical and 'neutral' device has prevented it for example from being showcased also as an early-21st-century engineering landmark. Masking the cofferdam implied hence leaving the technical device in the background and making flood risk less perceptible – in the same way that the main flood-defence structures raised to protect Coimbra and the Lower-Mondego are physically and mentally far away from the protected people and assets. Making the cofferdam's presence more legible would have brought to light not only "*the memory of the probable threat*" but also the contemporary existence of this still probable threat.

In fact, according to an interviewee, the cofferdam can be overtopped during more intense flood events (its highest point stands at the 18-m level, as shown in Figure 99, on p. 169), although a system of reinforced-concrete walls and landfills was installed on the top of some of its segments (reaching the 20-m level) precisely in order to prevent damage from floods (Rosa *et al.*, 2002). In any case, it would be more precise to acknowledge the

cofferdam as a defensive structure exclusively related to ground-water floods (involving thus only percolation processes), and not to river-related ones. Interestingly, in 2002, a few years after the start of the archaeological explorations, the cofferdam had the opportunity to expose its adverse effects. Following a minor urban flood that completely filled the monument's site again with water drained from the hill nearby, it was very difficult to bring the area back to the dry condition, since the cofferdam, already in place, "*functioned the other way round*", acting as a trap that impeded the water from draining naturally into the Mondego¹⁵⁵ (see Figure 141).



Figure 141: The water trapped by the cofferdam after a pluvial flood event in 2002

Legend:

- red circle: the Santa Clara-a-Velha heritage site clearly entrapped between hill and river
- yellow ellipse: the new Santa Clara Monastery, built uphill to flee the water in the 17th century

Source: CMC's archives, © Adelino Oliveira (17 May 2002)

In fact, since the construction of the Inês de Castro Avenue (raised on a dyke and thus separating the Santa Clara-a-Velha heritage site from the shoreline), the avenue itself had also been responsible for this same trapping effect. Yet, the two accesses to the Parque Verde do Mondego that were opened under the avenue during the Polis Programme have reduced its barrier effect vis-à-vis the water draining from the hill. In the two flood episodes of 2016, the cofferdam was indeed overtopped and functioned again as a trap. In these two situations, the Mondego's waters entered the Monastery's premises from the overloaded drainage system around the area, which worked the other way round, bringing the river back into the site (a possibility that does not seem to have been anticipated through hydraulic modelling¹⁵⁶) (see Figure 142).

As for the ruins of the church, one of the openings in the upper floor recalls a former window that was improvised into the main entrance to the building when its ground floor

¹⁵⁵ As explained by an interviewee, after the inception of the cofferdam, "*there was a set of drainage devices in the hill that ensured that such an event would not happen (and after that, it has never happened again; it seems that something was done in this regard)*".

¹⁵⁶ Indeed, all the area behind the Inês de Castro Avenue (including the Monastery's premises) is oddly not qualified as susceptible to floods in several recent modelling exercises, considering either the centennial flood scenario or the hydraulic data of January 2016 – see for instance LNEC (2012), APA (2016b) and Ordem dos Engenheiros (2016). Two major factors for the flooding of the Monastery's premises are not considered: the avenue's two pedestrian underpasses and the setbacks of the overloaded drainage system.

became continuously submerged (see Figure 143). The balcony connected to this window proposed by Atelier 15 in a previous version of the project (which was finally not retained) (Atelier 15, 2010b), would have even reinforced such memory. Plates made of weathering steel, a water-resistant material, were used in the floor of the church, since “*it is still anticipated (or at least admitted) that more floods may happen*”, as pointed out by one of the stakeholders (see Figure 144). The water marks on both the façade and the interior of the church (also shown in Figure 144), were considered an “*ugly*” shortcoming of the constant flood situation of the past by an interviewee.



Figure 142: The Monastery of Santa Clara-a-Velha's site flooded in 2016

Source: author's archives
(12 January 2016)

Yet, as a subtle “subnature” manifestation (Gissen, 2009), they indeed inform the visitor about contingency and the passing of time: it is not by chance that these water marks also somehow evoke the rocks' natural geological strata. In the words of the designers, the ruins of the church are a “[w]itness of the destructive power of time and of the triumph of nature over culture”, having the role of evoking “the glorious past and the expiry of all things” (Atelier 15, 2009, p. 14). In order to maintain the building under the same conditions that govern all living organisms, the authors intended to

keep the ruin in silence, open to time and to bad weather, consecrating its abandonment. The intervention as a whole aims to enhance the reading and the visit of what remains from the Monastery. It does not merely intend to consolidate, but it certainly does not aim to restore, reset, recover or reuse the site. The usefulness of the ruins will only be related to those activities that can both adapt to its precariousness and gain from its dramatic character (Atelier 15, 2010, n.p.).



Figure 143: General view of the southern façade of the Santa Clara-a-Velha church

The leftmost window opening recalls a former improvised entrance to the church's upper floor

Source: author's archives
(13 January 2013)



Figure 144: The new flood-resistant floor and the “ugly” old water marks inside the Monastery’s church

Source: author’s archives
(4 September 2016)

This perspective not only gives historical continuity to the heritage monument, but it acknowledges that despite having resorted to a complex and expensive technological solution, the site certainly remains as susceptible to floods and the Monastery’s premises as fragile to them as they have always been. The acceptance of this certainty is indeed one of the reasons behind the success of this project, which does not assume that floods have been relegated as an issue of the past, as formulated by one of the interviewees:

This site is not a dry place; despite being dry today, it is a place in which water is really present: turning off a switch is all it takes for the water to start rising (we often transmit this idea to people). Therefore, the imminence of the return of the water is a feeling as simple as a switch: if we turn it off, two days later the area is filled with water again.

In order to further safeguard the medieval monument, the design of the green park’s West Entrance, located alongside the Monastery, incorporates some additional flood-defence elements: floodgates were placed in the Inês de Castro Avenue’s underpass, and an embankment was also built, with slopes that make the access of Mondego’s waters even more difficult (see Figure 145 and Figure 146). Besides its protective function (see Figure 147), the embankment was intentionally placed over a segment of the Monastery’s cofferdam, somehow masking this structure (see Figure 137, on p. 197), and includes a sidewalk on its top that offers special views of the monument (GBA/PROAP, 2006).



Figure 145: The final plan of the Parque Verde do Mondego’s West Entrance

Legend:

- dashed red lines: underpass
 - purple: the Monastery’s church
- Source: PROAP (2010, p. 138),
© GBA & PROAP (modified by the author)



Figure 146: The Parque Verde do Mondego's West Entrance, just after completion in 2007

Source: CMC's archives



Figure 147: The West Entrance performing its water-retention role in January 2016

Source: author's archives
(13 January 2016)

Considering the existence of the cofferdam around the heritage site, both the floodgates and the embankment play a redundant role in terms of protection, a favourable risk adaptation strategy as expressed by the notion of “planned redundancy” (Jha *et al.*, 2012, p. 413). According to the 2009 LAE review of European water-related landscape interventions, “[t]he key issue of this project is the combination of two uses in the same space, first as a retention basin for the capricious river in the middle of the city, second as a broad expanse of urban open space complementing the narrow spaces of the old town” (Diedrich, 2010, p. 25). Previously included within the Parque Verde do Mondego’s master plan, the West Entrance was eventually designed by GBA and PROAP (in the framework of the master plan for the Portagem – Avenida João das Regras axis¹⁵⁷), having kept the initial aspirations for the garden in terms of scale and spirit, creating thus a transition interface between the ‘urban’ left bank and the new riverfront.

According to the landscape architect João Nunes (2009), PROAP’s general manager, the main challenge of this project was to transform the site from an isolated depression (a clear

¹⁵⁷ Due to the new flood levels and the related large investment cost, the tunnel proposed on the left bank by this master plan was eventually considered unfeasible; therefore, a simpler but effective same-level traffic solution was chosen and implemented. In any case, according to an informant, the road’s heavy traffic, whose impact was supposed to be minimized with the proposed tunnel, had been drastically reduced with the commissioning of the Rainha Santa Isabel Bridge.

residual space after the construction of the Inês de Castro Avenue) into an articulation of pathways in different levels. In its section dedicated to the “systems of flood protection”, the design memorial of this project also recalled that land grading was made only with very gentle slopes “as a means to allow walking on them and thus facilitating the evacuation of the premises in case of danger” (GBA/PROAP, 2006, p. 5). Anyway, since the design of this space should not create any intrusive landscape around the Monastery, no building was proposed within its boundaries (it is therefore totally transparent from a hydraulic point of view, just as it was before); consequently, there will probably be no real need for evacuating people in case of floods.

Although not a regular practice (as expressed by several interviewees), the designers of the three neighbouring riverine projects (namely, the Parque Verde do Mondego, the Santa Clara-a-Velha Monastery and the West Entrance garden) have worked in close articulation, while water has acted as a common thread. As previously referred to, the West Entrance plot and the Santa Clara-a-Velha site shared not only physical edges but also the overall solution for the immediate surroundings of the heritage complex, which was, among other, a timely response to water-related issues (see Figure 148).



Figure 148: Spatial integration between the Monastery's complex and the West Entrance garden
Source: author's archives (13 January 2013)

Yet, less evident than the toning relationships between these two projects is the connection between the design proposal for the Santa Clara-a-Velha complex and the Parque Verde do Mondego's left-bank segment. In a combined drainage solution linking these two projects, the water that is now pumped on a daily basis out of the heritage site re-emerges in the Choupalinho¹⁵⁸, feeding the canal that runs diagonally along the left bank, before reaching the river (see Figure 149). As pointed out by an interviewee, “*in a normal situation, the water in the canal would be somehow stagnant (accumulating litter, dry leaves etc.), but since the water pumped from the Monastery flows into this canal, it can be kept clean*”; yet, in the account of another informant, this intention was not fully accomplished (without specifying the reasons behind such failure).

¹⁵⁸ According to the interviews, the water volume presently pumped represents only 6% of the volume pumped before the commissioning of the cofferdam.



Figure 149: The water pumped from the Monastery's site reappears in a channel on the left bank

Source: author's archives
(24 January 2016)

In sum, the Monastery's history brings a lesson that is of utmost contemporary relevance: despite being near the river, the site where the complex was initially located was probably not supposed to be floodable when the decision to build it was taken in the 14th century. As highlighted by an interviewee, the Portuguese queen who supported this initiative would not have chosen a site known to be floodable for the construction of the Monastery¹⁵⁹. However, due above all to the silting process, the context drastically (and rapidly) changed after the location decision: the riverbed rose and the river began to overflow into a wider and more elevated area, until finally reaching the Monastery's premises.

This fact brings to the fore the pair of opposites formed by certainty and the unexpected, which is presently at the core of all hydrometeorological risks in the context of climate change; in this perspective, water's dynamics are increasingly being driven by cultural dynamics. Inspired by the Monastery's case, one of the informants astutely questioned, in the following terms, the human power to prevail over 'nature':

Will we human beings be able to overcome nature with all these devices (dams etc.)? Well, it's a fact that we won't. The ruin is prepared, the new building is on stilts (we indeed don't want the water to reach the museum's collections); as for the church, well, it has historically lived with the water, it may suffer some damage but these ought to be minor ones.

Acceptance of the unforeseen was a smart point of departure in this design process; certainty, in this case, does not refer to an idealized expected scenario, but to the anticipation that, just as in the past, riverine floods will certainly happen again (even if they are now more explicitly driven by a combination of natural and human factors). In any case, several interviewees acknowledged that the presence of water in the Monastery's complex during centuries was a fundamental factor behind the conservation of the rich collection of artefacts presently exposed in the museum and of the ruins themselves ("*the water enabled the freezing of the heritage site*"). In the same token, floods were also acknowledged as a kind of 'blessing' for the city as regards the possibility of now having a large riverine park. In fact, as stated by one of the designers,

¹⁵⁹ In this sense, the architect Graça Dias also notes that "if rains had been stronger in Coimbra at the end of the 1310s, there would probably not have been great and heroic statements about the nuns' stubbornness" (2009, p. 17).

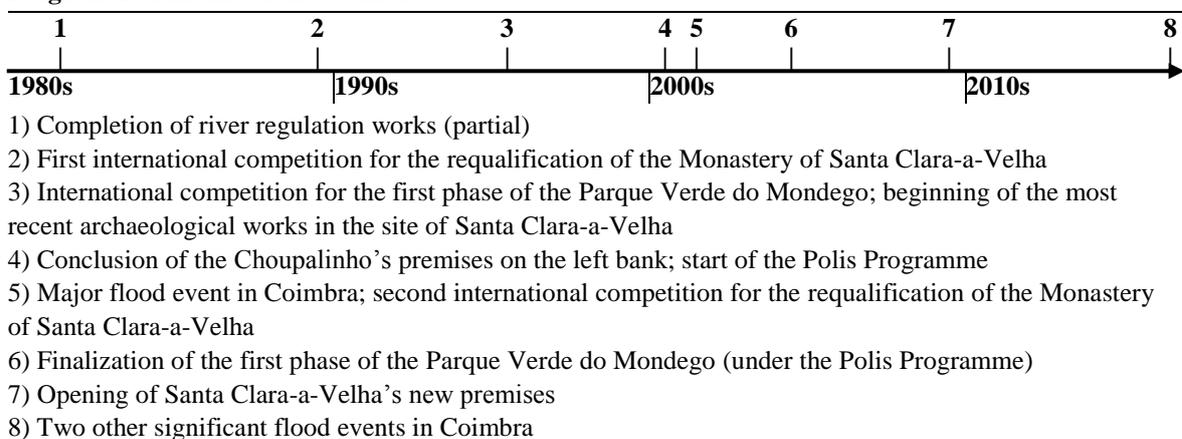
the Parque Verde do Mondego is an excellent and rare opportunity, since it was offered to the city by the floods of the Mondego. That is, the fact that the river had always been untamed (...) hindered the occupation of the riverbanks by constructions: there were only agricultural fields, and no industrial or other urban uses as it is common in most cities (...). The waning of the agricultural activities made it relatively simple to create a riverfront here (in contrast with other cities, where it is necessary to demolish derelict factories or other buildings to do so).

But contrary to the design process related to the Monastery's requalification, the one of the Parque Verde do Mondego did not anticipate the occurrence of floods also as an opportunity to create a mutable – dry and also wet – riverine public space, in which the river's overflows could play an important sensitization role for Coimbra's population. In any case, the two flood events of 2016 have shown that even the Monastery could have better anticipated the functioning of its premises during the periods in which the site is again dominated by the water. Altogether, the two projects of the Coimbra case exemplify a design perspective in which the Mondego's waters are (more or less) well tolerated, although, as shown in this section and by the recent floods themselves, the river and its dynamics could have been much more cared for within both the design processes and their ultimate outputs.

4.5 Chapter summary and tentative conclusions

The timeline of the plans and projects around the Polis Programme in Coimbra and their main contextual underpinnings are synthesized in Diagram 1. From the descriptions and analyses presented in the sections above, the design and decision processes related to these plans and projects have unveiled some general themes related to the articulation between design and floods, possibly leading to some lessons to be learnt. These main themes, mostly derived from the experience of the Parque Verde do Mondego's intervention, comprise: (1) 'the nature paradox'; (2) 'legal issues'; (3) 'floods as a timely scapegoat'; (4) 'flood awareness not necessarily translated into a proactive standpoint'; and (5) 'residual flood risk perceived as an indicator of failure'. All these themes had clear implications for the resulting design outputs in the Coimbra case.

Diagram 1: Timeline of the Coimbra case



Source: elaborated by the author

The first theme relates to the identified paradox in the perception and attitude towards nature and includes key issues such as naturalness, image and control. In fact, the Parque Verde do Mondego project highlights an interesting ambiguity in the desire to bring (back) nature into the core of the city, which could be tentatively stated as: ‘we love nature in our city (but it must be totally under our control...)’. The aspiration for naturalness expressed in the design process of the park (notably in the design brief) seems restricted to the image held by nature in terms of the quality of contemporary urban settings. This view strongly reflects the imagetic aspect of riverfronts – an issue emphasized within the Polis Programme as a whole –, in line with the predominant approach in landscape design described by Prominski (2006) (see comment on p. 62).

If this argument holds, the original vitality of the Mondego River related to its torrential regime does not actually have a place in a context in which image prevails over process, and in which the control of the river has also been historically advocated. Yet, the rainfall regime (with heavy rains concentrated in the winter), the major factor behind the river’s behaviour, did not change with the construction of the dams system upstream of the city. In contrast, the Mondego River has not been perceived anymore as a living entity after the regulation works; therefore, its active ‘personality’ and ‘whims’ were not transposed to the design task, in which the stability paradigm dominated.

Indeed, most of the urban floodplain had been vacant or underused for centuries; yet, only when the riverscape was perceived as ‘stabilized’ (or ‘controlled’), the creation of a riverine park was triggered, in which it would be possible to be in contact with the ‘river’ (a tamed river, though, from that point on). Of course an untamed river would have called for temporary uses on the riverbanks, but this did not have to directly imply the lack of urbanity and of effective appropriation of the riverfront. It is even possible to identify specific past initiatives in this sense: in the 1930s and 1940s, for example, Coimbra was the stage of a seasonal riverine beach encompassing the two riverbanks, with its first version designed by the architect Luís Benavente (see Figure 150 and Figure 151) (Gazeta de Coimbra, 1935; Rodrigues, M. C., 2003).



Figure 150: General view of Coimbra’s temporary riverine beach

Such facilities were successively installed between 1935 to 1945, during summertime
Source: CMC’s archives



Figure 151: A temporary bridge was among the facilities of Coimbra's beach, between 1935 and 1945

Source: CMC's archives

In spite of their temporary nature, these facilities were installed during a decade (between 1935 and 1945), in summertime; of course, this initiative had high operational costs (the ultimate reason behind its discontinuation), but during its lifetime, it managed to create the same riverfront ambience and vitality of today, without having to previously ensure the 'full control' of the river¹⁶⁰. In contrast, the recent stabilization of the river and the 'control' of its whims seem to have been too easily associated with (more or less) fixed hydraulic conditions, thus nurturing a paradigm of stability. Anyway, one of the most important questions raised by the Coimbra case is related to the perceived incompatibility of having a green park in a floodable area, as expressed for instance by the concerns of some institutions involved in the design process (see p. 173). The simple banning of uses in flood-prone urban areas was caricaturized by an interviewee in the following terms:

This is very good for biodiversity, because these places that cannot be used get full of rats (which are animals that do not have the risk problem, so they go there). Such a management also has these kinds of problems... The dangerous places are not used by people, so they become small urban jungles, which is good (there are weeds, wild animals, abandoned dogs and litter). I think it is better to have a place that from time to time one needs to say "don't go there"...

This quote perfectly exemplifies the idea of flood-prone spaces as 'non-territories', left without use or occupation in view of their perceived dangerousness; yet, it also judiciously recalls that risks of a different nature can be triggered by the lack of appropriation. In any case, using flood-prone zones to host parks has been a timely alternative all around the world to guarantee that these areas are integrated in the urban fabric (instead of being left as wastelands within cities) and are thus effectively used by people, even if on an intermittent basis¹⁶¹. Of course, designing such spaces implies the acceptance of river variations and also of some manageable occasional damage, which on the other hand promote flood-risk visibility and culture in the city in question.

Because of this paradox embedded in the Coimbra case, although the main ultimate output of the Polis Programme was obviously a floodable park, it is possible to say that the site's

¹⁶⁰ In order to ensure a sufficient volume of water alongside the urban beach, a temporary barrier beneath the Santa Clara Bridge used to be raised during summertime, being afterwards dismantled.

¹⁶¹ Two exemplary European interventions in this sense are the Besòs River Park in Barcelona (Langenbach, 2007; Prominski *et al.*, 2012) and the Isar River urban beach in Munich (Prominski *et al.*, 2012; Rossano & Hobeica, 2014).

flood proneness was not duly emphasized in the design. It is even interesting to note that despite the occurrence of a flood event during the design process, it is not really straightforward to figure out to what extent the final design proposals were conceived to cope with the future occurrences of such contingencies, even the minor and more regular ones. Therefore, since river fluctuations had for a long time been recognized as a disturbing element in Coimbra, it seems that there was no place for a strategy to accommodate the dynamics of shifting water levels in the design of the park. Although water proximity was the most desired feature of the park, being physically close to the river paradoxically meant being disconnected from its variation. But this condition was not inescapable; there are indeed several examples of riverine interventions that benefit from water-level variations during floods, following an accommodating strategy¹⁶².

In fact, a symbolic dimension potentially plays a key role in the Coimbra case: a stronger recognition of the residual flood risk within the area could be (wrongly) interpreted as a failure of the supposed definitive river-regulation works (desired for centuries and much praised by the local population) or even of the park's design itself¹⁶³. And although the park was not exactly designed to better accommodate the temporary excesses of the Mondego's waters (but at least to tolerate them), this misinterpretation has already been occurring, as previously shown (see p. 186). One hypothesis that can be raised in this regard is that the existence of a strong control mechanism upstream may have hindered the proposal of spaces or structures to be also dedicated to the river (such as large empty ponds to be only filled in with water during river floods, to function as controlled-flood areas). Therefore, the static approach of abiding by the 21-m threshold was considered enough to safeguard the park's facilities, in such a way that the silting process was understated as well.

Yet, this standpoint carries in itself another paradox: the same dams system that was built to control flood risk is now potentially a new source of such a risk, either through the possible need to occasionally release more water than usual (related or not to mismanagement) or, more remotely, through the unlikely (and seldom mentioned) possibility of a dam failure. This idea was particularly well formulated by the sociologist Delta Silva (2004, p. 18), for whom "structures like dams do not eliminate flood risk, yet they transform it", by lowering its probability or by creating new inducing phenomena. Indeed, although the dam-collapse scenario was included in the civil protection's flood-contingency plan (CMC, 2015), it is not at all emphasized when higher discharges, sometimes needed to protect the dam itself, are made (an argument that nonetheless does not justify privileging energy production instead of flood protection in the most critical periods).

Bureaucracy and the excess of rules – especially regarding the flood issue and the REN status of the area – were acknowledged as real constraints in this case, more important perhaps than floods' intrinsic limitations, in the account of some interviewees; these two

¹⁶² See for instance the two riverine parks in Spain (namely in Zuera and Zaragoza) designed by the practice Aldayjover Arquitectura y Paisaje, in which the hydrological regimes are similar to the one of the Mondego (Prominski *et al.*, 2012; Hobeica & Hobeica, in press).

¹⁶³ In this same vein, Idalina Baptista argues that 'control' is indeed a wished-for quality in the recent Portuguese planning culture, in opposition to the prevailing 'untamed' nature of contemporary Portuguese cities (as perceived by many scholars in the urban field) (Baptista, 2008; 2012).

topics form the core of the second theme raised by our analyses ('legal issues'). Anyway, since the beginning of its elaboration, the design of the park has strictly abided by the regulations then in force, namely the requirement to keep 90% of the area permeable. As a consequence, after the 2001 flood event and the ensuing adoption of more restrictive rules, only minor details were changed: the overall layout of the sections already implemented was indeed totally preserved.

The segment that changed most – its programme and building envelope were so reduced that they were completely eliminated – refers to UE 6 on the left bank, which was then (and still is at present) a secondary location as regards the city's centrality. Yet, it should be noted that the site's susceptibility to floods was here taken as the sole factor to justify the unfeasibility of the theme park's implementation – see the city council's minutes of 17 June 2002 (CMC, 2002) –, even if there were strong economic reasons not to go ahead with such an enterprise, as highlighted by some interviewees. Had this project been considered financially feasible, technical options do exist to design and build taking the flood constraint into account; these means could have been used, but they were nevertheless not called upon (this aspect indeed stands at the interface between the 'legal issues' and the next theme, 'floods as a timely scapegoat').

In this case, legislation (including the definition of the REN's boundaries) may particularly be seen as a problem since it then took a top-down approach, only partially permeable to the unveiling of conflicts and to open negotiations, as expressed by some informants. The performance of 'design and floods' within such framework can barely escape from some sort of path dependency (namely related to the paradigm of stability), even if designers' mindsets generally go in the opposite direction, as expressed in the following interview quote:

You know, the role of the designer is to try to do what s/he is not allowed to. Really, it's a matter of putting a little more pressure, otherwise we would risk falling into a crafty business of following exactly the rules so that nobody bothers us. We have to go a little bit further, we have to resist this trend and try to do things that are not consensual, for consensus is not worth it.

This statement somehow reflects the design's dimension of structuring unforeseen demands through reflexive practices, as argued by Krippendorff (2007) (see p. 54), but it also stresses the negative weight of legislation in this particular case. Anyway, it is worth noting that, when aiming to ban the occupation of flood-prone urban areas, governments demonstrate a high degree of caution, which has obvious repercussions in terms of accountability (since the burden associated to flood damage is often left to the institutions responsible for the flood legislation in force). Therefore, besides safeguarding people from disastrous floods, stricter rules may also be understood as a better protection of the legislators themselves from people's grievances, when such events occur, a subject that is not related to the third identified theme, 'floods as a timely scapegoat'.

This issue ('floods as a timely scapegoat') seems to have long-lasting roots. For instance, it is interesting to note that during the history of cities, floods have always been reported as a process that has hampered their continuous flourishing; nonetheless, damage related to flood events in Coimbra are largely referred to in generic terms (Martins, 1951; Ramos,

1998; Paiva, 2005). Indeed, flood damage, both in terms of affected people and lost assets, has only rarely been detailed. Since data regarding monetary losses, both direct and indirect, is often kept as confidential by the insurance industry, this fact may be quite understandable, but it may also indicate a biased flood-risk perception more than real extensive destruction. Two exceptions in this regard are a minor reference presented by Sanches (1996, p. 118) (a value of around 17 million euros of monetary losses incurred in 1960) and the *DISASTER* database initiative. The latter nevertheless does not account for the monetary value of the losses, but only for social damage (namely the number of deaths and of people injured, evacuated or made homeless due to flood events)¹⁶⁴ (Tavares *et al.*, 2013; Zêzere *et al.*, 2014).

In fact, there is another interesting point worth noting in this regard, closely related to flood-risk perception: many authors refer, at the same time, to the frequency of flood events and the exceptionality of their magnitude¹⁶⁵, which seems somewhat inconsistent. That is: one may conceive that flood events in Coimbra were historically either frequent (thus having relatively low expected damage) or exceptional (with greater and unexpected effects). One argument that may explain this apparent countersense is the potential political implications of summing up two seemingly urgent factors – the recurrence and the severity of floods –, which go in the same direction: the necessity of better flood protection. Therefore, in combination these two conditions could have greater influence when demands for ultimate ‘solutions’ are claimed from the concerned authorities at a higher governmental level. In this sense, one may reasonably infer that flood risk could have been historically overestimated in order to increase the national visibility of Coimbra’s floods.

If the assumption of the existence of a biased flood-risk perception is considered valid, one may probably say that such bias has drastically changed from an overestimation of flood risk and the related damage in the past to their sub-estimation after the execution of the most recent hydraulic works. As analysed by the geographer Isabel Paiva and the sociologist Delta Silva (2006), the 2001 flood event illustrated both the vanishing of flood-risk culture and the absence of proactive behaviours during the emergency situation. In particular, these authors pinpointed that the sub-estimation of flood risk was a heuristic strategy demonstrated even by some key players working in concerned institutions (related to land-use planning, flood management and civil protection) in the district of Coimbra (Paiva & Silva, 2006). Silva (2004, p. 18) refers as well to the “social undervaluation of risk”, leading to the haphazard – but not illegal – occupation of the Mondego’s floodplain and to the biased perception that flood events are not expected to occur anymore (as if the hydraulic works had also interfered in the precipitation regime in the river basin).

Therefore, it seems not to be by chance (but historically anchored) that floods were taken as a timely scapegoat by some of the Docks’ businesspeople to justify the closure of their enterprise during the 2013-2014 winter (see Figure 152). The same situation was

¹⁶⁴ According to the database, during the period between 1865 and 2010, there were 124 flood events in Coimbra, leading to 16 fatalities and 477 people evacuated, the last event with fatalities (2 cases) being in 1955 (Equipa *DISASTER*, 2012).

¹⁶⁵ See for instance Ramos (1998) or Paiva (2005).

experienced after the January 2016 flood, when the considerable damage suffered by the Docks' concessionaires duly justified such an attitude. Regarding the elaboration of the park's master plan, the effect of 'flood as timely scapegoat' could be seen in the passive attitude taken by the designers, as illustrated in the master plan's report (MVCC, 2004) (see comment on p. 176). In fact, when design could effectively make a difference with respect to the structures located in a floodable zone, the only specific recommendation for the projects to come was to attain the 21-m level, which was finally bureaucratically determined. Even if this requirement was based on the water level reached during the 2001 event, no consideration was given, for example, to the flow content and velocity, and to the water depth in specific locations, which could also constitute more reliable flood-risk indicators.



Figure 152: Floods presented as the reason behind the closure of one of the Docks' cafés (2014)

The zoomed-in notice states:
 "Dear clients,
 Due to floods, we will reopen soon.
 The management"
 Source: author's archives
 (28 March 2014)

The fourth theme raised during the analyses of this case concerns the fact that the existence of flood awareness did not necessarily mean a proactive standpoint regarding the risk. As referred above, the master plan for the Parque Verde do Mondego has somehow shown a passive attitude vis-à-vis floods; although the plan stressed them as an issue, it left the possibilities and decisions on how to deal with them totally open, as if they were not a concern to be managed also within the plan itself. Could we associate this with a way to circumvent greater responsibilities? In any case, the stability paradigm that underlay the design process is patent for instance in the conception of the 2001 flood event as a "*human error*" that could have been avoided, which implies that since it happened once it would not recur anymore.

At the same time, more frequent and less severe flood events were merely disregarded as unimportant, even if a certain degree of flood awareness was present, as shown, already in 1998, in an article by the civil engineer Carlos Ramos (1998) describing the regulation works in the Lower Mondego. As one of the consultants of the engineering firm in charge of the works, Ramos (1998, p. 23) argued that:

There is an awareness that the best solution is not to drastically eliminate floods and the related sediment transport, but to control and coordinate their frequency and volume with a renewed balance of the riparian environment and surrounding areas, in a manner consistent with the local socioeconomic base. [italics in the original]

Ramos (1998, p. 23) complemented that the adopted solution for the regulation works was aligned with such a reasoning, provided that the management of the infrastructures recently commissioned and the ones to be finalized is adequate, and that complementary non-structural measures are adopted as well. Nonetheless, such holistic view does not seem to have been embraced by either the local authorities or the designers working within the Mondego's riverscape. In fact, the identified gap between awareness and proactivity vis-à-vis floods is not expressed only in the park's master plan but also in a larger instance and in another initiative carried out in Coimbra. Despite the fact that the first national coordinator of the Polis Programme was a hydrologist who considers that "[f]lood hazard management epitomises the multi-dimensional nature of much environmental management" (Correia *et al.*, 1998, p. 209)¹⁶⁶, floods do not seem to have been duly integrated as an environmental concern within this national programme.

One indication in this sense is the series of books about the Polis Programme published by Parque Expo – notably Ferreira (2007), CESUR (2007) and Saraiva (2010) –, which addressed themes such as environmental mainstreaming, sustainable urban development or sustainable relationship between cities and rivers. Floods were not presented in any of these publications as an environmental issue, but only as a minor idiosyncrasy of the riverine setting. One may argue that a question of timing perhaps lies behind such perceived relegation, since the integrated approach to floods did not yet configure then a strong European trend. On the other hand, as regards the design process of the green park, since more than 20 years have passed since its beginning, one may also argue that the awareness expressed now by the interviewed stakeholders did not necessarily exist at the time, but simply represents a current response to (re)new(ed) concerns.

Anyway, it is also possible to identify such an inertial perspective in a more recent and more localized initiative: between 2011 and 2013, Coimbra (through its municipality and its main university) participated in the European programme denominated "Eau comme Patrimoine" (Water as Heritage), in partnership with the cities of Comaccio (Italy), Braila (Romania) and Lille (France). Aimed at exchanging experiences and know-how related to urban and landscape regeneration of riverine cities, the programme had among its expected outputs the elaboration of design proposals for each concerned riverfront. In the Coimbra case, only the Mondego River was included as local 'water heritage' – the existing small tributary streams that permeate the city were simply disregarded –, although the importance of the Mondego for the local culture was duly acknowledged by the involved team (Cardielos *et al.*, 2013a). The boundaries of the study were indeed extended to include other segments of the Mondego outside Coimbra (Cardielos *et al.*, 2013b); yet only the river's pacified (or less exceptional) conditions were taken into consideration in their proposals.

Following this, in the final section of the report of one of the programme's workshop (held in Lille), one finds an interesting note that provides some insights about the relationships

¹⁶⁶ Francisco Nunes Correia was the national coordinator of the Polis Programme between 2000 and 2003, and was in charge of the ministry of environment and territorial planning between 2005 and 2009. Full professor of environment and water resources in the Instituto Superior Técnico (the leading Portuguese engineering higher-education establishment), Correia has been extensively involved in research activities related to flood management.

between the city (Coimbra), its river and (current and future) urban designers working in this setting. The note recalls that floods were indeed recognized as an issue in Coimbra but the involved team did not manage to integrate such dynamics in its spatial proposals. In their own words: “[i]n its initial phase only one project from Coimbra took into account the aspects of flood protection but later presented no answer to how buildings located within the floodplain should be constructed” (EPAT, 2012, p. 12)¹⁶⁷. This attitude is very close to the one demonstrated in the master plan of the Parque Verde do Mondego: flood awareness was clearly shown, but a truly proactive stance towards such issue was not (yet) present.

The last identified theme – ‘residual flood risk perceived as a failure’ – may somehow be a consequence of the absence of such a proactive stance towards floods. Indeed, minor flood events have been occurring since 2001 (as registered in the *DISASTER* database, up to 2010), even hampering the due implementation of the park’s works (Jornal de Notícias, 2006). Accordingly, the Mondego’s overflows onto the Docks’ terrace have been the norm since the opening of its bars and restaurants, as already mentioned (see footnote 148, on p. 184). Besides the attested uneven management of the dams (Santos *et al.*, 2001; Ordem dos Engenheiros, 2016), a major cause behind such minor recurrent events is related to the long-lasting silting phenomenon affecting the Mondego basin (which may be now also considered a sub-product of the river-training interventions). As described by an interviewee, “*the fact is that, differently from its appearance, the river has little water, and if there is a high-water event... it is indeed easy for a glass full of sand to overflow with just a few drops of water, and this is what may happen there...*”

In fact, the silting process was indicated as a major factor behind the January 2016 flood (Ordem dos Engenheiros, 2016), but it was apparently neglected not only by the designers but also by the commissioners and overall stakeholders involved in the Coimbra Polis programme, a fact that exemplifies the prevailing flood-risk culture and stability paradigm. On one hand, the responsibility for flood losses was formally transferred from the municipality to the concessionaires of the park’s infrastructures (namely on the right bank), as if the silting process – which requires management by the responsible public bodies – was not a pressing issue. As highlighted by an informant, “[*having water on the Docks’ terraces*] is a contingency of that location, and this is written in the rental contracts; I remember that this has been discussed, and the renters knew from the outset that the water could get there.” Indeed, the operation licence conceded by the CMC to the restaurant operators included the following clause (CMC, 2016a):

The concessionaire shall exclusively bear the risks related to unpredictable circumstances, including those derived from floods. The threshold level of the Docks’ premises is 19 m and the water level is expected to reach 19.5 m (with a discharge of 1,200 m³/s, corresponding to a 1-in-5-year flood) and 20.9 m (with a discharge of 2,000 m³/s, corresponding to a 1-in-20-year flood). The concessionaire’s project shall be developed in such a way as to minimize the impact of these floods, regarding in particular the protection of people and assets through the elaboration of an emergency plan.

¹⁶⁷ Two written documents about the Coimbra project (included in another publication of the “Eau comme Patrimoine” programme) also unveiled this gap: while floods are presented as an important issue in the historical and geographical context of Coimbra (Cardielos *et al.*, 2013a), they are completely absent in the chapter in which the Coimbra team illustrates the project’s achieved outputs (Cardielos *et al.*, 2013b).

Although the discharge values indicated were somehow inflated, not corresponding exactly to the baseline of the regulation works (in which 1,200 m³/s would be the so-called ‘centennial flood discharge’ and 2,000 m³/s the so-called ‘millennial flood discharge’)¹⁶⁸, the possibility of having 1.9 m of water within the Docks’ premises with such probability of occurrence (5% a year) would be rather unacceptable. Even if this probability seems still quite low, the expected damage would be very high, as unfortunately attested by the February 2016 event. In any case, despite the increased figures stated in the licence terms, neither the designers and municipality officers nor the restaurant operators expected the Mondego to reach such high levels. The only fair reasoning to accept such licensing condition may indeed be associated to the social dimension of floods, namely the short-sighted memory of the concessionaires, who – in the same way of the other involved actors – had then full confidence in the regulation works. In any case, it would not be reasonable to make only the concessionaires accountable for the damage incurred during the two flood events of 2016, as duly expressed by one of the councillors at the CMC’s meeting of 21 April 2016 (CMC, 2016d).

On the other hand, despite the clauses included in their licences, the renters showed a low acceptability of the residual flood risk even before the 2016 events, as expressed by their enduring complaints regarding the sequential losses due to smaller flood events (As Beiras, 2014). This fact raises the question of whether the increased maintenance costs ensuing from such episodes were duly assessed prior to the commissioning of their businesses. In this regard, an interviewee noted:

[W]e know that (...) from time to time we’ll need to invest to rehabilitate the Docks; from time to time these natural conditions [i.e. high waters] will happen, somehow damaging and deteriorating the prevailing situation and making it necessary to intervene. (...) [A]nd one can say that we can never relax, because these phenomena, which used to happen every 100 years, began to happen every 50 years and are now happening every 10 years. Nobody knows if in 20 years from now they will begin to happen every 2 years, right? The meteorological conditions that we were used to, the average values and the statistics are being questioned on a daily basis by climate change. This worries us, it’s a fact.

This assertion opens a debate related to the perception that the Mondego’s floods are presently more frequent than expected: would this be due to epistemic risk (meaning that floods were not duly investigated at the outset) or to ontological risk (linked to the real dynamics of flood risk and its intrinsic changes)? Or yet, can this perception be somehow related to the supposed ‘failure’ of the hydraulic works that should ‘prevent’ floods from happening? In any case, it should be recognized that when the Parque Verde do Mondego’s plan was initially formulated, possible local consequences of climate change were not so stressed yet by the Portuguese scientific community. In fact, two important flood-research initiatives would only be carried out in Portugal after the conclusion of the Polis Programme: CIRAC (“Cartas de Inundação e Risco de cheias em cenários de Alterações Climáticas” – Floods and flood-risk maps in climate-change scenarios) and “Urbanized Estuaries and

¹⁶⁸ One may quite reasonably argue that, with these increased figures, the CMC staff were taking into account the silting process (thus going against the stability paradigm), but no updated study or modelling were found that justify these new values. In any case, the discharges attained on 11 January and 13 February 2016 – 1,495 m³/s and 1,970 m³/s, respectively (Brandão, personal communication, 8 September 2016) – were very close to the ones anticipated in the operational licence document.

Deltas: in search for a comprehensive planning and governance: the Lisbon case”¹⁶⁹. Yet, this fact does not allow us to infer that climate-change concerns were ignored by both municipal officers and designers in the Coimbra case, somehow contradicting the previous quote.

In any case, as recalled by the geographer Pedro Santos about the Coimbra case (personal communication, 2 August 2017), one should consider that having flood defences in place is not enough. It is also necessary to train and articulate flood-related operations (for example, the floodgates of the West Entrance’s underpass were simply not closed during the January 2016 event, as attested in the report elaborated by the Portuguese society of engineers (Ordem dos Engenheiros, 2016)), and to ensure maintenance, including the regular dredging of the river. These facts bring to the fore accountability issues that are also related to the ‘perception of the residual flood risk as a failure’; the flood events of January and February 2016 are good illustrations in this regard.

Indeed, before the regulation works, excessive rains were considered the major reasons behind flood events in Coimbra; now an institution (when not several ones) is pinpointed as responsible for the ‘disaster’ (CMC, 2016e; RTP, 2016). For instance, in January 2016, when the premises of the Monastery of Santa Clara-a-Velha were flooded, the Monastery’s administration alleged that no timely warning had been received; therefore the management of the Aguieira dam will in principle be accountable for the damage incurred in the heritage complex (Vicente, 2016; Soldado, 2016a). Yet, it seems that the concerned stakeholders have forgotten that the very existence of the Mondego’s hydraulic system was the trigger behind the revamping of the Monastery; actually, without the ‘control’ of the Mondego’s waters, no institution would have been encouraged to undertake such investment in the heritage complex. Hence, the damage incurred from time to time could be seen as part of the costs to be borne to ensure that the heritage site is back to its dry state and accessible for people’s enjoyment (the ensuing repair needs should thus be included as contingency costs, equating to regular operational costs or, since not on a yearly basis, to reinvestment outlays).

On the other hand, it is worth noting that the source of flooding in the Monastery’s premises seems to be now not directly related to the river’s overflows but to the overloads of the drainage system (which worked the other way round, bringing the river’s waters to the site)¹⁷⁰. This backflow phenomenon may have been overlooked in the flood modelling elaborated in the framework of the project¹⁷¹ (although the actual document for the

¹⁶⁹ Financed by the insurance industry (namely the Associação Portuguesa de Seguradores) and implemented between September 2010 and August 2013 by the CCIAM (Centre for Climate Change Impacts Adaptation and Modelling) of the University of Lisbon, the CIRAC project focused on assessing the expected economic losses in future urban-flood events incremented by climate-change effects, and on mapping urban flood risk in different climate-change scenarios (Action Modulers, 2013). The study targeted four well-known flood-susceptible urban contexts (focusing mostly on urban floods): Oeiras, Coimbra, Lisbon and Oporto. In its turn, the “Urbanized Estuaries and Deltas” project, carried out between April 2012 and March 2013 by the CIAUD (Centro de Investigação em Arquitetura, Urbanismo e Design) of the University of Lisbon, studied the adaptation of Lisbon’s riverfront to different scenarios, taking into account possible territorial impacts of the sea-level rise and increased floods (Costa, 2013; Costa *et al.*, 2014).

¹⁷⁰ This aspect was verified *in loco* by the author, during the floods of January and February 2016.

¹⁷¹ As informed by an expert, flood models often do not include local structures at the micro level such as drainage systems, which in this case have been the major source of floods in the heritage site.

Monastery of Santa Clara-a-Velha’s hydraulic works was not consulted). Thus, in their report about the January 2016 flood, the Portuguese society of engineers recommended “the elaboration of professional studies of hydraulic engineering aimed at reformulating the Monastery’s drainage system and ensuring the watertightness of the underpasses’ floodgates” (Ordem dos Engenheiros, 2016, p. 11).

Even the adequacy of the design of the Docks’ premises was questioned by one of the CMC’s councillors, during the meeting of 21 April 2016 (CMC, 2016d). The councillor Paulo Leitão (the engineer who was in charge of urban management in the previous municipal legislation) recalled that dredging the river may possibly not be enough to solve the flood problem in that location, and suggested that the municipality review the initial project of the Docks in order to verify the existence of possible ‘design errors’ (CMC, 2016d). In a way, the councillor was arguing that the cause for the damage incurred during the 2016 events may be also classified as a “*human error*” that could have been avoided. Again, this argument pinpoints to the fact that perhaps the sociocultural dimension of floods was underestimated in the design process of the Parque Verde do Mondego.

As regards the park’s design itself, the left bank, with its simpler layout, seems to have better tolerated the Mondego’s waters during the two 2016 events than the right bank (which experienced more damage, despite its quicker evacuation of the water). Yet, at least part of the damage incurred on the right bank did not necessarily derive from inadequate design, but rather from poor maintenance¹⁷². In fact, some of the structures that were damaged during floods (for instance, the wooden floorboards) were previously in need of repairs¹⁷³ (see Figure 123, on p. 187, and Figure 153 below). The contrast between the smooth recovery of the sailing club and the one of the Docks after the floods was probably not only a question of exposure, but also of vulnerability.



Figure 153: An example of flood damage on the right bank

In the centre, a segment of the wooden floorboard that was already damaged before the January 2016 flood, which was thus quite easily displaced with the water flow
Source: author’s archives
(12 January 2016)

¹⁷² One may say that the long-lasting silting process is also an expression of poor maintenance in a larger sense.

¹⁷³ Differently from the left bank, the management of the park’s right-bank section was delegated to the concessionaire of the Docks; before January 2016, there were visible signs of degradation and ‘abandonment’ of the open space around the Docks’ premises (including in the terrace itself). As expressed by some interviewees, the management of the park’s premises as a whole was anticipated as a potential problem by the stakeholders of the Sociedade Coimbra Polis, but the business model then suggested – to support its maintenance through part of the revenues generated within the park (student festivals, restaurants, water sports etc.) – was not validated by the municipality. In this sense, lack of adequate maintenance (evidenced, for example, by the accumulation of litter or toppled gabion sections) contributed as well to the severity of flood damage in 2016, while also creating other risks for the park’s users.

The case of Coimbra has shown the prevalence of a fatalist attitude, namely the necessity of experiencing yet another important flood event to act regarding flood mitigation and adaptation. For instance, the dredging of the river (for the very first time since the commissioning of the dams system in the 1980s), officially agreed on by the CMC and the APA in 2013, was only initiated in the summer of 2017 (see Figure 154) (Melo, 2013; Loureiro, 2013; Soldado & Andrade, 2016). On the other hand, the Docks’ project was finally reviewed by MVCC after the 2016 floods and now contemplates the possibility of business continuity in case of floods, with the addition of a second floor (Marques, 2017).



Figure 154: Dredging works in the Mondego River

The dredging vessels should be a more regular component of Coimbra’s stabilized riverine landscape

Source: author’s archives (19 November 2017)

Although the new project was not consulted (apart from the 3-D rendering showcased at the Docks – see Figure 155), we may say that the forthcoming refurbishment of the Docks’ premises gives Coimbra a timely opportunity to make flood risk more visible and apprehensible in the Parque Verde do Mondego. In this regard, the levels reached by the Mondego’s waters in 2016, instead of being simply erased (as “ugly” marks) and then forgotten, could be retained and even highlighted as powerful reminders of the dynamic presence of the river in the city (Hobeica & Hobeica, in press). Such levels could for example be duly indicated within the public toilets (a possible illustration is shown in Figure 156), without compromising the overall exterior appearance of the building.

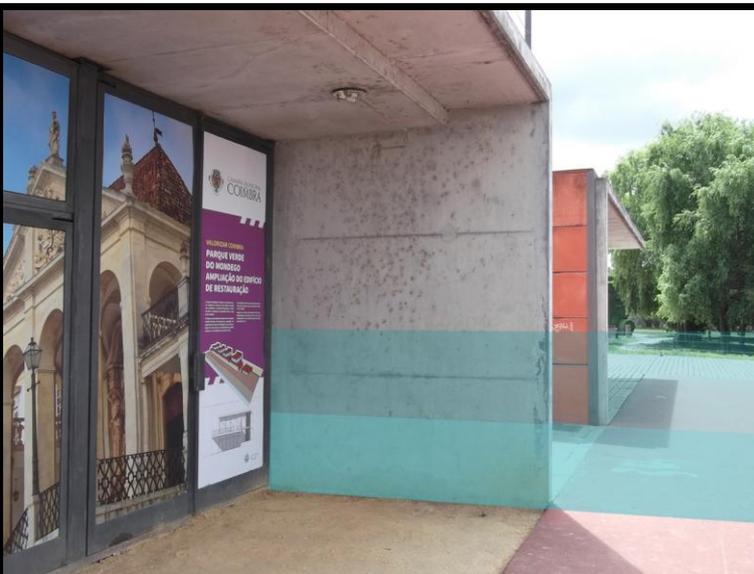


Figure 155: The flood-adapted design of the Docks, showcased at their abandoned premises

The two water levels indicated here are the ones attained in January 2016 (the lowest) and February 2016 (the highest)

Source: author’s archives (29 May 2017)



Figure 156: A possible design effort to contribute to the adaptation of mindsets to floods

What if the water levels attained in January and February 2016 were highlighted in the walls of the public toilets within the Docks' premises as a flood reminder?

Source: elaborated by the author (based on a photograph taken on 4 September 2016)

To conclude, the five main flood-related themes emerged in the Coimbra case are summarized in Figure 157; nonetheless these themes do not cover all the interesting issues raised in the case, several questions being still left open. For example, one may ask: if the Parque Verde do Mondego is someday fully implemented (up to the Portela Bridge), would the certainty paradigm regarding dealing with floods, which has prevailed up to now, still hold? To what extent has the revised project for the Docks' complex learnt from the park's own flood experiences and has thus taken into account both its physical and sociocultural dimensions? Besides the idea illustrated in Figure 156, what could be the possibilities to counteract, through design, the short-span memory regarding floods in this particular case?

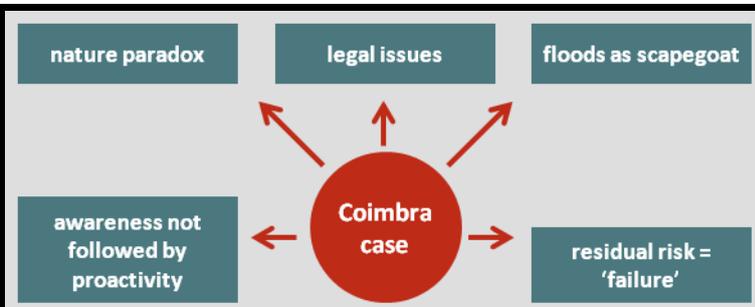


Figure 157: The main flood-related themes that emerged in the Coimbra case

Source: elaborated by the author

In a general conclusive note for the Coimbra case, 'design' and 'floods' seem to have been acknowledged as two more or less parallel processes that only by chance have intercepted each other, especially in the Parque Verde do Mondego's project. On the other hand, an opposite stance prevailed in the design experience related to the heritage site of the Monastery of Santa Clara-a-Velha, in which floods were taken as a historical starting point for the new intervention. It is nonetheless remarkable that the Mondego's riverbanks offered rather straightforward opportunities to have floods better integrated into the design of this green park; yet this dimension was probably not enough when confronted with other sociocultural factors that did not really favour more integrative approaches.

5 Scheldt Quays Master Plan, Antwerp

Scheldt's waters, 11 May 2016

5.1 Chapter introduction

Due to actual and predicted changes in environmental and climatic conditions, the mid-1970s “Sigma Plan” flood-protection scheme for the Belgian segment of the Sea Scheldt had to be updated in 2005. The new physical barriers then envisaged would put under threat the remaining visual contact between the city of Antwerp and the river. This situation called for a reinterpretation of the wasteland along the right bank of the Scheldt, which had previously been occupied for centuries by Antwerp’s historic port. For the Scheldt Quays, flood protection and urban life had to be combined into one single design. A restricted international competition was thus organized in 2006 to gather insights on how to equate urbanity and flood defence in Antwerp’s most sensitive location: the riverine spine, cradle of the very origins of the city and its most emblematic imagetic asset.

Considering that behind every spatial problem “lies an opportunity to prepare a project, and the bigger and more complex the problem is, the more extraordinary the opportunities are for finding unusual solutions” (Nunes, 2008, pp. 68-69), the PROAP-led winning team put forward a flexible proposal for the reclamation of the riverfront, with some guiding principles instead of a fully defined master plan. Central to the design process was the “planning game” (PROAP, 2010, p. 210), an original methodological tool comprising for instance different keys on how to deal with floods in that specific spatial setting, which invited all the concerned stakeholders to express themselves about the future of the quays. Spatially adapted to the river’s dynamics, the proposed strategy finally has the potential to tackle multiple objectives at once, by merging them into a distinctive urban embankment that acts at the same time as a protective “civil structure” and an enabling “civic element” (De Meulder, 2008, p. 17). In sum, the envisaged scheme is altogether a composite defensive structure (consisting of dykes, floodwalls and movable devices) and a belvedere, which adapts to the site according to its diverse local characteristics. This design proposal is also, by its own nature, adaptable in the long run to societal changes.

Differently from the other two studied cases, Antwerp’s urban project entails a large-scale, long-term master plan that potentially embraces several interrelated smaller urban projects within it (two of them already developed as plans and currently being implemented). Yet, as we will see, this is not a master plan in the traditional (and fixed) land-use sense, but a spatial framework that aims at ensuring the coherence and diversity of this exemplary riverfront. The following sections explore the effective integration of floods into the design of this specific case, having in mind, nonetheless, that the Scheldt Quays Master Plan reflects a *sui generis* situation – at least up to now –, in which flood-risk concerns were indeed the main leverage of the overall urban project.

Furthermore, as we will show, this case does not represent a typical flood-mitigation project, which would have situated it outside the scope of the thesis (see p. 106); on the contrary, it is an urban project *per se*, in the sense put forward for example by Secchi (1986), Solà-Morales (1987), Ingallina (2003) and Portas (2003). In any case, the smart incorporation of floods into the design had to be, from the outset, the underlying concept here; otherwise this urban project would have probably never come into being. It is notable, however, that the sensitivity to the flood issue expressed in the PROAP-led proposal clearly differentiated it

from the other ones in the initial design competition. For instance, the proposed openness of the process and the diversification of anticipated solutions (both in time and space) are very far from a conservative conception of spatial design as a stagnant activity and a predefined product. These qualities make the Scheldt Quays Master Plan an outstanding case of ‘design and floods’, despite the defensive stance that underlies the project.

5.2 Geographical and institutional contexts

Throughout history, the settlement of Antwerp by the so-called Sea Scheldt (the segment of the Scheldt River that follows a tidal regime due to the influence of the North Sea) has had a strategic importance in the development of this port city (see Figure 158). Antwerp’s easy connection with the sea (located at about 90 km to the northwest), its consolidation as a trade centre and its active membership in the powerful Hanseatic League in the late Middle Ages prompted cultural openness, worldwide connections and indeed the configuration of one of the first world-cities. At its height in the mid-16th century, Antwerp – then the major seaport and the most important economic and cultural centre in Europe – was in fact among the first cities of this continent to reach the 100,000-inhabitant mark (Attali, 2008). Due to several historical geopolitical reasons (mainly reflected in the interruption of the access to the city and its port through the Scheldt River), this status, although very important at the time and having informed all the subsequent urban evolution, was short-lived. The city would only start to strive again at the end of the 18th century.

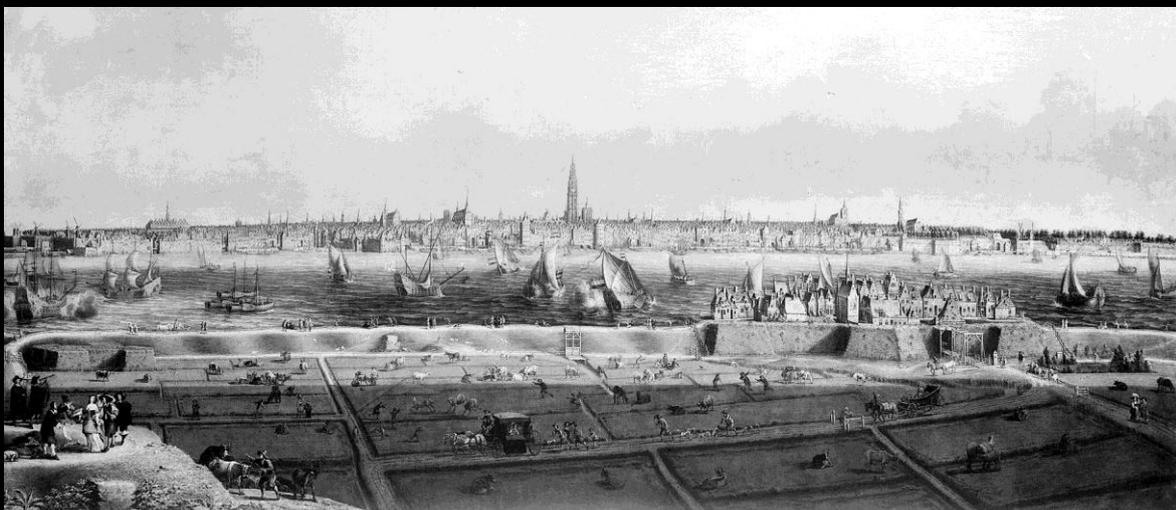


Figure 158: View of Antwerp from the Scheldt’s left bank, by Jean Baptiste Bonnecroy (1658)
Source: BALaT’s archives, © KIK-IRPA (Brussels)

The urban structure of Antwerp was predominantly defined before and during its golden age, historically following the same tradition of the other flat cities of the Low Countries, as regards the lively presence of water within its borders, notably in the form of artificial canals. Figure 159 and Figure 160 illustrate how the presence of water has shaped the city structure and oriented its evolution. The omnipresence of water within this territory has meant that land for urban purposes has always been a scarce resource to be collectively cherished. In this regard, as explained by Dehaene (2010, p. 62) about the Dutch delta, the

conditions required to manage such a water-based territory implied the parallel structuring of a long-lasting “strong planning culture”.

But the city’s relationship with the Scheldt has been far from straightforward, as stated by the urban planner Jef Vanreusel (1990). According to him, Antwerp has first evolved from a “water town” (between 850 and 1400), when port and city were organically and inextricably connected to each other, to a “navy town”. This new stage started in the 19th century, when Antwerp was chosen to be a French naval base and, as a result, new modern port facilities were built. The establishment of two new docks in Antwerp’s northern limits (in the 16th-century neighbourhood of Nieuwstadt) constituted then a turning point for both city and port, since their considerable size introduced a totally new scale in the urban fabric, clearly projecting Antwerp into the future: Bonaparte and Willem docks are still important local landmarks at present. Besides, since their connection to the river was mediated by a lock, these docks were the first step towards the configuration of a port that is not restricted by the tides anymore; yet, city and port were still tied to each other.

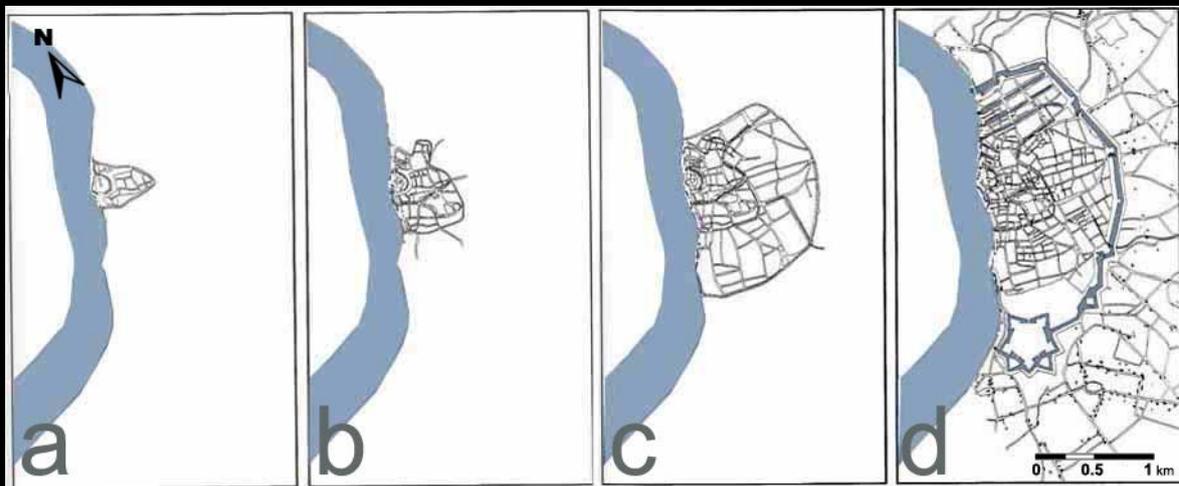


Figure 159: Four historical moments in the urban development of Antwerp

Legend:

a) map of the city in the mid-10th century

c) map of the city in the mid-15th century

b) map of the city in the mid-13th century

d) map of the city in the mid-17th century

Source: Vanreusel (1990, pp. 12 and 14) (watercourse and canals highlighted in blue by the author)

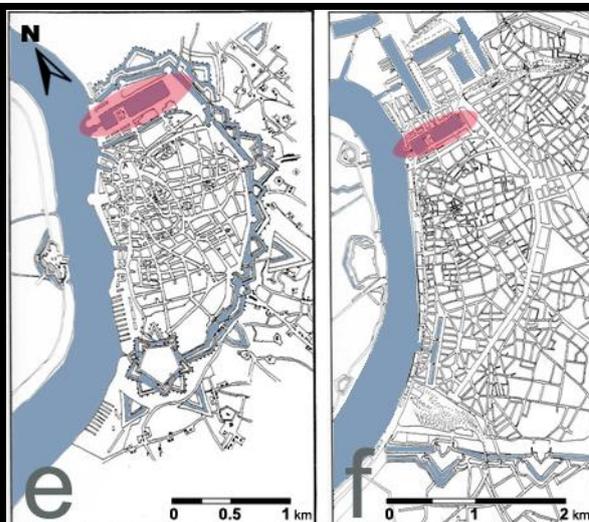


Figure 160: Two more recent moments in the urban development of Antwerp:

Legend:

e) map of the city around 1830

f) map of the city around 1900

The location of the Bonaparte and Willem docks is marked in pink

Source: Vanreusel (1990, pp. 18 and 22)

(watercourse, canals and docks highlighted in blue by the author)

The emergent quay along the Scheldt River also underwent some improvements during that period, to become a real waterfront: an attractive and bustling promenade space for the city, its preeminent urban façade (see Figure 161). Subsequently, a new stage in the city-river relationship started in the late 1800s, with the “tilted town” (Vanreusel, 1990, p. 23), when further port interventions were needed to facilitate berthing, loading and unloading processes. As a consequence, a large part of the oldest city and its built heritage located close to the shoreline were demolished between 1877 and 1884 (see Figure 162), during river straightening works that created a narrow ‘mineral’ strip (100-m wide) between the city and the river at a lower level than the one of the then existing street network (as informed during the interviews). The result of this operation can be referred to as the present-day ‘Antwerp quay’, in the singular form to stress the quite unitary character of this space, located exclusively on the right bank. Yet, it is usually named the ‘Antwerp quays’, in the plural form as a means to properly acknowledge the presence of discontinuity elements and distinct atmospheres along its significant length (3.5 km at the time).



Figure 161: The most central segment of Antwerp’s waterfront, by Edmond Fierlants (1858)
View before the rectification works, when the right bank was still marked by tree-lined quays
Source: City of Antwerp’s archives (watercourse highlighted in blue by the author)

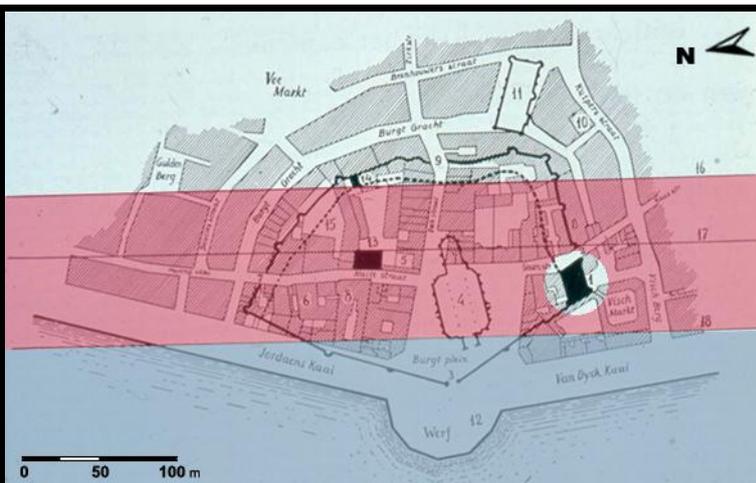


Figure 162: The 19th-century quay rectification in central Antwerp
The new quay area is marked in pink (the sole building that was spared is the Steen, in black on the right); the city façade is pushed back to the upper limit of the pink strip, while the blue strip represents the rectified Scheldt
Source: City of Antwerp’s archives (modified by the author)

During a second construction phase at the turn of the 20th century, the southern segment of the quays were extended following the same spatial pattern and materials, “the cobbled surfaces and the bluestone quay wall” (Stad Antwerpen, 2009, p. 43). The quays’ ultimate configuration, reaching 5.5 km, is presently valued as an icon of the 19th-century engineering, given the challenge of building the quay wall mostly on the river itself at the time. In any case, in addition to the built-heritage losses, the establishment of Antwerp’s

quays also had a very high cost in terms of interrupting the historical intertwining of city and river. Water marks within the city were then systematically removed; for example, as the existing fleets and canals lost their function of allowing ships to penetrate into the city, they were either filled or buried (see Figure 163). Furthermore, in view of the new port's heavy and intense activities (with dedicated railroad tracks, cranes and warehouses) and due to customs compliances, its premises had to be fenced, becoming completely separated from the city (see Figure 164).

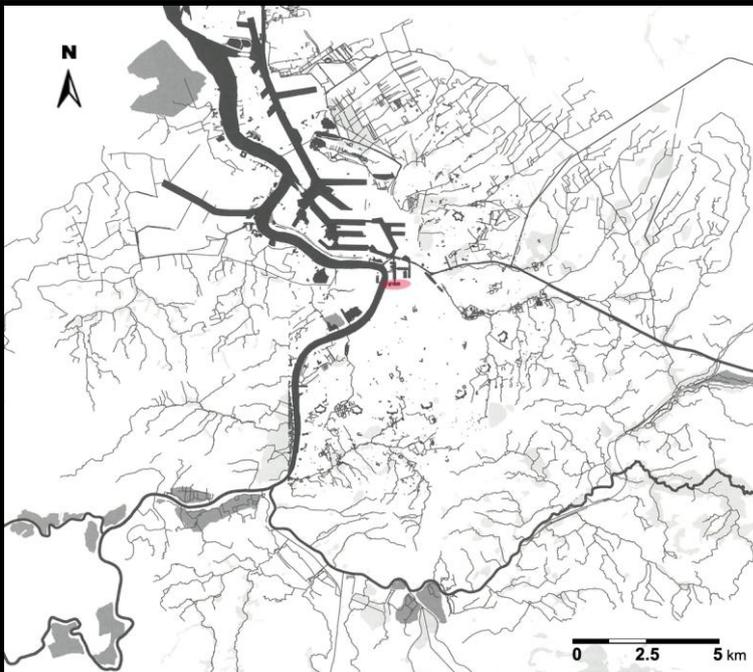


Figure 163: The water network in contemporary Antwerp (2004)

When comparing this map with the previous ones (Figure 159 and Figure 160, on p. 223), it is noticeable that:

- the Bonaparte and Willem docks (marked in pink) are no longer at the city outskirts
- the water marks in the city's most central area were completely eliminated
- in the northern section, the smaller streams were disconnected from the Scheldt due to the port's premises

Source: Secchi and Viganò (2009, p. 38) (modified by the author)



Figure 164: Antwerp's quays, physically isolated from the city, in the early 20th century

Only part of the visual relationship with the river was preserved
Source: postcard, City of Antwerp's archives

The quays, once a lively urban setting, thus lost their polyvalent nature, being reduced to their functional dimension. The architect Piet Lombaerde (1990, p. 59) provided a clear-cut description of the loss of the quays' symbolic dimension: “[t]here was nothing utopian at all though about this [quay] straightening (...) If anything the opposite was true. For years it dampened all innovative and creative thinking about the relationship between city and river.” Moreover, the city's centre of gravity that had been traditionally located by the riverside was then displaced eastward, settling around the railway-station area. This was a clear sign that, for the first time, Antwerp had turned its back to the Scheldt.

At the same time, in order to support increasing port-related activities, two new neighbourhoods were created in the outskirts: Eilandje (the Islet, in the northern part of the quays, adjacent to the Bonaparte and Willem docks) and Zuid (the South, the 19th-century quarter located on the site of the former military citadel). Bordering the Sailors' Quarter, the former “became a very lively area of the town, where life in the wide streets was governed by the manoeuvring of heavy horse-drawn drays. It was moreover a place where many barges and their families chose to make their homes” (Vanreusel, 1990, p. 25). In contrast, the latter was envisioned as a high-end residential neighbourhood, also chosen to host the Museum of Fine Art and a new train station. The only move towards not obstructing all city-river relationships was, inspired by Genoa, the construction of two elongated terraces above the docks flanking the central part of Antwerp, which have since been functioning as balconies overlooking the river (see Figure 165 and Figure 166).



Figure 165: Aerial view of the Scheldt Quays in the 1990s, looking northward

The section in the foreground is the (old) South, the one in the background is the Eilandje neighbourhood, while the historical city centre is in-between; the two elevated terraces are marked in red
Source: Teughels and Borret (2007, p. 92) (modified by the author)



Figure 166: A present-day view of the southern elevated terrace by the Scheldt

The southern terrace stands above the cruise terminal, which currently handles around 30 sea cruises per year (according to the interviewees)
Source: author's archives (12 May 2016)

The two figures above provide representative portrays of the “disarticulated town”, the contemporary phase of the Antwerp-Scheldt relationship as described by Vanreusel (1990, p. 26), prevailing since the mid-20th century. In fact, the straightened and autonomous quays constituted an efficient port infrastructure during less than a century; new technologies demanded further extensions of the port that could only be achieved by its relocation downstream, which was accomplished in the 1960s. Antwerp’s port then expanded up to the Dutch border, its area surpassed by far the size of the rest of the municipality (see Figure 167), and port and city thus became completely independent entities. When moving away from the inner-city space, the port left the quays as “a large-scale prosthesis” that did not effectively belong to the city (De Meulder, 2008, p. 13).

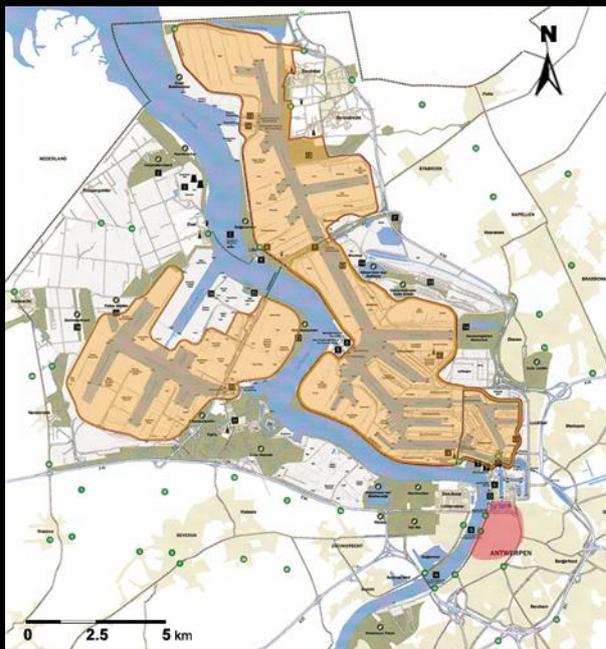


Figure 167: The total area of the Port of Antwerp today

Legend:

– in orange: the port area, 70% of which is located on the Scheldt’s right bank (within the municipality of Antwerp), while 30% is on the left bank (in the neighbouring municipalities of Beveren and Zwijndrecht)

– in pink: Antwerp’s approximate surface in the early 19th century

Source: Masbouni (2011, p. 165) (modified by the author)

As a result, in the late 1980s, the quays’ strip was “hardly worth being called a port area. Rather it was a no-man’s land, a void between city and river, used as a car park for both citizens and visitors” (Vanreusel, 1990, p. 129). According to an interviewee, Patrick Janssens, the Mayor of Antwerp between 2003 and 2012, used to say that Antwerp’s quays are “*the prettiest free parking space in western Europe*”. In fact, the quays have become a wasteland, a desolate urban fringe in the very core of the city, functioning as a barrier between city and river (Figure 168), which nevertheless were finally “brought eye-to-eye for the first time” since the development of the port (Uytenhove, 2009, p. 196).

In any case, the port activities did not completely disappear from the quays: touristic cruise ships still moor at the quays, rightly in the city centre (see Figure 166 above), and “*if there is a problem of space in the port, they (in a way) park big ships temporarily along the quays*”, according to an informant¹⁷⁴. The same person complemented that, although momentary, these activities are presently considered important by the city, since they are active means “*to keep alive the memory that these quays were once port*”.

¹⁷⁴ Other residual uses not related to the port are also present on the quays (for instance some office buildings and an event hall in the Rijnkaai section).



Figure 168: Antwerp's quays as a no-man's land, delimited by the floodwall (ca. 1990)

Source: City of Antwerp's archives

Nonetheless, an additional physical barrier was created in the 1970s. After a disastrous flood event that affected the Sea Scheldt in 1976 (during which the water rose almost 1 m above the quays' level in Antwerp), the Belgian government decided to prepare a large-scale plan against floods (W&Z, 2013)¹⁷⁵. Issued in 1977, the "Sigma Plan" aimed to "protect the whole of Flanders against floodings coming from the River Scheldt in relation to its tidal cycle", as explained by an interviewee. It focused on strengthening the existing flood-defence structures (dykes and floodwalls) along the Scheldt, as well as on the creation of 13 controlled-flood areas (Marchand *et al.*, 2006)¹⁷⁶.

Consequently, a reinforced-concrete flood-protection wall (1.35-m high and 5.5-km long) was constructed along Antwerp's quays in 1978 (see Figure 169), dimensioned to protect the city against flood events with a 0.29% annual probability (the '1-in-350-year flood'), while in the city's northern segment (corresponding to Eilandje, a former port area) a dyke was built with the same height. The 16 existing flood-protection gates along the floodwall are manually closed by the fire brigade when a fluvial-flood event is forecasted by Flanders Hydraulics Research (see Figure 170).



Figure 169: The undesired barrier effect created by Antwerp's floodwall

Source: author's archives (10 May 2016)

¹⁷⁵ One should keep in mind that the Scheldt estuary is shared by the Netherlands and Belgium (the mouth of the river is located in the southern part of the Dutch territory). In 1953, a major flood in this region resulted in almost 2,000 fatalities in the Netherlands and triggered the "Delta Works", encompassing large-scale flood-defence infrastructures designed to withstand a '1-in-4,000-year flood'.

¹⁷⁶ The "Sigma Plan" also comprised the construction of a storm-surge barrier downstream of Antwerp (which would parallel the Dutch flood-management style), but this structure was rejected after the elaboration of a cost-benefit analysis in the 1980s (De Nocker *et al.*, 2006).



Figure 170: One of Antwerp’s 16 flood-protection gates, on the Jordaenskaai

This is the same quay section as the one portrayed in Figure 164, on p. 225

Source: author’s archives
(9 May 2016)

Given that the daily water-level variations in Antwerp are considerable due to tidal influences (around 5 m)¹⁷⁷, the quays undergo minor floods regularly; such events are quite predictable and have a short duration (the high-tide period). According to the interviewees, the Scheldt has risen 20 to 50 cm above the quays’ threshold at least once a year since the construction of the floodwall (see Figure 171), although “*sometimes it’s only the splashing of the waves that comes on the quays*”.

The latest important flood event that affected the quays was in December 2013, “*with about 80 cm, then it was really necessary that the flood protection was there, otherwise the city of Antwerp would really have been flooded*”. However, on the downside, this physical barrier against floods has also been functioning since its inception as an obstacle to more intense city-river interactions, which had been crucial features of Antwerp’s atmosphere and liveability.



Figure 171: Antwerp’s quays under the Scheldt’s high waters

The cars in the parking areas are generally evacuated when a flood is forecasted

Source: City of Antwerp’s archives

Last but not least, the increased traffic on the riverside motorway (combined with the present use of the quays as a major car park, as seen in Figure 165, on p. 226, and Figure

¹⁷⁷ As explained by an informant, the fluvial overflows in Antwerp have “*everything to do with the tidal difference and the morphology of the River Scheldt, because (...) in Antwerp the River Scheldt is narrower than towards the sea, so we have the biggest tidal difference in Antwerp (we have a bigger tidal difference than for instance some villages that are closest to the sea, and also a bigger tidal difference than villages that are more upstream)*.” At the same time, “*the main thing now with the port is to get bigger ships with more containerization into the port, but for that we have to make the River Scheldt deeper. Making the River Scheldt deeper means having more water that can come in and means a higher risk of flooding*”.

169, on p. 228) has been further reinforcing the barrier effect between city and river, as well as the contemporary sense of “disarticulated town” (Vanreusel, 1990, p. 26). In fact, similarly to all large European cities since the 1970s, Antwerp has been witnessing the dominance of the car in the inner city and the flight of people and economic activities from the centre, accompanying a national housing policy in favour of individual-house ownership. The associated urban sprawl and social segregation have been among the main physical and imagnetic problems behind the recent degeneration of the city.

These imagnetic problems refer to both the appearance of the city and the way it has been perceived internally and externally (Secchi & Viganò, 2009). Moreover, the municipality’s boundaries were successively extended during the 20th century to provide for the actual enlarged functional urban area: in 1923, the Scheldt’s left bank was annexed to the city (river crossings are made through five tunnels; up to now no permanent bridge has ever linked the two margins). Subsequently, the municipality also integrated the northern territory corresponding to most of the current port area (in 1958), and the peripheral towns, which in fact functioned as city suburbs (in 1983).

The municipality’s area is nowadays about 20,000 ha, 36% of which being occupied by the port’s facilities on the right bank (see Figure 167, on p. 227). Antwerp is presently a medium-sized multicultural metropolis with around 500,000 inhabitants, originating from more than 170 countries (Sterkx, 2014), a diversity that is also reflected in its multiple spatial characters. However, the historically magnanimous city behind the port has somehow been reduced to an ‘appendix’ of what has become the largest Belgian and second European port¹⁷⁸. This fact somehow exemplifies the hierarchy of elements in the city-river-port relationship that has long prevailed, as presented by the architect-urbanist Pieter Uyttenhove (2009, p. 196): “the city was always third, after the river, which took the role of mother, and the port, whose role was that of a productive generator”.

After decades of neglect and economic decline (although being part of the prosperous European Northwestern Metropolitan Area) (Secchi & Viganò, 2009), the second Belgian city is today endeavouring to put itself again on the map, be it through the valorisation of its traditional competitive advantages (as in the diamond sector) or the exploration of new trails (such as culture or fashion) (Clark *et al.*, 2016). Given the multiple challenges to be dealt with within its newly enlarged territory, the city decided to prepare a comprehensive plan, the Global Structure Plan (GSA), put in place in 1984. For the first time in the planning history of Antwerp, this document stated a series of city visions on which decision-makers could rely to guide future urban interventions (see Figure 172). One of the eight underlying concepts presented in this global strategy was Antwerp as a “city on the river” (Stad Antwerpen, 2012, p. 11).

¹⁷⁸ An interviewee expressed this idea very clearly: “we’re actually a small town with a global port... I think in the 16th century, in the 19th century, we had actually a European scale, a really big city, but now of course with 500-600,000 inhabitants we’re very small”.

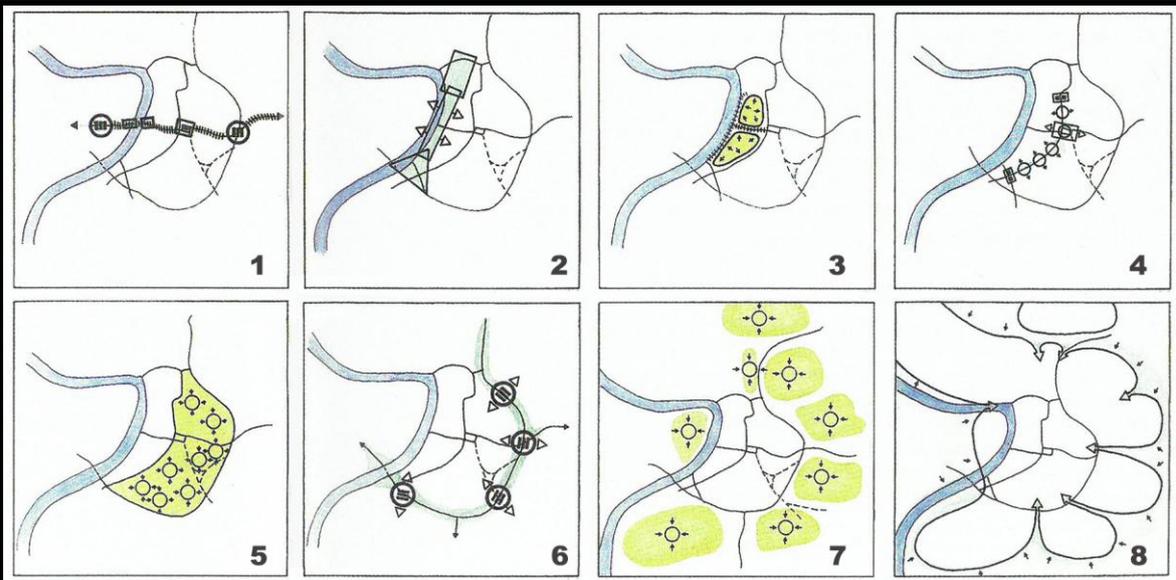


Figure 172: The eight concepts proposed in the 1980s by the GSA for an enlarged Antwerp

Legend:

- | | |
|---|--|
| 1) The east-west axis as the city's backbone | 5) The 19th-century belt: a vital part of the city |
| 2) A city on the river | 6) A ring forest with new bridge gates |
| 3) The city centre's upgrading | 7) The suburbs as cores with their own character |
| 4) Inner-city road for the channelling of traffic | 8) Linking green spaces |

Source: Masbounji (2011, pp. 20-21) (modified by the author)

Despite the GSA's fresh and far-sighted underlying approach, its stated urban ambitions, including the ones for the quays, were not put into practice (at least in the short term). As argued by an interviewee, it was at the time "*difficult to organize the reflection on the city, on the entire city*", mostly due to unfavourable institutional background conditions. In fact, looking retrospectively, the Municipality of Antwerp identified two major factors behind such failure: first, "a lack of political support, which meant that insufficient people and resources were deployed", and secondly the inexperience of the municipal services as regards "integrated spatial planning based on a coherent vision" (Stad Antwerpen, 2012, p. 11).

This rather passive institutional stance would only start to be reversed ten years later, after the city's decay had reached its limit, expressed by economic stagnation, social and functional segregations, and increased spatial fragmentation (Secchi, 2007). As expressed by an informant, "*in 1993 Antwerp was 'Cultural Capital of Europe'; so this was a period of time where there was a lot of thinking about the city and how to make it more attractive*". In contrast with the traditional land-use planning approach that prevailed until the 1970s (Borret, 2012a; 2012b), the city started to foster strategic large-scale urban-regeneration interventions in selected areas, such as the central railway station or the old Sailors' Quarter, neighbouring the quays. It also carried out smaller parallel projects, such as the systematic renovation of individual derelict buildings in the city centre, mostly for housing purposes (Masbounji, 2011).

These interventions, intended to refrain "the growing anti-urban sentiments and the flight of the middle-class to suburban settlements" (Coppens, 2015), were made possible thanks to the skilful concomitant use of several sources of funds (from the EU, Belgium and

Flanders) and the in-depth restructuring of the municipal services in order to coordinate them (Willems, 2007; 2011). This occasion finally led to the creation of several dedicated bodies to manage these diverse plans and implementation instruments, each of them dealing with particular urban issues, from urban planning to real-estate operations (Stad Antwerpen, 2009). For instance, urban planning was placed under the remit of the autonomous Stadsplanning Antwerpen agency (“*which was a special thing a bit separate from the regular planning department, so out of the administration*”), while the autonomous body AG VESPA became in charge of real estate.

A new professional planning culture was then emerging in Antwerp, in which spatial and social policies worked together (Borret, 2012a). This change is illustrated by the creation of the post of *stadsbouwmeester* (‘chief city architect’ or ‘city architect’), an independent advisor who, since 1999, has watched over the coherence and quality of the overall urban development in Antwerp, publicly or privately led, in different design domains¹⁷⁹. The expectations of this post were explained by an interviewee in the following terms:

The bouwmeester is a special function, it's an independent function (so it's not part of the administration; the responsibility is direct towards the political authority: the Mayor or the government), and the main mission of the bouwmeester is to improve the quality of all urban projects in the city. And so a typical role... you could say that there are two parts: there is a formal part, a very public part, that's the organization of the competitions (of architectural competitions); and then there is a second role, which is much more behind the scenes, and that is convincing people to go into the right direction, accompanying projects and so on.

More recently, during Janssens’s mandate as Antwerp’s Mayor (between 2003 and 2012), the professionalization of urban-related issues gained even more impetus, and a greater emphasis was given to the uplift of the urban setting¹⁸⁰. This policy was pursued as a means to revamp the city and counteract the rampant social and territorial segregation, and the related conflicts (Secchi, 2007). In this regard, “the city belongs to all of us” was then chosen as the slogan to timely herald these major objectives, and the municipality set the ambitious goal of providing and supporting high-quality urban development (Borret, 2012a; 2012b). Moreover, the previous interventions’ focus on problematic zones was gradually enlarged to also target promising areas in terms of opportunities and expected spillover effects (Coppens, 2015). In Janssens’s own words (2008, p. 18),

[t]urning Antwerp into the best living environment for people from different walks of life starts with its physical spaces. The most powerful instruments to create an attractive urban living environment are spatial planning, urban design and architecture, because human behaviour is considerably influenced by its surroundings.

Under Janssens’s guidance, Antwerp has then become a paradigmatic case of the formulation of a comprehensive city vision to overturn long-lasting structural and imagetic demands, through urban-regeneration initiatives (Masbouni, 2011). One important

¹⁷⁹ A similar position was simultaneously created at the Flemish-region level: the *Vlaams bouwmeester*, who heads a team that looks after the quality of the spatial design of a range of projects, from master plans to landscape interventions, including for instance infrastructure and collective housing.

¹⁸⁰ According to the interviewees, the staff of Stadsplanning Antwerpen, the independent agency then in charge of urbanism, grew from around 8 to 46 persons during that period.

cornerstone of this transformation was the elaboration of a new structure plan, given that this planning instrument was made compulsory by the Flemish Government in 1996. After a three-year process coordinated by the Italian practice Studio Secchi-Viganò and carried out in close collaboration with the related municipal services, the Strategic Spatial Structure Plan for Antwerp (s-RSA) was approved in 2006 (Secchi & Viganò, 2009).

The elaboration of the plan comprised an exhaustive mapping of the ongoing projects in the city and the active involvement of the public in the ensuing discussions. As highlighted during the interviews, this chance was also taken to upgrade the capabilities of the municipal officers – a young team eager to do the best for its city – in terms of effectively and creatively dealing with complex urban-design situations. The autonomous agencies recently created to deal with urban (spatial) issues (understood by an interviewee as “*the professional organization of the city*”) were even reorganized in order to coherently implement the plan in the long term.

The s-RSA has a strict spatial nature: “it does not put forth economic or social policy”; instead, it aims “to create the spatial conditions for the improvement of the city’s ecological quality, its social cohesion, economic growth and, more in general, the sustainable development of its region” (Secchi & Viganò, 2009, p. 5). Not intending to define *a priori* the spatial evolution of the city (as practiced in traditional planning approaches), the plan delineates a global vision for the city development in the spirit of *renovatio urbis*, which strongly reaffirms the principle of regeneration “by means of strategic interventions in the existing urban fabric” (Stad Antwerpen, 2009, p. 10).

Two elements are central to the policy exposed in this document: images and strategic spaces, which are eventually related to the proposed generic and specific spatial policies, in operational terms. Actually, the s-RSA begins with the proactive definition and affirmation of a desired and partaken vision for the future of the city. According to Secchi and Viganò (2009, p. 15),

[a] vision is a shared representation, in spatial and non-spatial terms, of a feasible future for the whole city – a description of what the city should be in the future. The emphasis on feasibility makes a vision different from desire or forecast; a vision should guide the city’s energies towards its future.

In its attempt to formulate such a vision, the Structure Plan has then taken up the challenge of providing the city “with a more diversified image than that of the port [it] has convincingly projected” throughout history (Uyttenhove, 2009, p. 197), unveiling new prospects more closely related to the city’s contemporary conditions. Considered “a mental picture, an idea, a concept” that “take[s] into account the collective imagination in a search for shared goals regarding the city’s transformation” (Secchi & Viganò, 2009, pp. 14 and 25), the image is thus at the core of the formulation of a renovated urban vision. Consequently, besides the traditional dominant “Port city”, the s-RSA proposed six additional “inspiring images” (Stad Antwerpen, 2012, p. 17), all of them being also closely connected to the city’s geography and (remote and recent) history.

The renewed images put forward for Antwerp were: “Water city”, “Eco city”, “Railway city”, “Porous city”, as well as Antwerp as both a smart combination of “Villages and metropolis” and part of a “Mega city” (Stad Antwerpen, 2009; Secchi & Viganò, 2009). The seven images clearly update and expand the GSA’s earlier proposals (see Figure 172, on p. 231), in terms of both spatial and conceptual scopes (only the “Porous city” and “Mega city” images had not been referenced within the previous plan). These images constitute the mainstays of the generic spatial policy, and each of them leads to the creation of urban scenarios and strategies as dynamic planning tools, the scenarios being conceived to “open possibilities” as regards possible urban futures (Secchi & Viganò, 2009, p. 26).

On the other hand, the formulated strategies lay the path to the concretization of desired scenarios, defining “thematic guidelines at city level”, which compose, in an initial stage, the generic spatial policy (Stad Antwerpen, 2012, p. 17). Coupled with these broad images, the plan identified five large strategic spaces “within which programmes and projects [will] individually and collectively contribute to the renewal of the city” (see Figure 173) (Stad Antwerpen, 2009, p. 7). Linked to the main structural elements of the city’s urban fabric (in terms of location, dimension and potential), the strategic spaces are associated to the specific spatial policies, which eventually determine the focus of major investments in the near future.

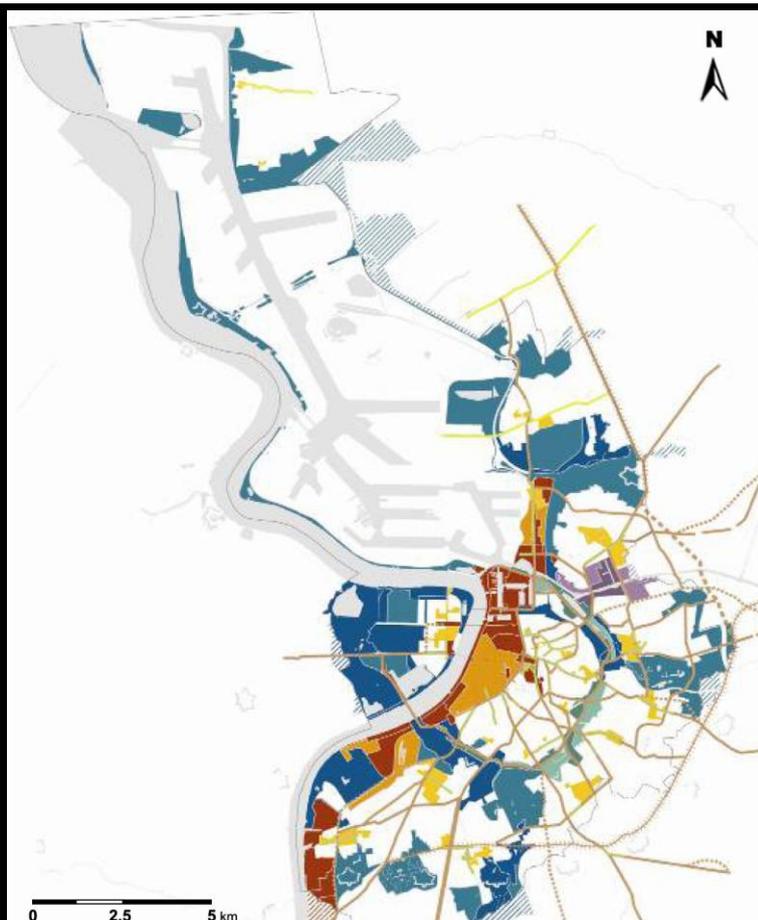


Figure 173: The five strategic spaces identified in the s-RSA

Legend:
 – dark red and orange: “Hard spine”
 – blue and light blue: “Soft spine”
 – green: “Green belt”
 – purple: “Living canal”
 – yellow: civic centres
 Source: Secchi and Viganò (2011, p. 33)

Such interventions target primarily the public space, a key element of the *renovatio urbis* strategy due to the large-scale spillover effects that it is expected to engender in its

vicinity. The s-RSA thus assembles Antwerp's several urban projects (in both the planning and implementation stages) in a single and flexible framework that aims to strengthen the city's vision. As a comprehensive and integrated planning instrument, the s-RSA proposes the design and management of the city's space in multiple scales, dealing concomitantly with macro structures (such as the city ring) and micro spaces (such as small squares), properly acknowledging Antwerp as both an intimate city and a metropolis.

The idea of slow-paced small-scale strategic interventions aimed at changing the face of the city was then locally conceptualized as "slow urbanism" (Borret, 2012a; 2012b; Smits & Teughels, 2014). While this perspective is more in line with the natural evolution time of cities, it is also, according to the interviewees, a reaction to the Dutch planning approach (very influential in Antwerp), the underlying idea of which is "*to build a lot, to go quick and to work with large private developers*". In any case, strong differences in terms of land-ownership patterns make that approach much less feasible in Belgium, where its ensuing urban results in the Netherlands are perceived as "*very unidimensional, very one period, very much one style, very poor*", in contrast to the richness possibly favoured when urbanism follows a more gradual track. As complemented by an informant, "*the advantage of slow urbanism (like slow food) is that perhaps it's more expensive, perhaps it takes a longer time, but at the end it tastes better*".

The importance of Antwerp's riverscape was properly highlighted in the s-RSA: first, within the "Water city", the foremost of the seven inspiring images, anchored in the relevance of all forms of water bodies and processes for the structuring of the city's territory along its history (see Figure 163, on p. 225). Indeed, as argued by an interviewee, "*the 'Water city' is not just the façade along the Scheldt*" but reflects the fact that

Flanders is full of water. It's not just Antwerp: all Flanders is full of water; and then, water is everywhere, then whatever you do in the city, water will be present, maybe not always as a problem (often as problem), and this is like an element that is part of the city in all its different sectors, not just in one point. Flanders, as a region, is made of water, (...) which is also a cultural approach (...), because it is everywhere, and you have always to deal with the water, and then it becomes also part of your cultural life (or the life of society).

In any case, the restoration of the former close relationship between the city and the Scheldt (in physical and cultural terms) is also highlighted as a central issue within this image (Secchi & Viganò, 2009). Antwerp being a city born and developed thanks to the presence of water, the "Water city" image suggests taking this element again as a means "to improve the quality of the (living) environment and the dynamics of the ecological system" (Stad Antwerpen, 2009, p. 10). As explained by Secchi and Viganò (2009, p. 35), the revaluation of the water's role in Antwerp is presently encouraged by the existence of a "new environmental sensibility", potentially sustained by three major factors:

The first is fear, for example the fear of flooding. The second is science; we know more about the environment today and about the consequences of neglecting it. The third is an ethical-aesthetic sensibility; today we are more aware of the value landscape and social practices can develop in nature.

The last two factors in particular are considered compelling enough not only regarding water issues but also to support the closely associated image of Antwerp as an “Eco city”; accordingly, the plan acknowledges “the fundamental role” played by the Scheldt and the water network as a whole “in the ecological structure of the city-region” (Secchi & Viganò, 2009, p. 55). Secchi and Viganò (2009, p. 35) strongly make the case for the reconquest of Antwerp as a “Water city” in the following terms:

Antwerp’s history, like the history of many other European cities, was a story of reduction, negation and elimination of nature’s presence. In the struggle for space, nature was the weakest actor and apparently the most malleable one. (...) The image of the water-city underlines the need to rethink this power relationship and it is based on the assumption that water is a key element for a complex set of policies for restructuring the urban space. To recognize the central role of natural elements in the design of the contemporary city also means to seek new relations among different demands for well-being. For Antwerp, improving its relationship with the Scheldt is the way to reach many goals: resolving problems of spatial segregation between the river’s left and right banks; improving the quality of public spaces along the river; helping develop the economic potential of cultural events and tourism; redefining the space along the Scheldt as a liner centrality within Antwerp’s territory.

For these reasons, water is considered in the s-RSA not only as an aesthetic element of urban composition but also as an actual structuring asset for the city, as it used to be in the past (Viganò, 2009a; 2009b). The “Water city” image duly recognizes the major water-related problems existing in the city, namely riverine and urban floods, as well as the fact that drainage and sewage are presently merged into a single system. Accordingly, the plan calls for widening the “‘engineering’ approach which attempts to solve each problem through use of forceful infrastructural technology and which is often incompatible with environmental processes” (Secchi & Viganò, 2009, p. 39).

Although the detailing of all water-related issues is not among its particular targets, the plan promotes an integrated stance in which the alternatives chosen to solve those specific problems could also foster the improvement of the urban space as a whole¹⁸¹. Besides the “Water city” image, the s-RSA stresses as well the importance of Antwerp’s riverscape when considering the riverfront as the actual backbone of the “strategic space” named “Hard spine” (see Figure 173, on p. 234), which links and structures its neighbouring urban areas (Secchi & Viganò, 2009). Due to their prominent location rightly in the city centre and considerable size – a 100-m-wide heterogeneous strip along almost 7 km –, the Scheldt Quays are recognized as the most important public space of the city, with even a metropolitan appeal.

¹⁸¹ The following generic spatial policies are derived from the “Water city” image: “preserve and enhance the river and the water network as the city’s most important ecological structure; reinforce the relationship between the city and the Scheldt, by increasing access to the riverbanks as well as related wetlands and polders; define new ecological connections with the river; consider the Scheldt a connective element between the left and right banks; enhance the role of the river as provider of recreational opportunity, quality public space and of facilities and services along the river; improve water quality and reduce water pollution; support an integrated water management policy” (Secchi & Viganò, 2009, p. 51).

In fact, the quays comprise a sequence of seven distinctive spaces, each of them related to a specific riverine zone: the ones in the middle flank the oldest city segments, while both extremes correspond to the more recent city extensions, initiated in the 19th century. The quays function indeed as an axis linking two strategic riverine sites, which were once part of the port and are presently being reconverted into new urban districts: Eilandje in the north and Nieuw Zuid in the south.

Being the most imposing structuring element at both the local and metropolitan scales, the “Hard spine” includes north-south segments in which urban interventions could engender a significant redefinition of the traditional concentric structure behind Antwerp’s historical development, which presently does not do justice to the city’s contemporary profile. It thus encompasses the expansion of the notion of ‘city centre’, being the most favourable location for new urban programmes, in which “introducing new centralities” and “reinforcing the elements that provide urbanity” can be fostered in parallel to the requalification of “more overloaded areas” (Secchi & Viganò, 2009, p. 183). In any case, one of the major goals associated to this strategic area is, from “a spatial, functional and symbolic perspective”, the re-establishment, in a contemporary mode, of “the bond between the city and the river” (Stad Antwerpen, 2012, p. 20), thus comprising the revamping of the Scheldt Quays, one of the strategic projects within the “Hard spine”.

This brief presentation of the s-RSA intended to stress how this plan symbolizes the renewal of planning and design practices in Antwerp, in which rethinking and redesigning the contemporary city have been going hand-in-hand. Recognized as an outstanding 21st-century planning initiative, the s-RSA obtained in 2008 the “Award for Excellence” of the International Society of City and Regional Planners (ISOCARP) (Stad Antwerpen, 2012), while Antwerp’s efforts towards improving the urban quality were distinguished in 2013 with the “European City of the Year Award”, granted by the British NGO The Academy of Urbanism.

As highlighted by the architect-urbanist Ariella Masboungi (2011, pp. 10), the resurgence of urbanism in Antwerp has provided several lessons to other European cities facing similar challenges, not particularly in terms of actual transformations but mostly regarding “the pedagogic value of the issues dealt with and the adopted methods”. Concerning the theme of our thesis, one of these lessons is precisely “*la menace est le sujet*” – in other words, taking the flood threat as the focus of attention¹⁸² (Masboungi, 2011, pp. 15).

¹⁸² The other major lessons from Antwerp are, according to Masboungi (2011, pp. 12-15): (1) “no situation is hopeless”; (2) “the urban project involves tangible and intangible interventions”; (3) “social cohabitation is the main stake of the urban project, which should ensure the connection between scales”; (4) “to regenerate the plan/project debate and reinstate strategic planning”; (5) “to integrate the management of competences at the strategic level”; (6) “to ensure the articulation between the local competences and the contribution of external experts”; (7) “to inhabit the consolidated city”; (8) “to reconvert”; and (9) “open questions”.

5.3 Process timeline

The first contemporary attempt to revamp Antwerp's quays was promoted at the end of the 1960s by John Mangelschots (former member of the Municipal Council responsible for spatial planning), with a proposal of regional scope focused on both riverbanks (Vanreusel, 1990). Nevertheless, this initiative did not have any concrete repercussion on the enduring situation of the quays. Indeed, the quays would only become the centre of attentions in the 1980s, following the formulation of the GSA and the ensuing planning concept of "city on the river" (Stad Antwerpen, 2012). A bottom-up initiative was then instigated: the "Stad aan de Stroom" ("City on the River", also translated as "City on the Stream" or "City and the River"), carried out by a homonymous NGO formed by interested citizens¹⁸³, which called for "the upgrade of the neglected nineteenth-century port areas by the river" (Stad Antwerpen, 2012, p. 11).

With some support from the municipality, this NGO took the first proactive step towards the regeneration of the quays¹⁸⁴, seen as "an immense opportunity to strengthen the links between Antwerp and its river" (Vanreusel, 1990, p. 28). In 1989, the two entities jointly organized an open international competition for design ideas for three riverfront areas related to the former port: Eilandje, the quays themselves and the South (see Figure 174). Mostly funded by the private sector (Willems, 2007; 2011), this initiative also included calling upon the advice of six selected international designers, who would propose a vision for these same areas. It is noteworthy that flood risk was not perceived then as a relevant issue, even though the integration of the existing protective floodwall was briefly referred to by most of the designers working on the quays' area; the fundamental issue was actually the reconquest of this desolate area for the sake of the city, its inhabitants and visitors. The tandem Beth Galí and Marius Quintana, from Spain, and Bob Van Reeth¹⁸⁵, from Belgium, were the architect-urbanists invited to deal specifically with the quays' strip¹⁸⁶.

¹⁸³ The promoters of this initiative were "active residents engaged in urban development, spatial planning and urban renewal, but also in the city's culture and history", who were concerned about "improving their own living environment" (Uyttenhove, 2009, p. 196).

¹⁸⁴ The "City on the River" initiative aimed to profit from the boom of waterfront revitalization in several European cities. And since "Antwerp [was] a little behind in [this] trend", the city could learn with others' experiences, taking advantage, at the same time, "of the fascinating and fruitful movement which has recently started in architecture and town planning. Architecture has rediscovered the city, after having neglected and even destroyed it for years. In the past few years, projects realized in several European cities combine a renewed character with attention to and respect for the existing city" (Vanreusel, 1990, p. 9).

¹⁸⁵ Van Reeth and his practice Architect Work Group (based in Antwerp) already had a close relationship with the revamping of the city's quays, on or nearby which they had previously designed two landmark buildings in the 1980s: the Huis Van Roosmalen house and the full renovation of the Zuiderterras restaurant. Van Reeth was also the first Flemish *bouwmeester* (between 1999 and 2005).

¹⁸⁶ The Eilandje area benefitted from the advice of the architect-urbanists Manuel de Solà-Morales (Spain) and Yves Lion (France), while Toyo Ito (Japan) and Rem Koolhaas (the Netherlands) were in charge of the South, comprising both Zuid and Nieuw Zuid. In practice, given the brainstorming purpose of this initiative, most designers did not confine their proposals to their respective areas. For instance, the ideas of Solà-Morales also included suggestions with repercussions on the quays, the most significant of which was the opening of the Bonaparte Dock to let the river infiltrate again into the city. This opening would clearly highlight some of the ancient city limits while reinforcing Eilandje as a distinct former urban-extension area. Likewise, it would require a complete review of the quays' traffic, which should be distributed in two levels to "provide for a more civic atmosphere rather than a monotonous vehicular strip" (Solà-Morales, 1990, p. 159), somehow following the same spirit behind the architect's successful project for Barcelona's waterfront.

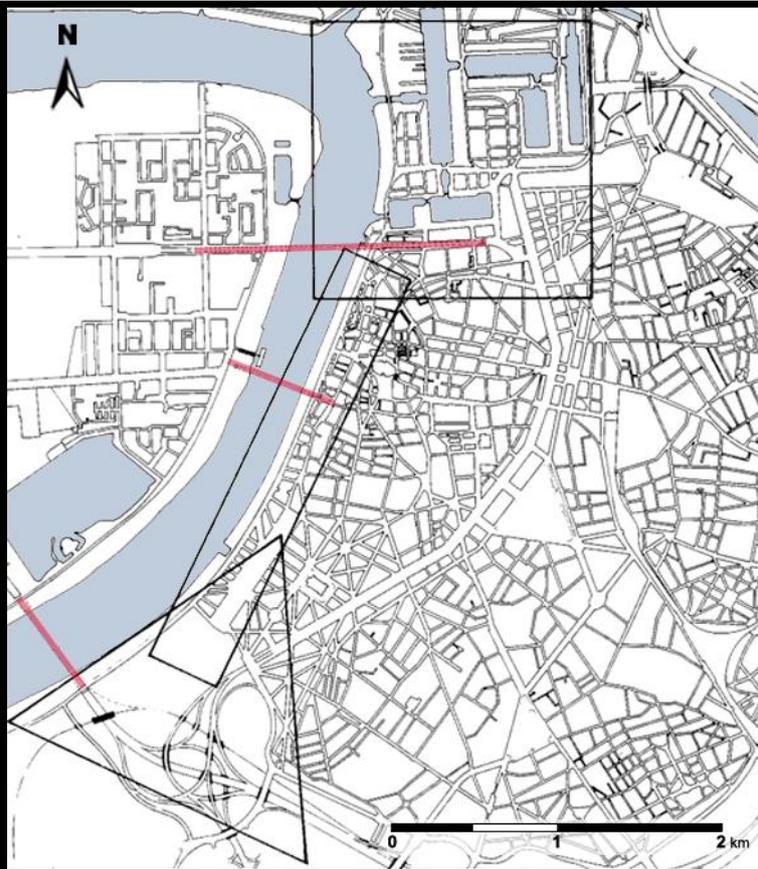


Figure 174: The three areas targeted by the “City on the River” urban-design initiative

Legend:

- square: Eilandje
 - strip: Scheldt Quays
 - triangle: the South
 - in red: tunnels under the Scheldt
- Source: Vanreusel (1990, p. 128)
(modified by the author)

Mirroring Barcelona’s experience with which they were very familiar, Galí and Quintana focused on a project covering the quays and the two areas at their extremes, where two new parks should be located (see Figure 175). Considering that “[t]o recover the quay is to recover its space”, they put forward a vast continuous open and empty strip, which would hence highlight the Scheldt, “giving new value to its presence in the city” (Galí, 1990, p. 166). To enhance the continuity of the riverscape, they proposed for example the filling of the Bonaparte Dock (the smallest one, closest to the river) in Eilandje. And to reinforce the void character of the quays, they recommended placing all the car parks underground and taking away the reminiscent port warehouses, considered “without remarkable architectural value” (despite the recognition of their importance for the city’s “collective memory”) (Galí, 1990, p. 165). In order to increase the accessibility to and the open views towards the river, they also suggested the selective removal of the floodwall, substituting it by a less intrusive land grading that meets the required 1.35-m protection height.

Like his Spanish peers, Van Reeth also took an enlarged perspective towards the quays’ area – not only including the two quay edges but extrapolating even further to encompass both riverbanks. Considering that the quays’ existing through traffic could only be restrained by the closing of the city ring, the architect proposed two elevated bridges, in Eilandje and the South (see Figure 176) (Van Reeth, 1990). The increased accessibility of the left bank would additionally favour a more balanced urban development. A chain of car parks for non-residents should be provided under the quays, while the port’s warehouses would be maintained, but hosting new uses. As regards the barrier effect of the floodwall, Van Reeth argued that “[o]nly if the wall is erected at the water’s edge do the Quays become entirely viable”; in this sense, an intermediate solution suggested by him was the

creation of “a bank [in the sense of a slope] on both sides of the provisional tidal wall” (Van Reeth, 1990, p. 173).

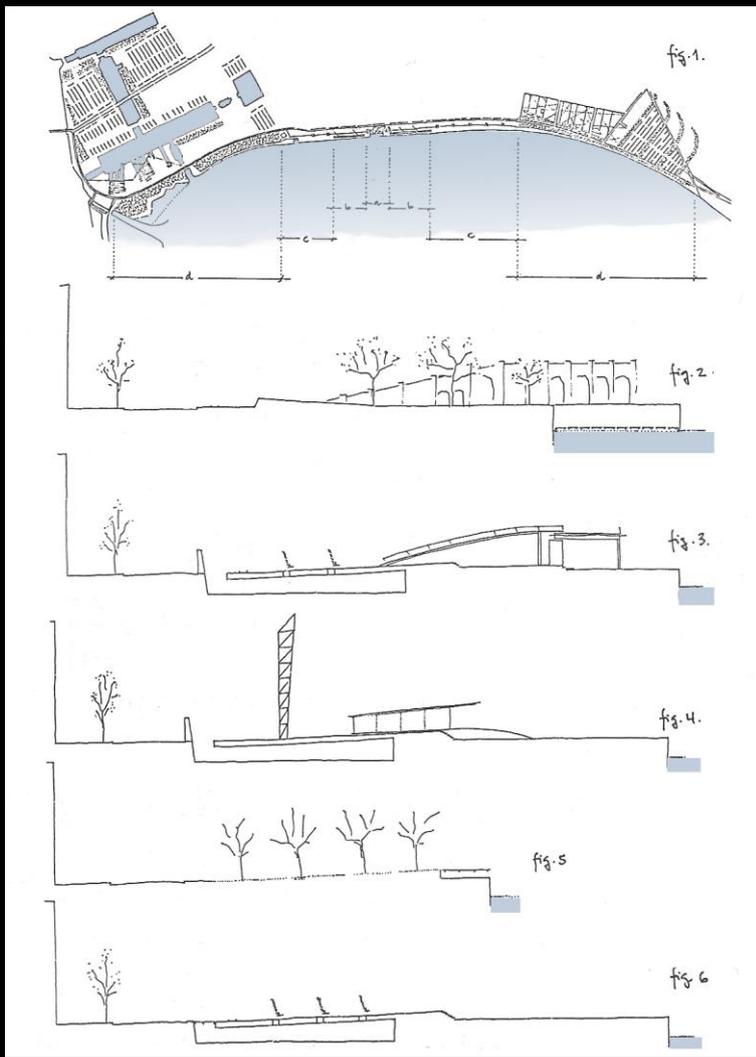


Figure 175: Beth Galí and Marius Quintana's proposal for Antwerp's quays

Legend:

- “fig. 1”: site plan (the entire riverfront, including Eilandje, the quays and the South)
- “fig. 2” to “fig. 6”: sections of some specific quay segments

Source: Galí (1990, p. 164) (water highlighted in blue by the author)

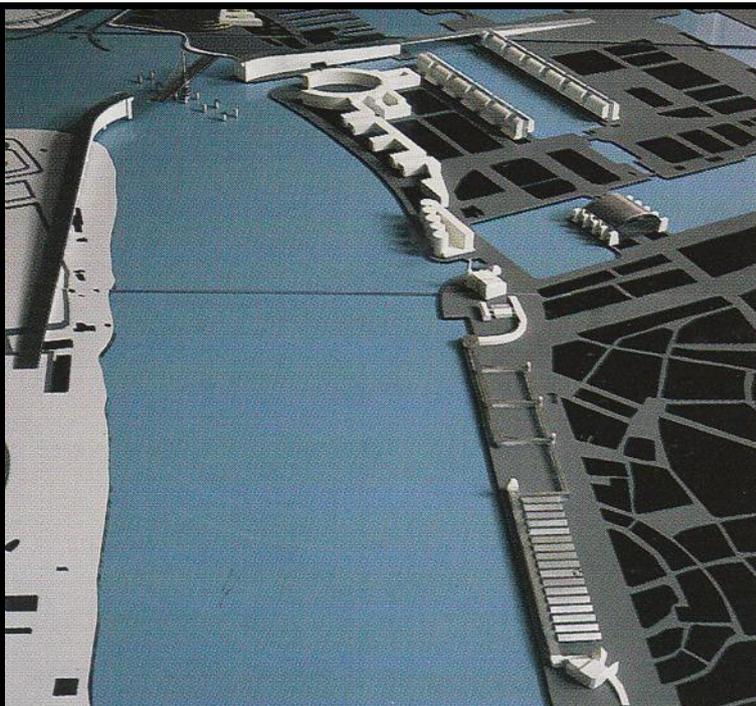


Figure 176: Bob Van Reeth's proposal for Antwerp's quays (northern segments)

Two new river crossings were at the centre of this design proposal
Source: Van Reeth (1990, p. 175)

Notwithstanding the remarkable achievements of the “City on the River” initiative, the operationalization of any of the related proposals would be very complex, at least in the short term, mostly due to the superposition of powers and interests in the riverfront. In fact, as informed by the interviewees, the port authority (then the major concessionaire of most of the lands in question) and the Flemish waterway-administration agency (Waterwegen en Zeekanaal nv, or Waterways and Sea Channels – W&Z), which is actually the owner of the area, were mostly concerned with the financial return of their assets. On the other hand, the Municipality of Antwerp, the entity in charge of urban-development planning and execution, had no tradition (in terms of human resources and other means) of dealing with projects at a very large scale; in its turn, the Flemish government, then one of the most important financiers of such projects, had other funding priorities (Smits & Lorquet, 2011; Willems, 2011; Smits & Teughels, 2014).

At the same time, as testified by an interviewee, “*the political landscape changed so dramatically [in 1994] that the funding for those projects stopped completely (so between 1994 and 1999 there was actually no city planning or city projects)*”. Therefore, despite the initial municipal backing of this bottom-up initiative, “it appeared that the authorities were not yet ready for the implementation of long-term projects after all” (Stad Antwerpen, 2012, p. 11). In fact, institutional inertia was probably stronger than the ambitions and means available to translate this initiative into reality, as stated by Janssens (2008). In practice, the lack of both sponsorship and political support put an end to the initiative in 1994 (Willems, 2007), without changing the riverfront prospects. From the proposals formulated in the framework of the “City on the River”, only Solà-Morales’s ideas for Eilandje have somehow been followed up on at the end of 1990s, when the city and the port authority initiated the process of recovering that vast area through a master plan elaborated by Buro 5 Maastricht (Smits, 2011; Stad Antwerpen, 2011).

As for the quays, the idea of their reconquest had at least become more salient than ever. A vivid synthesis of this closing stage was put forward by two local architects-urbanists, Filip Smits and Philippe Teughels, who have been working for the municipality (2014, p. 1373):

In hindsight, Stad aan de Stroom ended the way it started: as a (mere) dream of Antwerp citizens. (...) In short, by the time that Stad aan de Stroom was put on hold as a project, the abandoned and derelict port areas had definitely been reintroduced to citizens’ mental map of Antwerp.

This mental rediscovery of the riverfront has triggered the spontaneous appropriation of the quays’ space by Antwerp’s inhabitants, for temporary individual or collective uses (such as bicycling, picnicking or even hosting summer festivals), in parallel to the more permanent car-park function. Also, after the “City on the River” initiative, the quays have attracted private-sector real-estate investments flanking the waterfront (Smits & Lorquet, 2011); as asserted by an informant, “*during the period from the early 1990s until 2000 almost all the buildings along the waterfront were renovated and were made into lofts and high-end residential units*”. Yet, from the public space’s point of view, only some minor interventions have taken place in the central part of the quays (Stad Antwerpen, 2012). The formal abandonment of the quays by Antwerp’s public authorities was noted by an interviewee in the following terms:

So one could say that in many European cities, first they renovate the public space of the quays (of the waterfront) and then comes the private project development; that's the classic strategy: you improve the public space and then new housing, new apartments, will come because the public space is more attractive. In Antwerp, it's the opposite: the waterfront, the built front along the water, has already been renewed; there have been many new projects, while the public space is still a problem, and it's still very bad.

Accordingly, the re-emergence of the riverfront as a bottom-up process somehow contrasted with its prevailing hopeless appearance. In fact, it seemed that a driving force was urgently missing for putting into motion the good intentions for the quays; this role would be eventually taken by the 'inglorious' flood risk, foreseen to increase in the 21st century. Indeed, as summarized by an informant, *"the reason for the master plan is not the ambition of improvement of the public space; the reason for the master plan is a very technical one: it's the risk of flooding"*.

Having in mind that the circumstances of the formulation of the "Sigma Plan" in the 1970s had changed (namely regarding the anticipated sea-level rise and stronger storms, as well as the general assumptions behind and knowledge on flood protection), this sectorial plan was reviewed and updated in 2005. A new threshold was thus established to meet the latest safety requirements (mainly derived from the climate-change prospects in the Sea Scheldt): a flood with an annual probability of 0.01% (the so-called '1-in-10,000-year flood'), considering 2000 as the reference year¹⁸⁷. According to the interviewees, this is the highest protection level within the "Sigma Plan", to be attained only in Antwerp, where the damage potential is also the highest. As a result, the existing floodwall along the Scheldt Quays should be raised 90 cm, to reach a height of 2.25 m (see Table 9, Figure 177 and Figure 178).

Table 9: Potential flood heights and their evolving probabilities

	Projected annual probability of a flood that reaches a certain water level		
	in 2000	in 2050	in 2100
Level 1: existing quays	1/1.5	< 1	< 5
Level 2: existing floodwall ("Sigma Plan" of 1977)	1/350	1/100	1/20
Level 3: updated "Sigma Plan" (2006)	> 1/10,000	1/4,000	1/2,000

Source: elaborated by the author, based on data from W&Z (from June 2006)

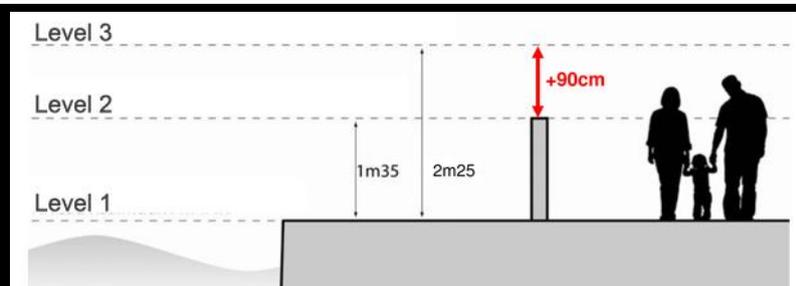


Figure 177: The undesired scenario of raising the floodwall along the Scheldt Quays

Source: Teughels (2011, p. 67) (modified by the author)

¹⁸⁷ This flood scenario assumes a sea-level rise of 22 cm between 2005 and 2050, and of 38 cm between 2050 and 2100, and also takes into account future manipulations on the Scheldt estuary (such as the deepening of the riverbed) to improve the access to Antwerp's port. These baseline conditions are even more severe than the ones adopted in the Dutch parts of the estuary, which consider a flood scenario with an annual probability of 0.025% (the so-called '1-in-4,000-year flood') (Marchand *et al.*, 2006).



Figure 178: What if the floodwall along the Scheldt Quays was simply raised?

In red, simulation of the impact of heightening the floodwall in the very centre of Antwerp
Source: author's archives
(9 May 2016)

In view of the anticipated aggravation of the barrier effect (in both spatial and visual terms) linked to the flood-defence intensification prospects, “[s]imply raising the height of the existing floodwall was not an option, neither for Antwerp nor for Flanders” (Stad Antwerpen, 2012, p. 36). In this sense an agreement between the city of Antwerp and W&Z was established in 2005 to start a joint planning process for the renovation of the quays¹⁸⁸. According to the interviewees, this circumstance was indeed a timely coincidence, in which the “*necessity of the Flemish government to raise the dykes*” and “*the political interest of Patrick Janssens*” effectively met¹⁸⁹.

The first step in this direction was the launching, by the Flemish government architect, of an international design competition “to appoint a designer to draw up a Master Plan for the regeneration of the Scheldt Quays and to monitor the realization of the Master Plan in the subsequent stage” (Stad Antwerpen & W&Z, 2006a, p. 4). In fact, given the scope and relevance of the project, the city decided that the competition should be organized at the regional level, as clarified by an interviewee:

The advantage is that the Flemish government architect has this kind of competition formula (the Open Oproep¹⁹⁰), which is well known in Europe; so if you participate in the Flemish government's competition system you know that your competition will have a lot of attention among good European architects, so that's the main reason. So in the city (...), for the projects in which we want to be sure that there will be enough good architects interested at the European level, we use the Flemish government's architecture [contracting] system.

The competition focused on the riverfront of the three areas previously targeted by “City on the River” proposals, and posited that safety and the quality of the resulting urban realm should be concomitantly achieved. Aiming at “a very ambitious regeneration project” (Stad Antwerpen & W&Z, 2006a, p. 4), the design competition pursued several overall objectives, notably:

¹⁸⁸ Acting on behalf of the Flemish government, W&Z was the public entity responsible for updating the “Sigma Plan” and has since then been carrying out its implementation.

¹⁸⁹ An interviewee noted that rightly after taking up the role of Antwerp's Mayor in 2003, Janssens had expressed his intention to recover the “City on the River” projects for the quays.

¹⁹⁰ The “Open Oproep” (meaning ‘open call’ or ‘open tender’) is a Flemish mechanism for contracting design services that comprises two major steps: first, interested design practices (normally in interdisciplinary consortia) postulate in an open manner for carrying out a given project; secondly, based on their portfolios, five of these teams are shortlisted to participate in a restricted design competition. The list of projects subject to this contracting modality is published twice a year.

- the revitalization of the quays as one of Antwerp’s most important public spaces;
- the upgrading of flood-defence structures according to the new “Sigma Plan” (the safety-level scenario formulated by W&Z “*was accepted as a precondition [to be] incorporated in the plan*”, as explained by the interviewees);
- the stabilization of the existing quay wall, considered an urban heritage of the 19th century, presently quite deteriorated and at risk of collapsing in some segments (see Figure 179)¹⁹¹.



Figure 179: The deteriorated quay wall in Nieuw Zuid
 Source: author’s archives
 (10 May 2016)

While the first objective was much longed for from the city’s point of view, the latter were indeed related to more tangible needs, especially from the perspective of the Flemish government (in charge of safety issues in the Sea Scheldt) (Vanneuille *et al.*, 2011). In this sense, a note regarding the updating of the “Sigma Plan” is worthwhile. Dealing with floods in Flanders is now encompassed among wider water-management issues, being anchored in a long-term vision for the Scheldt Estuary (defined in a shared manner with the Netherlands), in which nature (in the sense of ecology and environmental conservation) has a central role.

In the updating process, the same types of flood-defence measures initially appraised in the first “Sigma Plan” were re-evaluated (De Nocker *et al.*, 2006); yet, more emphasis was now put on the natural environment (for instance with the proposal to create new wetlands) and on economic aspects (such as the accessibility to the port) (Mees *et al.*, 2016). A new water-management stance centred on the sustainable-development concept has emerged since the elaboration of the first “Sigma Plan”, whereby flood-risk mitigation is handled jointly with nature development (Vikolainen *et al.*, 2013).

In Antwerp, the flood-hazard probability is considered (relatively) small (see Figure 180) and the “potential number of casualties” is considered low, but the potential economic impacts are the highest of the whole Sea Scheldt (due to the concentration of valuable assets) (Marchand *et al.*, 2006, p. 13). For instance, the flood-hazard map of Antwerp’s centre does not put in evidence the flood impacts associated to the existing underground structures (namely the tunnels under the Scheldt). In this densely built urban context – and

¹⁹¹ This point was described as follows by an interviewee: “*the quay wall itself is now in bad condition, it’s more than 100 years old; when we check it with the current stability norms, we have to conclude that for the 5.5 km in no place it is according to the actual stability norms*”.

even downstream, where the port activities are predominant –, there is not much space to be given back to river variations, especially if one considers the “*gigantic amount of water we should withdraw from the river to have any effect in Antwerp*”, as rightly pointed out by an interviewee. Therefore, instead of being combined with a ‘designed nature’ (as it is the case in most of the Sea Scheldt estuary), flood risk here would be combined with a designed and upgraded urban realm.

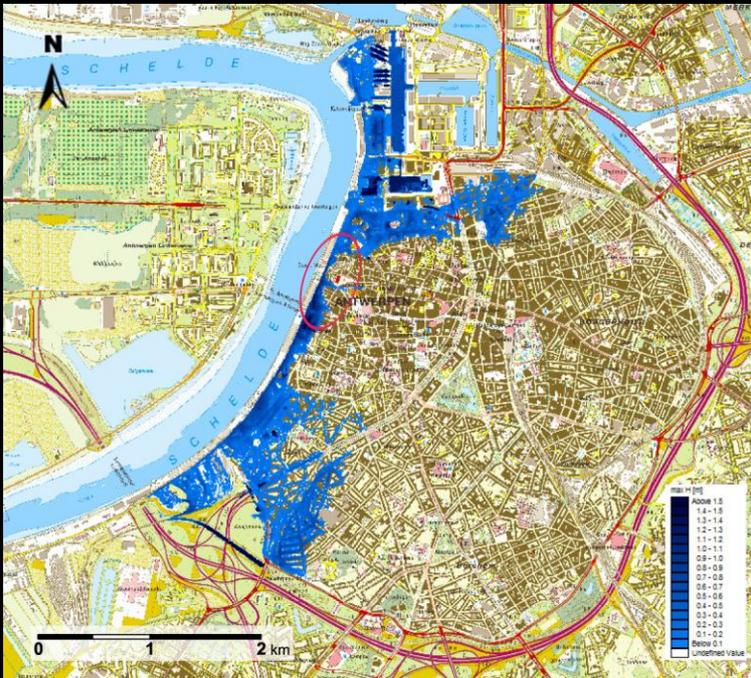


Figure 180: The fluvial-flood hazard in the core of Antwerp’s right bank

This map indicates the areas by the river that would be flooded in case of a failure of the floodwall (the area encircled in red corresponds to the historical city centre)

Source: Vanderkimpen *et al.* (2010)

In the words of Philippe Teughels, the Scheldt Quays’ project manager, and Kristiaan Borret, Antwerp’s ‘city architect’ between 2006 and 2013 (2007, p. 94),

[t]he new intervention on the quays will not be conceived as an exclusively technical question but strives for a maximum level of urban integration. It constitutes a double design challenge: what is the vision of the future for the quay area; and how does the new flood defence fit it?

Indeed, while the upgrading of the flood defence and the stabilization of the quay wall in Antwerp were considered a high priority by the Flemish government, the reasoning of the city administration (in particular the Stadsplanning agency, in charge of managing the plan) was to benefit from this opportunity (and the ensuing investment) in an intelligent way. This point was highlighted by an interviewee, who synthesized the city’s mindset after the identification of the double engineering problem:

[T]hen the city said: “if you, engineers, want to improve now the water safety of the city, and you have to renovate the quays, well, we will be more ambitious in the urban quality”; because there is now a kind of protection wall on the quays and we don’t want that again, we want a much better solution, so we will really demount it (...), and secondly we will put our own money also into the project so that for us it becomes a reason to renovate the quays as a public space.

In any case, according to an interviewee, the vision underlying the revitalization of the quays has always been shared by both citizens and politicians, that is, to keep the quays as

“*public domain and not to build too much on them*”¹⁹². Accordingly, the competition brief highlighted potentially conflicting issues within the design task, such as raising the flood-defence scheme (while integrating it into the existing urban fabric), not obstructing the view of the river (in fact the restoration of city-river relationships) and eliminating the urban barrier effect from both the floodwall and the traffic (Stad Antwerpen & W&Z, 2006c). The challenge was made clear in that document (Stad Antwerpen & W&Z, 2006c, p. 5), when the competition promoters stated that

[t]he development of the flood defence is a design-based task in the broadest sense of the word. The solutions may not be narrowed down to the choice between fixed and movable elements of a flood defence wall, but have to be approached as part of the development of a vision and concepts for the public space and, if applicable, buildings on the Scheldt Quays.

This perspective is totally in line with the overall conception of the architect-urbanist Marcel Smets, the Flemish *bouwmeester* between 2005 and 2010, to whom, given the key importance of urban infrastructures in the contemporary world, their design should not be pursued to merely produce efficient engineering devices but also to add to the quality of the urban realm (Smets, 2010; 2013a; 2013b). Being the actual organizer of the competition, the regional *bouwmeester*, with the close collaboration of his counterpart at the city level, took a lead role in preparing the competition brief and “*in defining what [was] the subject of the competition, and in that sense defining what kind of project we [would] make*”, as pointed out by an informant.

Following Smets’s orientations, the competition did not intend to generate an “execution-oriented design”, but rather a strong and coherent vision for the riverscape, as well as the proposal of “a set of specific preconditions and requirements” that would underlie the redevelopment of the quays in the long term (Stad Antwerpen & W&Z, 2006c, p. 9). The plans of the five preselected design teams differed significantly in terms of both the vision for the quays – that is, their ambience and the resulting urban image – and the spatial solution for integrating flood defence into them¹⁹³.

Given the size and importance of the project, “*the jury requested further clarifications on several specific (more concrete) issues before taking its ultimate decision*” and finally selected the design team composed of PROAP, the Belgian architecture and urbanism practice WIT, and the Italian firms D-recta (for project management) and Idroesse (for engineering). From the point of view of the commissioners, when compared with the other competition entries, the PROAP-led proposal presented three major assets, as

¹⁹² The same interviewee complemented: “[t]here is a large support: even from the opposition and the most extreme right-wing or left-wing parties, they all feel that the quays should be a place for the public”. In contrast, another interviewee recalled that, at the beginning of the planning process, W&Z as the owner of the area was “*really focused on ‘how much can we have as a return on the investment? Is it not possible simply to have more buildings on the quays (more residential buildings or offices)?’ It was a question that they very much put forward, because in terms of the financial feasibility of the project it will be better for them*”. This conflict was eventually pacified by the city with the argument that urban planning (including the functions to be assigned to the quays) is under its own remit.

¹⁹³ The shortlisted teams were led by S333 (from Amsterdam, the Netherlands), West 8 (from Rotterdam, the Netherlands), Studio Secchi-Viganò (from Milan, Italy), BAU (from Barcelona, Spain) and the Portuguese landscape-architecture practice PROAP (headed by the landscape architect João Nunes). Their respective proposals are briefly presented in Teughels and Borret (2007) and Van de Put (2007).

pinpointed by the interviewees. First, the PROAP team's design showed "*a kind of right approach about how to use the landscape to integrate technical interventions*"; secondly, "*their proposal was not a kind of finished proposal (some of the teams made a master plan for the quays in the way they would look like when everything is finished)*". Furthermore, they captured "*the existing identity of the quays and the landscape quality that in Antwerp we actually like, not trying to transform the zone into some international-style quays that might be in Barcelona or whatever city (some generic plan), but trying to contextualize*".

Indeed, the winning team submitted a proposal that, in some aspects, was not a direct expected answer to the objectives stated in the project specifications; yet, their response constituted the very means to reach them. As synthesized by a member of the design team, the main underlying idea of their competition entry was

in a very 19th-century way in a certain sense, to turn around the civil-engineering thing that had to be done in a civic instrument¹⁹⁴, and to basically use it as a device that was constructing public space and constructing the relationship between the city and the river (re-establishing a new type of relationship). So, it was a bit a trick, the main idea: "we anyway are going to spend this money on civil-engineering stuff, do it in such a way that the civil-engineering thing, at the same time, immediately, by itself, becomes a civic element." That was the concept of the entry; and it appealed...¹⁹⁵

Acknowledging the quays as a unique element of the city that yet has several particular spatial expressions, instead of a traditional master plan (in the sense of predefining areas, locations and functions) the winners proposed a "planning game" (PROAP, 2010, p. 210), in which several solutions could be assessed in terms of both flood protection and ambience. The game was conceived as a methodological tool to perform 'research by design' with the involvement of citizens and the concerned public authorities, around the interplay of river-quays-city typological sections along the whole riverfront (see Figure 181)¹⁹⁶.

With such a tool, the PROAP team intended to support the decision-making process, especially considering the fact that the master plan had two commissioners with very different points of view, a condition that, as stated by an interviewee, made the designers realize "*from the outset how complex (not really complicated, but complex) the decision*

¹⁹⁴ According to the philosopher Michel Foucault (2007, p. 20, quoted in De Block (2015)), 19th-century French engineers "were trained to develop overall planning policies that established a *medium* or *milieu* – that is, a multivalent framework in which a series of uncertain elements could unfold", contrasting with the common idea that engineers use solely objective parameters in their infrastructure designs (such as safety, feasibility and efficiency), not related to other requirements of the urban realm.

¹⁹⁵ This argument was complemented by another interviewee in the following terms: "[t]he major reason behind the success of this proposal was first of all to speak about the [quays'] infrastructure as a territory, and then to show that this infrastructure would be above all a transition between the city and the river; it would never be an obstacle, it would always be an inhabitable space".

¹⁹⁶ It should be noted that such a 'research by design' approach (or "design-based research") was indeed expected by the promoters of the competition, the objectives of which were expressed as "a number of 'research questions'" to be dealt with through design, as clearly stated in the competition brief (Stad Antwerpen & W&Z, 2006b, p. 10). Specifically regarding the flood-protection device, the questions were for instance: "How can the flood defence infrastructure be an additional value for the public space? Which principles of flood defence are the most appropriate for which locations?" (Stad Antwerpen & W&Z, 2006b, p. 10).

dynamics of the different actors would be¹⁹⁷. Moreover, besides the provision of public space and flood protection, the design had to manage, in a much contextualized way, other relevant urban demands, such as mobility and heritage along the riverfront.

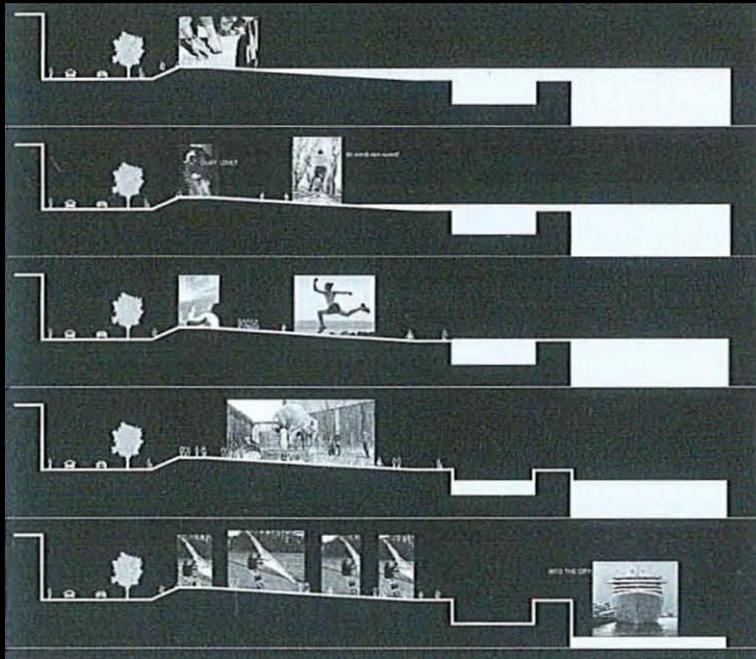


Figure 181: A sample typological section proposed for Antwerp's quays

In this section (as presented by the PROAP team for the design competition), the elevation of the protection level is achieved through smooth land grading; five different heights attained by the Scheldt's waters and possible corresponding uses are here illustrated
Source: Teughels and Borret (2007, p. 96), © PROAP, WIT, D-recta & Idroesse

The game contained specific pieces (the typological sections) and some rules derived from a careful study of each segment of the quays and from corresponding programming possibilities (PROAP, 2010). Initially, ten sections or quay slices – the quays' "keys" (De Meulder, 2008) – were proposed to form the 'abacus' (see Figure 182), with which the involved stakeholders could quite intuitively compose the new riverfront landscape, considering not only the balance between safety and urbanity but also other pragmatic factors such as financial viability and compatibility between the slices.



Figure 182: The design abacus (as presented in the final version of the Scheldt Quays Master Plan)

The rows refer to the seven quay segments (the height of each row is proportional to the length of the respective segment), while the columns indicate the proposed typological sections

Source: PROAP *et al.* (2010, n.p.), © PROAP, WIT, D-recta & Idroesse

¹⁹⁷ In addition to W&Z and the Stadsplanning municipal agency, several other institutional actors have interests and have been involved in the quays' regeneration process, notably the port authority, De Lijn (the public-transport company), GAPA (the municipal mobility and parking agency) and the Flemish body for the preservation of monuments.

Presented as the conclusive element of the PROAP team’s competition entry, the abacus compiled different typological sections proposing several combinations between type and location of the flood barrier, and profile of the quay’s traffic lane. Each typological section, reflecting a particular relationship with the water and the possible related urban programming¹⁹⁸, could then be possibly assigned to specific segments of the quays (see Figure 183), according to their present traits but also the ambitions attached to them. As properly referred to by an interviewee, in these sections the floodwall was mostly transformed into “*a topographical element with different slopes*” that “*expands the quays’ surface in order to make them inhabitable*”, being this “*inhabitable topography (...) always a space of mediation between the city and the river (also maintaining its own space, the water space)*” (see Figure 184).

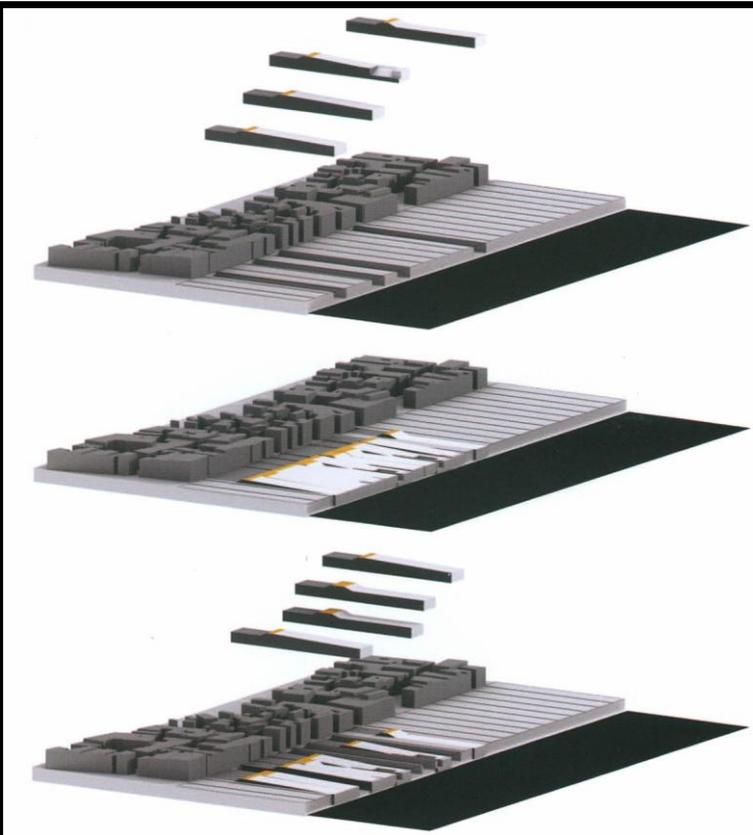


Figure 183: Potential combinations of quay typologies, envisioned by the Scheldt Quays Master Plan
Source: PROAP (2010, p. 211)

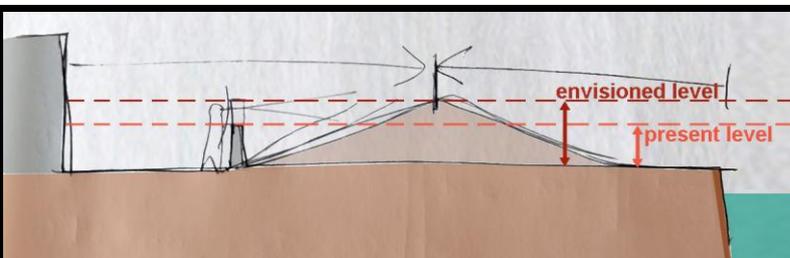


Figure 184: A schematic representation of the proposed “inhabitable topography”

Source: sketch by one of the interviewees (modified by the author)

Resulting from land grading in some segments or being simply incorporated as a floodwall into (existing or new) built structures in other sectors, such new element would finally

¹⁹⁸ As argued by an informant, “every wet zone obviously has temporary programmes; the urban or public space proposals there have to be understood as something temporary that can be affected by the water variations on an annual basis (once a year for sure), with flood heights of around 20-50 cm”.

define the proportions of the permanently dry and the potentially wet quay spaces, eventually enabling more regular or temporary urban uses within them. The game therefore made explicit an array of possible relationships between each of the different flood-defence strategies and the corresponding quay spatiality, thus instigating the discussions about the choice between fixed *versus* mobile devices, as well as their location, closer to or further from the quay wall¹⁹⁹.

The underlying idea was “the spatial variation of the borderline against the rising waters, by approaching it to the river or claiming land for the city, defining a dynamic landscape that varies under the tide effect or in case of exceptional floods” (PROAP *et al.*, 2010, n.p.). Variations of the water level were then combined with variations of the quay sections (as shown in Figure 181, on p. 248); or, the other way round, the “tides of the city become the breath of the quays”, as expressed by the architect-urbanist Bruno de Meulder, from WIT (2008, p. 19). The scenarios produced by the matching between the typological sections and the quay zones would thus support intense debates and negotiations about the future of the riverfront, yet in keeping with the overall vision decided for the quays (LAE, 2009).

Therefore, the spatial grammar formed by such ‘toolbox’ had the double function of ensuring the harmony of the whole quays in the longer term while promoting the due valuation of their multiple atmospheres. As a consequence, it definitely “choreographs a unity of diversity”, as expressed by Shannon (2013, p. 171). The game also perfectly matched the intended openness of the master plan’s preparation, related to both its collective development and the idea of not producing a finalized plan, but an evolving – dynamic and flexible – one. This stance was in fact made clear in the final document: “the masterplan will not be a blueprint but a strategy, not a project but a frame for evaluating future interventions. It should not decide what cannot be decided yet, not before concrete proposals come into the scope of realization” (PROAP *et al.*, 2010, n.p.). Perhaps the best way to synthesize the whole proposal for the quays is through Nunes’s own words (2008, p. 72):

[T]he type section proposal involves the construction of a design process rather than attempting to obtain a designed solution, it means defining an operational working model, the planned coordination of a time sequence, the rewriting and recontextualising of the current/existing situation, instead of proposing a static and indiscriminate transformation. In a nutshell, the proposal is all about landscape.

Besides the landscape approach, two components were fundamental for the success and openness of such design process: an enlarged participation and a strong communication strategy²⁰⁰. These associated activities were intended to foster people’s sensitization and involvement (while fine-tuning their expectations and the quays’ design), as well as to enhance their appropriation of both the quays’ space and the proposed plan. Indeed, the municipality understood that the expected changes in the relationship between city and river – mostly the loss of direct views towards the Scheldt due to the heightening of the

¹⁹⁹ The use of the expression ‘flood defence’ along this chapter mirrors its use by the two project promoters, but this expression is not at all used in the final document of the master plan (in which ‘flood protection’, with its less negative connotation, was preferred).

²⁰⁰ A comprehensive account of the communication and participation strategy that accompanied the elaboration of the master plan can be found in Stad Antwerpen and W&Z (2011).

flood barrier – would require the adherence of Antwerp’s citizens, in addition to the articulation of several city and regional services. As wisely illustrated by an interviewee, “*a city neither is one person, nor one voice; the city is also ten voices, is also the Alderman of tourism and administration and the Mayor and... so, it’s also a dragon with ten heads, always trying to move enough as good as possible in one direction...*”

The municipality therefore prepared “*an innovative participation process (...) at the level of the city as a whole*”, which was favourably welcomed and lasted beyond the design process itself. Between 2007 and 2009, Antwerp’s inhabitants were invited on several occasions and through multiple means (such as an Internet survey and several round-table discussions) to express their wishes and concerns regarding the quays (see Figure 185); more than 1,000 people interacted with the plan during that period (Stad Antwerpen & W&Z, 2011). An exhibition organized at the quays about its past and future and guided tours around the history of the port’s activities also attracted the local population (more than 50,000 persons and around 1,200 persons, respectively) (Stad Antwerpen & W&Z, 2011).



Figure 185: One of the collective occasions to decide the future of Antwerp’s quays

Source: Masbounji (2011, p. 70)

The discussions with Antwerp’s inhabitants and experts concerned methodological aspects – ‘is the master plan a timely instrument, given the challenges and the timeframe it has to face?’ – and the substance of the decisions to be taken – ‘are these the most appropriate design proposals?’ –, focusing particularly on the public space. In this regard, the “*design process for the quays was in itself an experiment for the city of Antwerp and for Stadsplanning*”, while the communication strategy was not a mere one-directional transmission of information, but also a process of information gathering, construction and sharing²⁰¹. Besides the publication of several documents about the renovation process to come, the communication efforts have produced some milestones that are still present in the quays’ landscape. For example, two temporary booths presenting images and information about the past and future of the quays, installed in 2010, can still be visited on the quays, in Sint-Andries and Zuid (see Figure 186); these platforms exhibit as well a scale indicating the actual height to be attained by the new flood-protection device. At the same time, in each quay segment, some reference images of the anticipated transformation of the area are displayed on the floodwall (see Figure 187).

²⁰¹ In 2009, the Scheldt Quays’ participation process won the Flemish “Thuis in de Stad” (“At Home in the City”) award in the category of “resident, neighbourhood or quarter initiative” (Stad Antwerpen, 2012, p. 167).



Figure 186: *In loco* exhibition of the Antwerp quays' past and future

This booth showcases the future of the quays, while in a second one nearby the history and ancient images of the quays are presented

Source: author's archives (10 May 2016)



Figure 187: The floodwall portraying the envisioned Antwerp quays

All along the quays, the floodwall is presently punctuated with such reference images

Source: author's archives (10 May 2016)

Besides the systematic follow-up of the plan by the city *bouwmeester* and the regional *bouwmeester* (both members of a steering committee that regularly met to discuss the project's evolution), the participation and communication strategy involved three formal enlarged moments of interactions, in which “*the project was submitted to different assessment committees, with different stakeholders, in order to get closer to a final document as consensual as possible (which was never an easy task given the multiple entities intervening in this area)*”. The most relevant particular interests involved in the elaboration of the master plan were tackled by specialized sub-studies, related to technical aspects, mobility, financial issues, functional arrangements and heritage (culture and history); taken as sub-components of the master plan, these sub-studies were performed in parallel to its elaboration (see Figure 188).

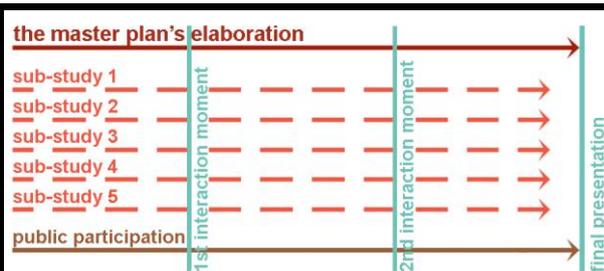


Figure 188: Organizational arrangement behind the elaboration of the Scheldt Quays Master Plan

Source: elaborated by the author, based on a sketch by one of the interviewees

Anticipated in the design brief, this arrangement determined that “*the master plan was the guiding factor, so it was responsible for designing which were the scenarios that would be investigated further*” within the sub-studies²⁰². The interaction moments were particularly aimed at exchanging the knowledge produced within the parallel activities; they defined three phases in the development of the plan. As explained by an informant,

the idea was to have a first phase which was really open minded and then each of the studies could have a broad idea and brainstorm and anything could go, and at the first exchange of ideas we would have a positive selection... We would actually cut the scenarios that we thought were too unrealistic or not feasible; and we would build scenarios, and then with these scenarios the second phase would start: each of the studies but also the master plan would then focus more on elaborating different kinds of scenarios. (...) and then in the second exchange moment, we would make a positive selection on the one scenario that we would like, the best one, and then actually finishing this one scenario and making one master plan.

Despite the “*continuous dialogue*” that prevailed during the design process following such arrangement, the safety level to be attained within the overall intervention had previously been defined (as a technical subject) by W&Z and therefore taken as a “boundary condition” throughout the design process (STAR-FLOOD, 2014). An interviewee indeed noted that the city “*just accepted the height that we need to have from the ‘Sigma Plan’, and the making of the master plan was more about landscaping, functions, and not so much then about safety anymore, because we knew what level of safety we needed to achieve*”.

According to an Antwerp-specific factsheet produced in the framework of the STAR-FLOOD European research project²⁰³, neither the organizers nor the participants of the debate about the Scheldt Quays Master Plan brought forward the elevation of the flood protection itself for further discussion (STAR-FLOOD, 2014). This stance is totally in line with the management of a “simple risk”, as suggested by the IRGC (Aven & Renn, 2010), and also with the locally prevailing cultural stance towards flood risk, namely flood defence as a remit of the governmental actors. This point was highlighted by an informant as follows: “*in Flanders, we really have the philosophy that [the government has] to protect people against floods²⁰⁴, but then you have the effect, the other way round, that when something happens all the citizens are very angry because the government didn’t protect them enough...*”

²⁰² According to the interviewees, the parallel development of the master plan and its sub-components was one of the key achievements of the Flemish government architect during the preparation of the design brief, since W&Z had initially proposed to follow the traditional linear path: they would first define the design preconditions (besides the already known height of the protection device, its location, type, materials etc.), and only then the designers would be called upon. After the selection of the design team, the Flemish government architect had a more supervisory role (for instance monitoring the plan every three months), while the city architect was “*much more involved at the drawing table and in the intermediate meetings*”.

²⁰³ STAR-FLOOD is the acronym for “STrengthening And Redesigning European FLOOD risk practices”, a research project that involved, between 2012 and 2016, 18 flood-prone urban contexts in 6 European countries.

²⁰⁴ This standpoint was also made evident in the wish for the quays’ project expressed by a participant of one of the round-table discussions, quoted in the master plan’s presentation booklet: “[a] safe flood protection that *provides complete protection* against floods, yet allows us to maintain the view of the water” (Stad Antwerpen & W&Z, 2011, p. 38; emphasis added).

Therefore, the flood issue was only further developed within the technical sub-study, jointly carried out by SBE and Technum, which assessed the stability conditions of the quay wall and the feasibility of the proposed flood-defence solutions. This sub-study involved for instance the elaboration of flood-hazard and flood-damage models (Vanderkimpfen *et al.*, 2010), which were particularly geared towards verifying possible scenarios (namely to assess “*what if the mobile system fails*”), in order to ensure that the ensuing damage could somehow be constrained. The specialized (more technical) information emanating from all the sub-studies and the design itself would be confronted to each other especially in the aforementioned interaction moments, as presented in Figure 188 above.

A preliminary proposal of the master plan was presented in 2009, generating discussions and inputs from “a broad and varied audience (citizens, representatives of the local economy, social associations and experts) during a 3-day symposium”, which equated to a third interaction moment (Stad Antwerpen, 2009, p. 42). The richness of the results of this symposium and of the overall public participation “*helped improving the master plan and making it better*”, and were integrated into the final document, as asserted by an informant. The “great spirit of democracy” within which the plan was developed was indeed remarked by Nunes, for whom the political will was a fundamental condition behind the design’s ultimate development, since it encouraged “the inhabitants to play an active part” in “the transformation processes, both major and minor, which affect them” (2008, p. 68).

After more than three years of shared commitments, researches, ideas, agreements and design, the Scheldt Quays Master Plan was eventually concluded and approved by the concerned authorities in 2010. This milestone was taken as “*the starting point for the more detailed plans on project level*” and for the definition of the priority implementation zones, as explained by the interviewees. The implementation of the plan (namely the quay-wall stabilization stage) started in 2012, covering two initial segments (Sint-Andries and Zuid, and a logistic platform in Blue Gate Antwerp), while the renovation of the public space should follow in Sint-Andries and Zuid and Droogdokken; the works related to the three major objectives on the entire quays were at the outset expected to take 15 years.

5.4 Resulting plan and projects²⁰⁵

The PROAP-led design team departed from a positive view of the flood-prone condition that prevails on the Scheldt Quays, as can be noted in the introductory section of the master plan (PROAP *et al.*, 2010, n.p.):

[T]hanks to the flood protection, the quay surface has been preserved until now, and has received its very special statute: the occasional flood risk makes it intra-muros and extra-muros at the same time. Not only is the raised water barrier necessary for better flood protection, it is also an opportunity (...) [that can] redefine the relationship between city and river. Can we think of alternatives within the margins of safety and economy? Can in other words the new flood protection be conceived in such a way [that] Antwerp citizens could learn to love it?

²⁰⁵ This section refers to the content of the master plan as it was delivered in 2010. The revisions associated to the change in the mobility policy, although having some general repercussion on the plan (namely in terms of reducing the use of mobile protections) are not covered here.

This perspective not only reflected the municipality's ultimate aims for this vast urban space, but also outlined the tone adopted for the elaboration of the Scheldt Quays Master Plan. It is worth noting that a key concept here was inclusiveness, expressed in terms of appraising several alternatives to jointly handle safety and the liveability of the urban realm, as well as in the integration of the inhabitants' aspirations for the quays. In fact, reaffirming the public nature of this space was a central aspect of the quays' design, which somehow followed the opposite direction of most riverfront-regeneration schemes being carried out around the world, as stressed by a member of the design team:

[I]n our competition entry, there was no emphasis at all on development, in the sense of real-estate development or programmes of commercial activities, not considered being a necessary thing. In that sense, in a caricature, it was probably, since a very long time, the very first waterfront development without development (in brackets real-estate development), and not intending it either.

The master plan thus recovers the same ambience for the quays earlier proposed by Galí and Quintana, to whom the spatial void and the possibility of having undefined programmes and uses were positive qualities of this vast area (see Figure 175, on p. 240)²⁰⁶. In any case, this point of view was also shared by the project commissioners, as stated by an informant:

[W]e didn't want to 'dis-signify' the quays, put a lot of... we didn't want to build, unless public programmes (a museum or something like that), but for instance in other cities perhaps they would develop the quays with housing projects; so we didn't want private projects (buildings), and we didn't want to fill it up completely, so there should remain some open spaces with no clear definition of programme, where all things can happen, sometimes very busy (because they are organizing events) but sometimes totally empty. So this kind of feeling that you could... for me that was very important, the kind of heterotopy feeling that you could... you have the city, where there are a lot of shops and bars, and everything is vibrant, but you could step out of the city, you could be on the quays, alone, calm, not too many people around, no festival etc., and you could walk with your dog, and look over the river and have a long perspective, so the kind of other face, being out of the hustle of the city, that was very important to keep.

Another key concept was the openness of the design proposal (which partially derives from the extent of the quays themselves), being able to evolve according to changing societal and economic situations – yet without losing its necessary operational character in the shorter term. This implies that further development may even be welcomed in the future (some buildings envelopes were already anticipated in specific spots); it may indeed be needed to guarantee at least part of the financing requirements of the overall scheme, as clarified by an interviewee:

[T]here is a certain leeway for reviewing parts of the proposed programme and the associated areas, if this eventually turns out to be interesting from the point of view of the economic strategy (in particular now, with the current questioning of the initial budgets). I'm not referring to residential towers located by the water's edge, not at all; but perhaps to the introduction of some additional urban equipment.

²⁰⁶ As aforementioned, although their proposal did not have to tackle the issue of raising the floodwall, the Spanish architects had already suggested replacing the barrier element (in its present lower height) by a smoother land-grading solution.

In any case, such a move would not contradict the essence of the plan, which did not set a predetermined spatial product but instead provided a framework in which safety is guaranteed while the city develops its full potentials in the longer term. The design team was unambiguous in this sense (PROAP *et al.*, 2010, n.p.), when stating that

[t]he masterplan thus wants to set clear spatial conditions that allow for future developments, safeguarding potential for scenarios and opportunities we do not know yet or even cannot imagine at this moment. It proposes a set of decisions and guidelines that prepare the quays to absorb actual and future projections, through focussing on basic spatial issues. It wants to set a long-term spatial ambition, flexible and dynamic, and able to deal with uncertainties. (...) As a referee, the masterplan tries to mediate the many claims on the quay area in an open-ended process.

Therefore, the resulting master plan dealt concomitantly with an array of different accomplishments that span from broad guidelines (the “conceptual attitude”), reflecting the stated ambitions for the quays, to some design proposals (emanating from a “design research”), presented as concrete (but not binding) examples of possible spatial layouts (the so-called “*reference images*”). Between these two poles, the design team proposed some “general decisions” and a “sectorial typological characterisation”, intending to ensure spatial coherence along the master plan’s long-term implementation in the full extent of the quays. In sum, these four sections constitute the central spine of the plan, in which main definitions were set at the larger scale of the whole quays, while the small scale of the concrete implementation was kept open to further interpretations as the design process evolves. In this sense, the flood-defence structure was assigned the ultimate role of enhancing the urban connections at the scale of the whole city, through the harmonious continuity of the quays.

The conceptual guidelines are composed of more or less vague headings that define the shared urban vision for the quays, being the cornerstone of the design attitude. They are presented in the master plan’s document as if they were a poem, a subtle choice that stresses the imagetic and sensible nature of the resulting plan:

‘The quays are a dynamic urban landscape.’
‘The quays belong to no one and to everyone.’
‘The quays are a porch to the river.’
‘The quays are the major public domain for Antwerp.’
‘The quays are a showroom for the city.’ (PROAP *et al.*, 2010, n.p.)

These headings are then further developed and illustrated, one by one, with associated quay images. The first guideline reinforces on one hand the unity of the quays as an identity-related structure of the city as a whole, and on the other hand the vibrant and continuously changing atmosphere that prevails on them, due to existing human and river dynamics. In fact, as described by an interviewee, “*when you go from the south to the north, you encounter different landscapes; the element separating river and territory is continuously changing, so it is a dyke, it becomes quays, it becomes harbour, it becomes a park*”. Nonetheless, this rich variety would have to be balanced with the spatial continuity of the quays; in this sense, the main message here is: “[e]xperiencing the quays as one single territorial and urban landscape is a fundamental quality that should absolutely be preserved

and enhanced” (PROAP *et al.*, 2010, n.p.). The second guideline stresses the quays as an undefined autonomous entity between city and river that accepts and supports a multitude of individual and collective activities. Hence, in the words of the design team, “the quays are a ‘decompression space’ where citizens can recover their breath and a ‘compensation space’: a refuge where things can be done that are considered inappropriate in the formal, urban environment” (PROAP *et al.*, 2010, n.p.).

The condition of the quays as a transition zone (in both north-south and east-west directions) is highlighted in the third guideline, which regards flood proneness as a “blessing” for the city, since it is considered the main reason why the quays have remained up to now open and undefined in terms of urban uses. Therefore, it is anticipated that the proposed flood-defence infrastructure “can set conditions for the quay area to fully develop its role as sanctuary” (PROAP *et al.*, 2010, n.p.). The fourth guideline concerns the important aspect of the quays as a major public domain, already mentioned at the beginning of this section. Finally, the last guideline reiterates the first one in terms of the quays as a spatial reference for the entire city, but also evokes them as a mirror, a ‘showroom’ of the different urban ambiances that flank the riverfront. In this regard, the design team considers that “one standard solution” can no longer “properly regulate the complex relationship city-river. The masterplan will therefore balance the unity of the wharf with the diversity of the city along the length of its quays” (PROAP *et al.*, 2010, n.p.).

With these broad (but strong) statements in mind, the master plan goes on to specify some “general decisions” to be followed in the subsequent detailed-project formulation stage, which, although more concrete than the conceptual guidelines, are more flexible in terms of their interpretation. Derived from the iterative negotiations and deliberations along the whole participative process, these decisions somehow keep alive the spirit put forward by the “inspiring images” of the s-RSA; they can be generally summarized as follows (PROAP *et al.*, 2010, n.p.):

– “Active harbour”: the quays as a historical and busy port structure should be safeguarded. Therefore, some port elements such as hangars and cranes should be maintained, as well as the possibility of mooring along the riverfront. This preservation stance is coupled with other suggested port-related activities (for example the possibility of water taxis), as a means to keep and even enhance the port character of the city (PROAP *et al.*, 2010, n.p.).

– “Heritage and archaeology”: as expressed in the previous ‘decision’, the respect for the existing tangible heritage on the quays goes hand-in-hand with the introduction of new structures, in such a way as to maintain their status of “living monument” (PROAP *et al.*, 2010, n.p.). Hence, the master plan clearly affirms the intention of not ‘freezing’ the quays (meaning that not all recommendations emanating from the cultural and historical sub-study were internalized in the design proposal), while understanding that both present and future generations should be allowed to leave their marks on the quays (the present plan likely constituting the 21st century’s major contribution).

- “Mobility”: the plan’s mobility concerns included not only the accessibility to but also within the quays. The several existing barrier effects will be avoided, as a means to favour accessibility, bringing into play diverse transport alternatives. This includes reducing the traffic on the quay lane and improving the links between the two parts of the city cut by the river. In line with the conclusions of the mobility sub-study, car parks on the quays (considered excessively permissive nowadays) should be placed underground, while public transports (including across the river) should be promoted (PROAP *et al.*, 2010, n.p.).
- “Public space and image quality”: the quays should remain open and accessible to everyone, apprehensible as a unitary urban space, yet with distinctive features in each particular city segment. The overall material image of this public space is to be composed of three prevailing characters – “naturalness”, “portuariness” and “urbanity” (PROAP *et al.*, 2010, n.p.) –, while the gradual transition between them is to be ensured by the proposed flood-protection structure (which thus plays here a much broader role than the traditional technical devices used for risk defence).
- “Quay programmes”: the current and future urban uses and functions located on the quays should constitute an additional asset for the surrounding neighbourhoods, providing them with amenities that they currently lack (PROAP *et al.*, 2010, n.p.). In any case, flexibility of uses should be pursued in the wished-for design output. Some additional buildings with new programmes could be introduced as contemporary landmarks on specific spots to enrich the city’s riverscape, without compromising the public nature of the quays.
- “A new flood protection device according to the actualized Sigma Plan” (PROAP *et al.*, 2010, n.p.)²⁰⁷: the envisioned safety should not be attained through a uniform strategy. Therefore, fixed elements (such as embankments or balconies, or even structures incorporated into buildings) and mobile devices will be used according to the quays’ specific relationship with their immediate urban surroundings. The line corresponding to the location of these protective elements is one of the few components of the plan that are clearly defined in the final document (see Figure 189).

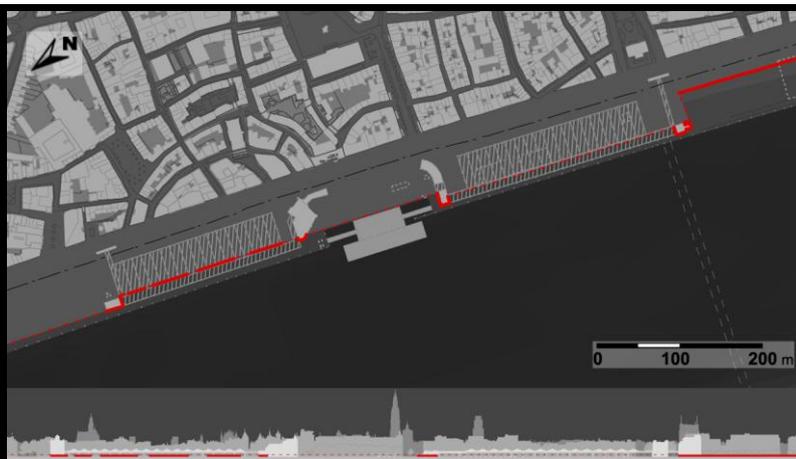


Figure 189: Plan and elevation of the new flood-protection solution on the central quay segment
 Legend:
 – dashed black line: existing floodwall
 – continuous red line: proposed fixed flood-protection elements
 – dashed red line: proposed mobile flood-protection devices
 Source: PROAP *et al.* (2010, n.p.), © PROAP, WIT, D-recta & Idroesse

²⁰⁷ In the master plan’s document the flood protection “general decision” appears as the third point, but in view of its central relevance for this thesis we decided to present it in a more detailed manner after all the others.

By manipulating the location of the respective flood-defence alternative chosen, the prevailing dry or wet character of each quay segment was then defined. Therefore, when the protection structure is closer to the river more (flood-safe) space is left for the city (paving the way for more fixed programming opportunities), while when closer to the city the river is given the opportunity to spread over the quays during high waters. According to an interviewee, the drawing corresponding to the location of the flood protection finally “*indicates, over the 6.5 km of the quays, which would be the most sensitive and urgent areas in which a more direct contact with water is needed, and thus where the mobile barriers would be fundamental.*” The total length to be covered with mobile devices was a debated issue, particularly given cost and safety concerns. As referred by an informant,

since there are presently well-developed technologies on unobtrusive movable flood barriers (which are only visible when they are needed), one may ask: “couldn’t the plan simply be the definition of a line along the river with movable barriers that are lifted when needed?” But the fact that such a solution has a high price meant that it would be a significant constraint in the budget that they were beginning to prepare (the budget was also worked up in parallel to the design process). In fact, this would have ended up suggesting mere numbers: how many kilometres we could build using such costly mechanism and how many kilometres we should make using less expensive alternatives.

This account was complemented by another one, which illustrates the different points of view of the two project commissioners on the issue:

For the mobile flood protection (where we could do that), [the city] did ask for a second opinion, and this was of course the start of a conflict [with W&Z], because [the city] questioned their idea on how much flood protection we could have; [W&Z] said “well, you can have so much”, [the city] thought “well, maybe we can have more, let’s ask some Dutch firm to have a second opinion.” And that was the start of a conflict (that escalated) because [the city] took on the role of also questioning [W&Z’s] expertise.

This conflict revolved not only around the costs of the mobile devices (which would finally be borne by W&Z) but also around the fact that these “have a higher probability of failure than fixed flood protection solutions”, even if they “would be advisable from a spatial point of view”²⁰⁸ (Stad Antwerpen & W&Z, 2011, p. 29). Therefore, having in mind the shortcomings of mobile devices and the fact that fixed flood-protection elements create visual barriers towards the river (one of the city’s major concerns), the choice of each of these two types of mechanisms had to be carefully balanced, following the knowledge produced within the technical sub-study. Due to the interest in restoring earlier city-river relationships, the plan suggests using mobile devices mostly to protect the oldest part of the city flanking the riverside (shown in Figure 189 above), which would also enable to increase the amount of public space in this dense central area.

It is worth noting that the master plan’s final document oddly does not include any actual photograph of the quays under waters, in the same vein as the consulted documentation related to it, elaborated by the project promoters or the designers. This fact may be explained by either the absence of good images with an architectural appeal or the

²⁰⁸ This conflict is also a clear illustration of how the design’s process and output are intertwined with ‘external’ issues (in this case the questioning of the legitimacy of one of the stakeholders).

difficulty (due to the associated dangerousness) of taking such pictures²⁰⁹. The most probable reason may yet be simply related to the fact that these events are often negatively associated to disruption and losses, going thus in the opposite direction of the defensive approach then pursued in the design. In any case, although the minor floods affecting the quays are quite frequent (at least once a year, as mentioned on p. 229), the rarity of the more severe events against which the city is to be protected with the implementation of the master plan may also be a justification for the absence of images of the flooded quays.

The five abovementioned decisions are eventually combined and synthesized in the master plan, taking into consideration the particularities of the urban setting flanking the riverfront. As a result, more concrete orientations fully anchored in the characteristics of the site and its needs are proposed; a “basic typological characterisation” is thus outlined for seven distinct segments, each of them having different ambiances related to the suggested flood-defence strategies (PROAP *et al.*, 2010, n.p.). Before introducing these decisions, the master plan presents the design abacus as the conceptual matrix (or the first generator) subjacent to the proposals then developed (see Figure 182, on p. 248), and the retained quay-section typologies as the toolkit (which are here further developed in terms of their spatial traits). According to an interviewee, the abacus was kept in the final document mostly as a reminder of the design process, since its major methodological functions had already been accomplished.

While introducing the retained typological sections and the corresponding quay segments, the design team made clear the master plan’s underlying planning principles (PROAP *et al.*, 2010, n.p.):

- Optimism and Adaptability, and learning from parallel experiences;
- Territoriality, as the integrating principle for interventions and their included landscape significance;
- Flexibility, presenting strategic solutions capable of dealing with all functional constraints, and capable of adapting to particular situations in each segment of the territory;
- Sustainability, balancing maintenance costs and spatial quality, aligning ecological to economic values.

These principles somehow express the main stances also taken by the two contracting bodies since the beginning of the design process, as discussed in the introduction of this section, although some of them (such as territoriality and flexibility) are clearly inputs of the designers themselves, according to their readings of the design situation. In the central part of the master plan, each quay zone – expressed by its particular “*couleur locale*” (see Figure 190) – is presented following the same structure²¹⁰:

- an introductory text with the local particular implications of the five “general decisions” (PROAP *et al.*, 2010, n.p.), delineating the zone’s overall character;
- a synthesis plan in which these implications are spatialized;

²⁰⁹ Following our demand, the Municipality of Antwerp did provide us with some flood-related photographs of the quays, but these either show wet quays outside of the high-tide peak or were registered after 2010 (when the master plan was finalized).

²¹⁰ At least one example of each of the drawing types included in the master plan will be presented in this section, together with a summary of the proposals for each zone.

- detailed sections in which the quay “keys” that may be used in the zone are explained in more concrete terms²¹¹ (including the selected flood-protection solution and a particular quay-lane profile);
- for each of the applicable typological sections, a set of plans related to three different water-level scenarios, in order to show the impact of floods on the proposed uses (briefly illustrated with some general images); and
- a schematic plan associating the three image-quality characters (“naturalness”, “portuarity”, “urbanity”) to the resulting public space, complemented with some suggestions in terms of quay-lane profile, materials and ambience (showcasing images of other projects, by way of mere references, in order to facilitate future decision-making) (PROAP *et al.*, 2010, n.p.).



Figure 190: The seven quay zones with their respective “couleurs locales”

Legend (from left to right):

- red: Droogdokken
- orange: Rijnkaai
- yellow: Bonapartedok and Loodswezen
- green: Sailors’ quarter and city centre
- blue: Sint-Andries and Zuid
- light purple: Nieuw Zuid
- purple: Petroleum Zuid (renamed Blue Gate Antwerp)

Source: City of Antwerp’s archives

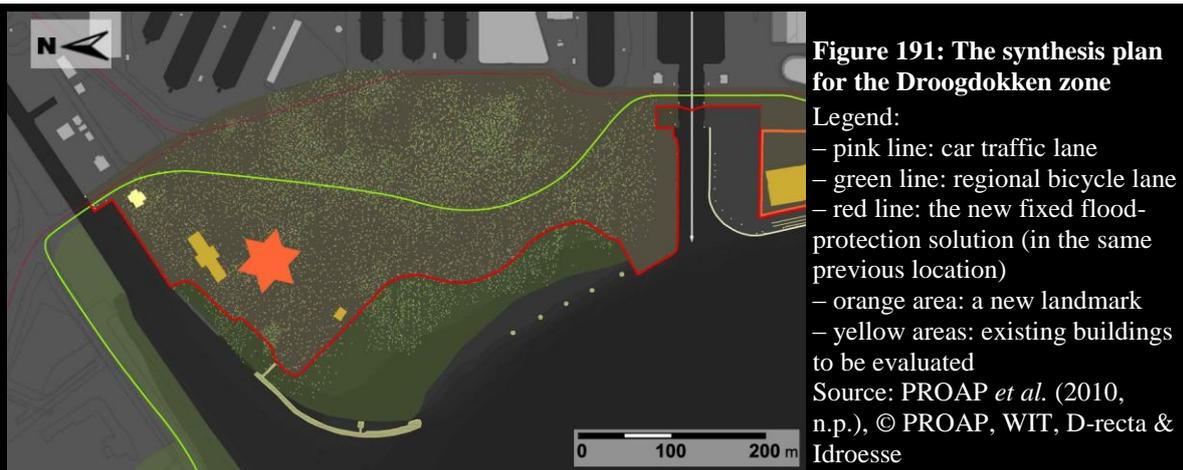
The section containing the aforementioned information is followed by an exercise of exploratory design, which is “the most detailed level [in the master plan] as well as the most open-ended one. It basically remains ‘research’: its result shows what is possible and thus points the way for subsequent designers of subprojects” (Stad Antwerpen & W&Z, 2011, p. 27). The designers recognize that the research by design was “very fruitful to support earlier guidelines or typological choices” (PROAP *et al.*, 2010, n.p.); yet, the pictures included in the exploratory-design section (either plans, simple 3-D renderings or more elaborated images) only illustrate a possible interpretation of the guidelines contained in the master plan and are therefore not binding.

As noted by the project commissioners, these suggestive images may nonetheless convey the idea that the master plan is ready for implementation (an expectation that could be unintentionally created within the participatory process) (Stad Antwerpen & W&Z, 2011). This stance would be clearly incoherent with the wished-for flexibility of the plan (in terms

²¹¹ As noted in the master plan’s presentation booklet, “[a] good integration of the new flood protection into the urban landscape is a point of particular interest (...). Cross sections are chiefly used to investigate this issue. They are an excellent tool to visualise the barrier effect of the flood protection as well as all possible solutions” (Stad Antwerpen & W&Z, 2011, p. 49).

of both programme and detailed layout) and its capacity to adapt to unanticipated societal needs and funding conditions along the implementation process. In any case, as regards floods, the presented images duly stress the minimalist landscaping options taken by the designers (only a few built structures on the floodable parts of the quays), implying that the destruction potential of the Scheldt's waters is kept to a minimum (Lamster, 2007). A summary of the major features of the seven quay segments (as finally characterized in the master-plan document) and some illustrations of the exploratory design are presented below, keeping our flood lenses as the main thread (PROAP *et al.*, 2010, n.p.):

1) Droogdokken: at the transition between Antwerp's northern edge and the port (having thus both "urbanity" and "portuariness" characters), this zone will become "a metropolitan park and a place to wander" (PROAP *et al.*, 2010, n.p.). The quay wall in this segment is only present around the belvedere, in its southernmost section, and does not have a heritage status. Consequently, part of the shoreline here keeps its 'natural' state and the existing flood protection is a dyke instead of the floodwall. These features will be further emphasized and integrated in the future park (Figure 191), which will be the only recreational space by the right bank's shoreline to have a more natural atmosphere²¹².



A closer contact with the Scheldt will be propitiated in Droogdokken, somehow mirroring the ambience of the Sint-Anneke Beach, located just across the river. Despite the zone's confluence character (the dry docks, still included within the port premises, were finally excluded from the planning area), its prevailing image is one of "naturalness", as presented in the schematic section in Figure 192. The master plan also envisages that the belvedere area will be raised to the "Sigma Plan" safety level, while the dyke will be heightened with a gentle downward slope – a related exploratory-design example is presented in Figure 193.

²¹² This aspect was explained by an interviewee in the following terms: "for the Droogdokken area, [we] also want to have tidal nature back into the city; [we] want to make a zone where the natural bank of the River Scheldt would be visible (...), so that you can experience the tides and you have this zone where there is always mud and you have this zone which floods every month during spring tides (...) you have this tidal nature near the city centre. And then it will also be more accessible (...) so that the people from the city and the children could come here, very near their homes, to learn about the tidal system and the nature. So that was another interesting point of view, to make the people aware of the water and to experience the variations."

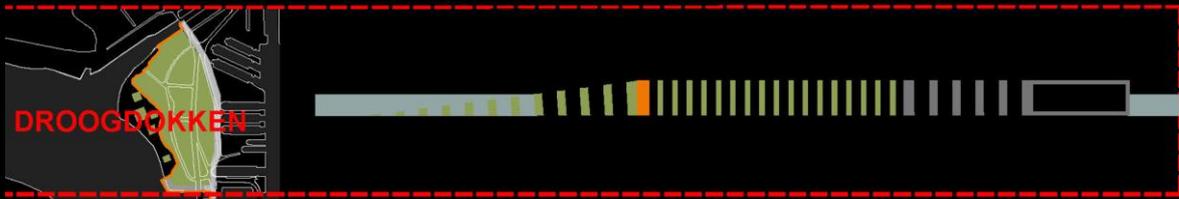


Figure 192: Schematic section presenting the prevailing “image qualities” in Droogdokken
 Green lines correspond to “naturalness”, while grey lines indicates “portuariness” (in orange, the location of the crest of the protecting dyke)
 Source: PROAP *et al.* (2010, n.p.), © PROAP, WIT, D-recta & Idroesse



Figure 193: Exploratory-design example for Droogdokkenpark
 Source: PROAP *et al.* (2010, n.p.), © PROAP, WIT, D-recta & Idroesse

Droogdokken was the second quay segment to have its project further developed, after a design competition held in 2011, which also followed the Flemish “Open Oproep” procedure. The winning design team, composed of Van Belle and Medina Architects (a Belgium practice) and Vögt Landscape Architects (from Switzerland), had to adhere to the master plan’s general guidelines, but was not restricted by the ‘research by design’ exercise presented in the plan’s final document. In their design, finalized in 2016, the area’s curved configuration limited by the river was emphasized, with the expansion of the belvedere overlooking the city, which took a hexagonal shape enclosed by the new quay wall at the “Sigma Plan” level (see Figure 194). The overall spirit of “naturalness” and the open programming were nonetheless totally kept.



Figure 194: Final plan for Droogdokkenpark
 The dashed red line indicates the crest of the protecting dyke (at the updated “Sigma Plan” level)
 Source: City of Antwerp’s archives, © Van Belle, Medina & Vögt Landscape (modified by the author)

2) Rijnkaai: directly bordering the most important redevelopment area in the north of the city, the “modest new waterfront” for the “regenerated harbour-city Eilandje” is intended to be the most occupied quay segment (PROAP *et al.*, 2010, n.p.). The existing port cranes are to be maintained, thus blending “urbanity” and “portuarity” characters, while greenery will continue not having a particular place here. The proposal for this section is the one closest to the traditional idea of urban waterfront: dense and mixed-use developments rightly on the quay, since it is considered that “[n]ew building envelopes on the Scheldt quays can provide more structural coherence with *Het Eilandje*” (Stad Antwerpen & W&Z, 2011, p. 41). The flood-defence device is here proposed near the water’s edge: mostly a floodwall integrated into existing or new elevated buildings (which would further enrich the city riverfront), creating balconies underneath them overlooking the Scheldt (see Figure 195 and Figure 196).



Figure 195: A detailed section of the Rijnkaai segment, considering two water-level scenarios

The scenario on the top shows the present flood-protection level (8.35 m), while the second one represents the mean water level (2.65 m)

Source: PROAP *et al.* (2010, n.p.), © PROAP, WIT, D-recta & Idroesse



Figure 196: Exploratory-design example for Rijnkaai

The scenario studied here consisted in maintaining the hangar 26 and integrating the floodwall beneath it

Source: City of Antwerp’s archives, © PROAP, WIT, D-recta & Idroesse

Although this solution responds quite well to W&Z’s concerns regarding the return on its investments (see footnote 192, on p. 246), the designers note that it might conflict with the techniques for the stabilization of the quay wall, since “necessary stabilization anchors will hinder deep underground constructions or foundations in the first 40 meters perpendicular to the quay wall” (PROAP *et al.*, 2010, n.p.). Thus, in Rijnkaai, the present 100-m-width quays become a narrow strip populated with the existing monumental port cranes, which remain floodable and accessible to the public; the image quality in this strip anticipates a particular atmosphere, with a “minor light intensity as well as the roughness, robustness and solidity of urban furniture” (PROAP *et al.*, 2010, n.p.). In the southern part (flanking the Bonaparte Dock), a more direct visual connection with the river is proposed, by resorting to a semi-mobile flood-protection device.

3) Bonapartedok and Loodswezen: the urban configuration of this area, located between the traditional city and its 19th-century northern extension, constitutes a distinctive break in the quays; moreover, several listed buildings concentrate near the former lock of the Bonaparte Dock. These conditions propitiate “an intimate tidal garden and a stop for water transport”; a pontoon is thus suggested here to support these two functions (PROAP *et al.*, 2010, n.p.). In this spot, the river variations can be fully experienced, while the flood-protection alternatives generally follow the ones proposed for Rijnkaai. On one hand, mobile devices will enable a greater visual permeability between the MAS and the Scheldt in strategic locations (as shown in Figure 197); on the other hand, fixed devices will be integrated into existing and new buildings (a new landmark is proposed on the quays here).



Figure 197: Exploratory-design example for the area around the Bonapartedok's former lock

The contact with the water is reinforced; in the background, the MAS, with open views to the river (except when impeded by the mobile protection devices, during extreme floods)

Source: City of Antwerp's archives, © PROAP, WIT, D-recta & Idroesse

In this regard, this quay section brought a specific challenge, given the heritage status of existing docks, locks, several buildings (which will soon host new uses) and an urban monument, whose relationship with the river is hampered by the location of the present floodwall between them and the Scheldt. To overcome this limitation, the master plan proposes an innovative way to deal with the defensive device (PROAP *et al.*, 2010, n.p.):

Reconversion of the monuments will examine if the water barrier can be integrated within the buildings, at the city side, to recover the typical relationship with the Scheldt and the water. Buildings within the floodable area will then be protected one by one (and at own risk) with particular, temporary and/or less disturbing solutions.

Indeed, an interviewee noted that

of course it's really difficult to have a flood-protection dyke system near these historical buildings; you don't have the space (it's too little space to make a dyke) so you need to make a wall. But even so, the Master Plan had really good ideas and challenged the engineers to try to incorporate the flood protection into the historical buildings, and this has been a fight from the start until now, trying to convince people to really integrate the flood protection into these historical buildings. Every new project leader that I see, which is executing one project on these buildings, first thing he always says is "well, why can't you put the flood protection outside of the building?", and we have a lot of difficulty always to convince them, but we have been doing that for some years now (...).

According to the interviewees, following some recent studies elaborated in the framework of the renovation of the Loodswezen building, the feasibility of this proposal was finally verified and it is about to be implemented with the due approval of both the building owner

(the port authority) and the heritage body. Erected within the basement of the building (its ground floor is actually elevated) (see Figure 198), the floodwall at the height stipulated by the “Sigma Plan” will be totally dissimulated from the urban and landscape points of view. In any case, the master plan recalls that such a solution always “requires special attention for accessibility (or possible evacuation) of the buildings any time” (PROAP *et al.*, 2010, n.p.), an issue to be taken into account in the renovation of the Loodswezen building. In this context, the public space closer to the shoreline will remain prone to floods, which implies resorting to simple and robust layout and materials in its design (see Figure 199).

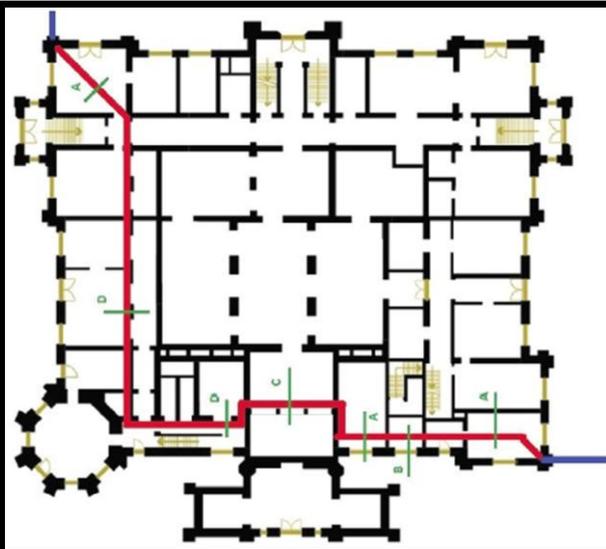


Figure 198: One of the studied options for the integration of the floodwall into the Loodswezen building

In red, the floodwall integrated into the building’s basement; in blue, the continuity of the flood defence outside the building

Source: City of Antwerp’s archives



Figure 199: Exploratory-design example for the public space in front of the Loodswezen building

Source: City of Antwerp’s archives, © PROAP, WIT, D-recta & Idroesse

4) Schipperskwartier and Centrum (the Sailor’s quarter and the city centre): flanking the historical city core, the most central part of the quays is understood as “a permeable urban infrastructure” (PROAP *et al.*, 2010, n.p.). In order to recover past city-river connections in this area, the use of mobile flood protection close to the shoreline is proposed (see Figure 200), compensating the lack of open space in the city centre, and “urbanity” is to be the prevailing atmosphere (PROAP *et al.*, 2010, n.p.). Therefore, the wide (and flood-safe) platform to be regained by the city could be used for several regular or sporadic urban activities, bringing back the vitality of the riverfront in this emblematic zone. Considering that this is the most sensitive quay area from the urban image and heritage points of view, the choice of the most expensive flood-defence solution (including in terms of operational cost) seems fully justified here. Covered public spaces are also proposed under the hangars to be preserved (with reconfigured uses) (see Figure 201).

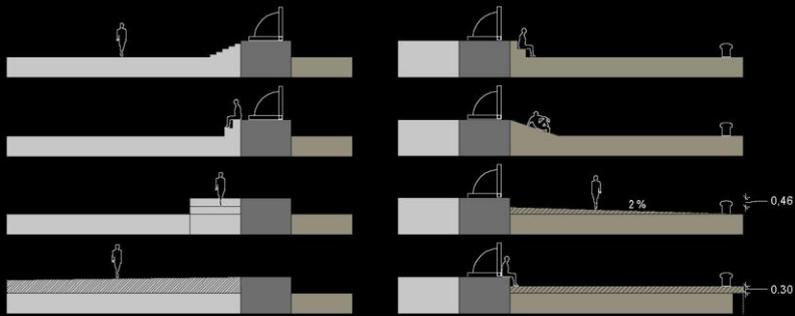


Figure 200: Some of the options for integrating the mobile flood protection into the public space

The mobile device is placed above a fixed threshold that can take many different forms
 Source: PROAP *et al.* (2010, n.p.), © PROAP, WIT, D-recta & Idreesse

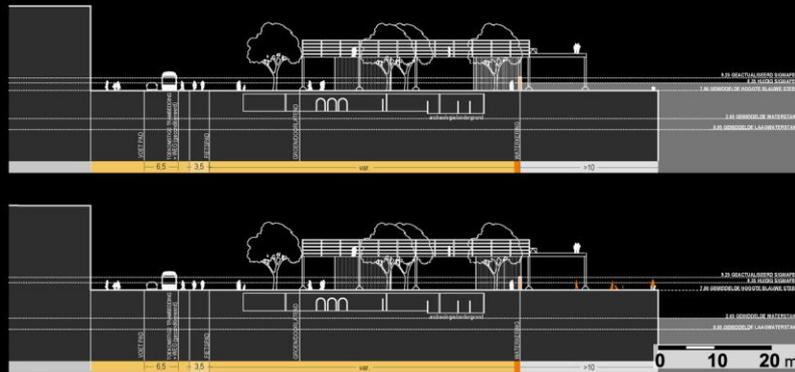


Figure 201: A detailed section of Schipperskwartier and Centrum, considering two water-level scenarios

Access to archaeological vestiges under the southern hangar will possibly be provided
 Source: PROAP *et al.* (2010, n.p.), © PROAP, WIT, D-recta & Idreesse

The only busy spot in this segment at present is around the Steen building, its square (where, differently from the rest of the Scheldt Quays’ public spaces, trees are still concentrated by the shoreline, as they used to be before the rectification works – see Figure 161, on p. 224) and the associated pontoon, which brings the city closer to the river. A new linear pontoon in front of the Schipperskwartier is proposed to promote the intensification of water-related activities, adding again some “portuarity” to this neighbourhood, while also functioning as an additional promenade by the river. Following the same rationale pursued in the case of the Loodswezen building, the floodwall should as well be integrated into the existing listed buildings in this segment and possibly into “new building volumes under the hangars”, as shown in Figure 201 above (see also Figure 202 below) (PROAP *et al.*, 2010, n.p.).



Figure 202: Exploratory-design example for Schipperskwartier and Centrum

New configuration and uses are proposed for the northern hangar
 Source: PROAP *et al.* (2010, n.p.), © PROAP, WIT, D-recta & Idreesse

5) Sint-Andries and Zuid: this segment is envisaged as the quays’ “void and haven”, in which the riverine atmosphere will prevail through the resort to an embankment closer to the city, liberating a vast empty space by the river (PROAP *et al.*, 2010, n.p.). Therefore, the quay will here basically remain as it currently is: a floodable space (see Figure 203). Car parks are placed underground, in a way that leaves the quays for people’s enjoyment (see footnote 205, on p. 254). This segment was the first quay area to be further detailed as a pilot project, a task that was also conducted by the PROAP-led team between 2009 and 2015, thus demonstrating how the master plan’s general rules could actually fit in a final design (Figure 204). The stabilization of the quay wall in this segment started in 2012, while the renovation of the public space will be implemented in several phases (initially scheduled to begin at the earliest in 2014, its starting date was finally adjusted to mid-2017).



Figure 203: A study of the impact of floods on the uses proposed for Sint-Andries and Zuid

Three water-level scenarios were considered in the master plan (the orange line indicates the crest of the dyke): daily tides (on the left), twice a year (in the centre) and the updated “Sigma Plan” level (on the right)
Source: PROAP *et al.* (2010, n.p.), © PROAP, WIT, D-recta & Idroesse



Figure 204: A segment of the PROAP team’s detailed plan for the quays in Sint-Andries and Zuid

Source: City of Antwerp’s archives, © PROAP, WIT & D-recta

The desired emptiness atmosphere and the possibility of having undefined programmes, expressed by both the project commissioners and Antwerp’s residents during the participation stage, were fully put into practice here²¹³. At the same time, the idea of an “*inhabitable topography*” is effectively accomplished in this segment, while the crest of the dyke comprises a promenade all along its length with views to both city and river (see Figure 205). The flood-protection device was indeed integrated “*as a very landscaped dyke (not like the standard dyke that [engineers] like to build, but with very smooth terrain modelling), and you can always see that you have the height of the flood level, the line, you can follow it but it’s really integrated in a very smooth way*”, as described by an informant.

²¹³ As noted by an interviewee, the internal dynamics of the Sint-Andries and Zuid project were similar to the ones involved in the elaboration of the master plan, in terms of both design phasing and consultations.



Figure 205: Sections of the flood-protection device in the detailed project for Sint-Andries and Zuid

The dynamic topography formed by the dyke generally favours the space for the river, although people can use it most of the time
 Source: City of Antwerp's archives, © PROAP, WIT & D-recta

The image quality proposed for this zone is defined in relationship with the new proposed dyke. While “urbanity” (expressed through greenery and permanent urban amenities) marks the (always-dry) city behind the dyke (Figure 206), in front of the dyke the riverside constitutes a “terrain vague” that will function as a refuge from the bustling urban ambience, being associated to “portuariness” (PROAP *et al.*, 2010, n.p.). The possibility of having ships moored by the shoreline was thus maintained, while temporary activities can take place in this area, “especially in summer when the flood risk is very low” (PROAP *et al.*, 2010, n.p.); the water will even be accessible through a sloping platform located near the former lock of the southern dock (Figure 207).



Figure 206: An example of “urbanity” behind the dyke

The undesired barrier effect is minimized through a careful insertion of greenery and urban amenities
 Source: City of Antwerp's archives, © PROAP, WIT & D-recta



Figure 207: An example of “portuariness” in front of the dyke

A ramp contributes to reconnecting city and river, while forming an urban beach
 Source: City of Antwerp's archives, © PROAP, WIT & D-recta

Despite the effective integration of the flood-protection structure in the riverscape in this segment, such adaptation solution may have a drawback in operational terms, especially considering the particularity of the locally prevailing cultural stance towards flood risk (referred to above on p. 253). Since crossable gentle slopes will make the transition between the dry (flood-safe) city and the floodable quays, no real barrier will impede the access to the quays during flood events; at the same time, according to the interviewees,

Antwerp's inhabitants are not really aware of the risks posed by the river in its normal conditions. Therefore, additional (softer) flood-mitigation interventions (such as sensitization) may also be needed to complement the spatial solution, as duly recognized by an informant:

Now we still have the floodwall, which is an ugly floodwall but it's a barrier. In the future we will have dykes, which are easily accessible, and we still have to, with the police officers and the fire department, we still have to work out an operational system: what do we do when it floods? How do we keep the people away? Will there be patrols? Will there be policemen telling people "don't enter here"? Do we need signalization? We still have to elaborate on that, we don't have it yet.

6) Nieuw Zuid: flanking a brownfield – a former railway service area – that would be subsequently converted in an urban extension (outside of the scope of the quays' master plan), this quay segment is conceived as “an urban park strip awaiting development” (PROAP *et al.*, 2010, n.p.)²¹⁴. Given the individuality of this area as regards the existing city and the availability of land, a dyke was proposed as a simpler flood-protection solution, detached from the shoreline. Therefore, most of this quay segment will be raised to the flood-safe level (see Figure 208), in order not to obstruct the views to the river from the new neighbourhood to be located behind it (as it will be the case in the traditional zones of Sint-Andries and Zuid). This alternative thus enables improved relationships between the neighbourhood and the water, as noted by an interviewee: “in Nieuw Zuid, the city will reach the river at a higher level, and the city itself will directly look at the river”.



Figure 208: A detailed section of Nieuw Zuid, considering two water-level scenarios

Source: PROAP *et al.* (2010, n.p.), © PROAP, WIT, D-recta & Idroesse

Besides plenty of greenery that gives continuity to the northern quay segment and links the city to the countryside in the south, the plan also anticipates some building envelopes in Nieuw Zuid (see Figure 209). Indeed, the prevalent character of the more urban quay segments did not seem to fit here²¹⁵, especially given the fact that green public spaces will be duly provided within the new mixed-use neighbourhood (which embraces urban vitality

²¹⁴ During the elaboration of the master plan, the transport firm Mexico Natie was still the concessionaire of most of the Scheldt Quays' segment corresponding to the future city extension of Nieuw Zuid (Stad Antwerpen & W&Z, 2006c, p. 28).

²¹⁵ The designers' justification is the following: “As long as the continuity of the wharf is guaranteed, the quay area does not need to be identical to the one along the city centre: a 100 m wide strip separated from the city. With the highway junction in the back, this city extension is rather narrow and probably not able to support such a vast open area” (PROAP *et al.*, 2010, n.p.).

and sustainability as its main goals)²¹⁶. Contrasting thus with the overall approach taken in the consolidated city, this proposal was explained by an informant as follows:

In the Zuid and Petroleum Zuid areas, the barrier almost disappears (that's what is proposed by the master plan), given that the city encroaches on the river rightly at the 9.25-m level (which is the safety level), and in this case we can even build directly on the water's edge, in a controlled manner, favouring transversal and permeable moves, for instance by resorting to elevated ground floors etc. Why not?



Figure 209: Exploratory-design example for Nieuw Zuid

Source: PROAP *et al.* (2010, n.p.), © PROAP, WIT, D-recta & Idroesse

It is worth noting that Nieuw Zuid corresponds to the segment in which the quay wall is the most deteriorated (the use of the quay has even been restricted since 2007, due to subsidence risk, even though it hosted port activities until 2012). Consequently, a priority quay-wall stabilization intervention started in 2015 in this area and is expected to last five years. A brand-new quay wall is presently being built (see Figure 210); it nonetheless retains the same height and reuses the finishing of the previous historical one (such as the blue stones and the bollards), in order to ensure visual continuity along the whole quays.



Figure 210: Works for the renovation of the quay wall in Nieuw Zuid

The flood-protection solution in this segment will be a dyke close to the shoreline, the height of the quay wall remaining the same to ensure visual continuity
Source: author's archives (10 May 2016)

7) Petroleum Zuid: Antwerp's oil cluster, established in the early 20th century and partially being relocated today, is understood as an "activity hub and green corridor to the Hobokense polder", a transition zone between the industrial fabric and the agricultural lands (PROAP *et al.*, 2010, n.p.). The future of this urban fringe was still undefined during

²¹⁶ The proposals for the quays developed within the master plan were integrated in the specific development plan for the New South, elaborated between 2011 and 2012 by Studio Secchi-Viganò.

the elaboration of the master plan (a parallel study was conducted to reconvert it into a green-business platform oriented towards inland navigation), while the concessions of the area would be in force until 2035 (Teughels, 2007). Considering these facts, in the conclusions related to the ‘research by design’ exercise for this segment, the designers smartly state that “it becomes more and more senseless to try and define concrete guidelines for a too distant future” (PROAP *et al.*, 2010, n.p.).

Therefore, as expressed by an interviewee, their few indicative guidelines included that “*the existing structures get integrated into a green zone, a park, while also maintaining the current functions of a logistic area, of a port area (that is, an area with industrial and logistic appropriation*” (see Figure 211). Indeed, the zone can still be conceived as a part of the green corridor that starts to the south of Sint-Andries and Zuid and extends until the natural reserve at the Hobokense polder (by Antwerp’s southern boundary), although, given the necessity of private premises in the new business park, the quays themselves would lose their public character in some spots.



Figure 211: The synthesis plan for Petroleum Zuid (renamed Blue Gate Antwerp)

Legend:

- pink line: car traffic lane
- red line: the new fixed flood-protection solution
- yellow areas: existing structures to be evaluated
- green line: regional bicycle lane
- orange line: building envelope
- white area: new quay infrastructure

Source: PROAP *et al.* (2010, n.p.), © PROAP, WIT, D-recta & Idroesse

As regards the flood-protection solution, given the involved uncertainties, the designers opted for simplicity, proposing for instance to raise the quay wall to the updated Sigma level (keeping thus the existing mooring conditions) (see Figure 212). According to the interviewees, this quay segment was the most difficult one in terms of reaching a consensus during the elaboration of the master plan²¹⁷. This fact explains why an informant considered that “*actually the master plan [for the Scheldt Quays] almost ends [in the Nieuw Zuid] in its full capacity*”, even if “[*i*]n the beginning we had the ambition (and also it’s really much in the Structural Plan) that the quays [also] incorporate [Petroleum Zuid].”

²¹⁷ Concerning this issue, one of the stakeholders somehow unburdened himself in the following terms: “*this was the zone where we had the most difficulty trying to combine the different stakeholders and the interests of the different stakeholders. So both the Flemish government and Waterways and Sea Channels (but also some other private parties here), they really wanted this to be a new company zone, and when we first started to make the master plan here, there were also other political ideas, like to make it a big forest or a park, and there were really heavy debates on that. The debates ended in making it a corporate zone, but following those debates there were always some kind of suspicion towards making a master plan, towards what we would try to say here, on landscape and functions, [fearing] that we would try to have a new decision (not making it a company zone), and so a lot of stakeholders were very suspicious.*”

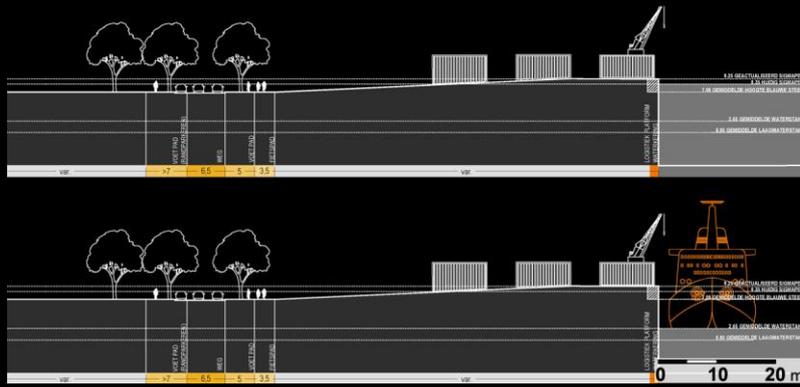


Figure 212: A detailed section of Petroleum Zuid, considering two water-level scenarios

The functioning of the logistic platform is not disturbed even during extreme flood events

Source: PROAP *et al.* (2010, n.p.), © PROAP, WIT, D-recta & Idroesse

For commercial reasons (namely the commissioning of the new industrial hub, which was finally named Blue Gate Antwerp), the logistic platform in this zone (marked in white in Figure 211 above) is already fully accomplished. Here the quay-wall stabilization works and the upgraded flood protection were finally combined: the new quay was actually built at the “Sigma Plan” flood-safe level²¹⁸ (see Figure 213). These first works were also intended to support the overall redevelopment of the industrial zone and the neighbouring Nieuw Zuid area, since the contractors “*would be able, for example when they are constructing here, to bring the construction materials as much as possible through the river*”, thus minimizing part of the implementation costs related to transportation.



Figure 213: The new quay in Blue Gate Antwerp, already at the updated “Sigma Plan” level

Since the quay here would function as a logistic platform, it was simply built anew at a higher level (as suggested in the master plan)

Source: author’s archives (10 May 2016)

The master plan’s final document ends with a section containing some “frequently asked questions” about the plan itself (mainly its contents, mindset and operationalization aspects), as if they were raised by Antwerp’s inhabitants, as shown in the following two examples: “What will happen with the hangars?” and “Can I touch the water?” (PROAP *et al.*, 2010, n.p.). Moreover, the document also includes an appendix corresponding to the master plan’s operational framework, a section that was not anticipated in the design brief but required by the commissioners when the master plan was almost being concluded (as disclosed during the interviews). This appendix provides a summary of the plan and anticipates some indications on “logical units for the implementation as well as the spatial preconditions under which certain subprojects can be developed” (Stad Antwerpen &

²¹⁸ As noted by an interviewee, “*from a logistic point of view, having some sort of floodwall is very inconvenient because you always have to pass over or you have to pass through and it can be flooded when a severe event occurs, you have to be prepared that in your logistic zone the quay will be flooded and that’s not very interesting for that kind of companies.*”

W&Z, 2011, p. 51). It presents some additional plans that clearly define critical axes (such as the location of the flood barrier and the tramway) and identify coherent units of sub-projects (in operational terms), which should (ideally) have their detailing and implementation carried out as whole (even if no execution phasing is exactly proposed).

Overall, the master plan's guidelines strengthen the links between city and river (while favouring both safety and urbanity), being thus totally in line with the s-RSA's "Water city" and "Eco city" images. Indeed, the plan actively seeks to allow the 'naturalness' of the Scheldt (which is presently a much designed river, like most European ones) to be experienced by city dwellers, as duly expressed by an informant:

Once we started working with the flood-protection system and rethinking the relationship between the water and the city, it was the relationship between water and city; but then it was water as an element that brings in seasonality, that brings in tides, that brings in the movement, that brings in seasons, that brings in colours, that brings in the weather, so it makes many elements of nature perceivable, and this had to be brought back. Because now, until then, the river was something behind, and the city had turned its back to it, and it could not reach it, so bringing the inhabitants back to the river and bringing them in different types of confrontations with the river is bringing the fundamental relationship between nature and man back in the city (...), integrating [these variations and contingencies] in urban life, but basically in a situation where [the quay] remains a kind of a balcony, to step out of the city, so a kind of compensation, a contemplative space of the city in which you get out of the business, get out of the compactness, get out of the over-constructed and the dynamics and commercial and whatever (the hectic urban life), you step out, you're on the balcony and you... It enforces itself in a completely different atmosphere.

The richness of the master plan is partially derived from the acknowledgement of the quays as a space of mediation between river and city without compromising the diversity of the urban fabric flanking the riverfront. Consequently, the proposed flood-protection strategies further enrich the dialogue between Antwerp and the Scheldt: dry and wet ambiances are in fact negotiated along the quays' entire length, whereas both are conceived for the enjoyment of the city's inhabitants in a safe manner (see Figure 214 and Table 10).

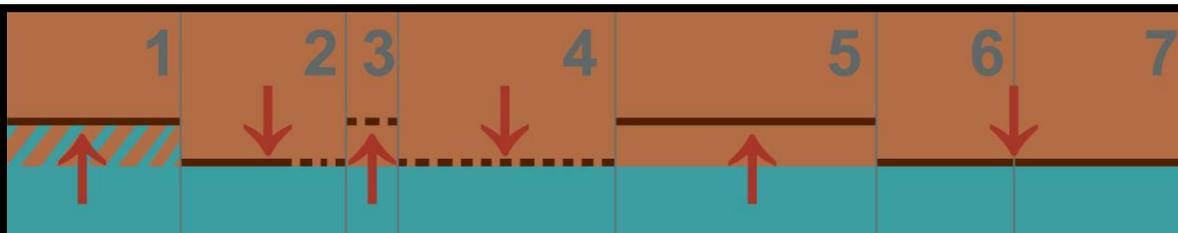


Figure 214: Type and location of the flood-protection solutions proposed in the master plan

This scheme presents the negotiation of city and river spaces in the seven quay segments of the master plan
Legend:

- 1) more space for the river: a tidal park
- 2) more space for the city: the floodwall is incorporated into buildings (+ mobile defence)
- 3) more space for the river: a tidal garden (mostly mobile defence + floodwall incorporated into buildings)
- 4) more space for the city: mostly mobile defence
- 5) shared space: partially floodable promenade (embankment)
- 6) and 7) more space for the (expanding) city: the quays are (almost fully) raised

Source: elaborated by the author

Table 10: Dry and floodable area in each segment of the Scheldt Quays (including the quay lane)²¹⁹

	1	2	3	4	5	6	7
Floodable area (m ²) (%)	29,949 (20.5)	19,965 (28.8)	11,772 (30)	13,659 (15.2)	59,986 (46)	14,574 (8.9)	35,983 (21.2)
Permanently dry area (m ²) (%)	116,342 (79.5)	49,311 (71.2)	27,358 (70)	76,158 (84.8)	70,368 (54)	147,748 (91.1)	134,090 (78.8)
Total area (m ²)	146,291	69,276	39,130	89,817	130,354	162,322	170,073

Source: elaborated by the author, based on PROAP *et al.* (2010)

In several locations the direct contact with the water is to be restored; Antwerp's inhabitants will actually have the possibility to come closer to the Scheldt (and possibly touch it) also on the right bank: in Droogdokken, Loodswezen, and Sint-Andries and Zuid, besides the new pontoons proposed along the quays. Quite ironically, the increased accessibility to the water may equally have a downside, which is again related to the prevailing cultural stance towards risks (although in this case the risk in question is the one of drowning), as lucidly explained by an interviewee:

So the real contact with the river is a little bit undue, because it's very dangerous if you fall into it. (...) In that way I think it's a little bit ambiguous, because you want people to experience the water but you also don't want people to be seduced to jump into the water. And that's difficult because, you see, if you are on the quays when the weather is fine you see people trying to get to the water everywhere, like in the lock [in the South], you sometimes see young people climbing from the stones to the muddy area to explore it, and it's really very dangerous; and last Summer [2015] it was on the news that the police of Antwerp had patrols on the water and they were warning people by their megaphones: "Do not jump into the water!"

Just like in the case of Sint-Andries and Zuid (see p. 269), when fostering a closer relationship with the Scheldt, the rearrangement of the flood-protection device has to be complemented with compelling communication activities. Indeed, the design of the quays has to be combined with a precautious mindset as regards the river's waters, so that people can safely enjoy Antwerp's new riverfront (by "*just lying in the sun near the water*", as suggested by an informant).

To conclude this section on the 'design product', a final note is perhaps needed regarding the implementation schedule of the Scheldt Quays Master Plan; in fact, an innovative process and a highly valuable plan, if not effectively carried out, can only have a marginal impact (if any) to actually transform Antwerp's riverfront. The positive conditions that enabled the due elaboration of the plan have unfortunately not endured to ensure its smooth implementation (Borret, 2011). This point was referred to by some informants, one of them in the following terms: "*immediately after the competition we went on, it progressed very well, but then after two-three years things became complicated, and financial problems, and discussions were postponed, and decisions were postponed, then it went slower and slower*".

Despite the "*very good collaboration at the level of the project leaders*" from AG VESPA and W&Z along the process, the plan's implementation has been facing important delays

²¹⁹ These figures, included in the operational-framework appendix, are only indicative, being based on the design research developed within the master plan.

especially due to financial reasons: *“there is not enough money to keep a good pace (...), we need to have more money to be able to make the transformation quicker”*. Indeed, as highlighted by the interviewees, the fact that the quays’ project does not really involve private developments has important repercussions in terms of financing:

[I]t’s entirely a publicly funded project, but it costs a lot of money, and this is why the transformation is really slow. There are other areas in the city of Antwerp where we can have a return on investment by giving plots to the private developers and gaining money to refurbish the public domain; this is not the case for the quays.

Moreover, the massive investments involved demand close collaboration between the concerned entities, in order to have budgets and plans fine-tuned and synchronized²²⁰. In any case, an informant cleverly noted that *“finance is always political; so where to put the money that’s a political decision”*. The same person also considered that when the competition was launched the main challenge was a design one: *“how to integrate technical measures in public space with ambition”*; nonetheless,

the main challenge now [in 2016] is how to advance, how to get things built, so why is it not being built? And also how to avoid that you lose quality and that you lose ambition, because now that it has been taking a long time (that’s a classical evolution), after a time when it takes too long people begin to say: “well, just build something, don’t fuss too much about quality etc., because we really need to advance now.” So that would be for me now the main challenge: how can we still keep the original ambition, and still really build something, realize.

The implementation delays became even more extensive with the election of a new mayor in 2012, who *“has changed completely the agenda of the city, interrupt[ing] also very important projects that were going on”*; in fact, urban planning and regeneration somehow lost the importance acquired during the previous term of office²²¹. Therefore, for an urban project to be presently carried out in Antwerp, it has to follow a process described as a *“competitive organization”*: *“there are a lot of projects which are interesting, and we need the money for all these projects and we need to have political support”*, the latter having diminished for the implementation of the quays’ project. The current loss of momentum, with the rupture in the city’s political orientation, is indeed a major concern for most of the interviewees. As sagaciously noted by an informant, *“to recover, to regenerate, to rethink the space of a city is a very difficult and fragile operation; if you interrupt it, you have to restart completely, it is very quick to lose everything, having then the need to restart completely.”* Given the present constraints, the expected duration of the quays’ works has risen from 15 to 25 years (STAR-FLOOD, 2014).

²²⁰ As explained by an interviewee, *“[t]he overall figure is 450 million euros for the investments in the quay wall, flood protection and public domain; there is an exploitation cost of 2 million euros, and there is an income of 2 million euros. So the entire infrastructural investment won’t be recuperated by public or private investments”*. Another one complemented: *“public investments are also like dinosaurs, they take a lot of time and you have two public investors [in this case], which have their own way of working, and you have to put these two in the same rhythm; I think that this is the difficult part of it”*.

²²¹ Two examples of the city’s new orientation: although the post of city architect was maintained, there are now *“less people working in the department, and the impact, the power of the new bouwmeester, is less important, (...) so the function is now more restricted”*. Besides, Stadsplanning Antwerpen first lost personnel, before being finally merged into AG VESPA (in 2014), and since *“the planning agency wants to produce good planning at long term [and] the real-estate agency, of course, wants to have short-term revenues, there is [thus] a kind of conflict between the two...”*

Regarding the master plan, although “*the spatial and functional roles of the quays didn’t change*”, the major political disagreement has related to mobility and car parks on the quays, which were a key concern behind the overall ambience proposed for the riverfront. Differently from the previous policy, “*the current mayor is in favour of car-based mobility, that is, taking cars up to the shops’ doors (in a perhaps more populist attitude)*”, as expressed by an informant. The decisions previously taken in this regard have been overruled, namely having underground car parks at the outskirts of the quays (which was indeed a costly investment), and the master plan has been adapted accordingly.

The car parks (among the few structures under public-private partnerships) are now located much closer to the city centre and “*are going to be half underground*”, a change that implies a significant cost reduction, since less mobile flood-protection devices will be used in the central segment (being partially replaced by defensive floodwalls integrated into the buildings). Yet, the idea of having a car-free central quay segment and reversing the cars’ present status in the city centre has been totally lost. In any case, as stated by an interviewee,

I think that it’s always the case in politics, in governmental circumstances when you have new leaders, they don’t abandon the plan but they want to put their own accents, and then their opponents say “oh, no, this is not an accent, this is really a change in the plan!” (...) [But the Scheldt Quays Master Plan is] on a high level and it leaves open space for different accents, like when in ten years maybe it will be not for a political reason but for some other reason that you want to change it a little bit, but the structure is there and you can fine-tune...

5.5 Chapter summary and tentative conclusions

The design and decision processes related to the Scheldt Quays Master Plan bring to the fore several lessons for the regeneration of flood-prone urban spaces, even if the major stance towards flood risk is here explicitly a defensive one. From these lessons, we identified five major themes: (1) ‘floods positively viewed as an opportunity’; (2) ‘flood protection duly articulated with other urban demands’; (3) ‘design objectives clearly stated but means not fixed in advance’; (4) ‘the previous experience and/or sensitization of the design team’; and (5) ‘design activity performed as an open process’.

The first theme is related to the positive stance underlying the design process: neither the quays (which were once perceived as an ‘urban prosthesis’ left behind by the port) nor floods themselves are understood in a negative sense; on the contrary, both are viewed as a great opportunity for Antwerp by the project commissioners and the design team. Such standpoint was for instance expressed by the commissioners through their “great reluctance to consider [the problem] from a strictly technical and infrastructure perspective”, by taking it as an occasion for “using the design to make a contribution to responding to other problems affecting the city” besides flood risk, as observed by Nunes (2008, pp. 68-69). On the other hand, given the range of possibilities opened by the floodable quays – “where nothing and everything can happen” –, the designers even portrayed this context as “a god’s gift to Antwerp”, or “Antwerp’s ticket to the future” (PROAP *et al.*, 2010, n.p.).

Aiming to reinforce Antwerp's sense of urbanity, the master plan takes such positive stance as one of its main planning principles (see p. 260), even in relationship with the flood-defence device. Indeed, floods were here assumed as being beyond a technical constraint, constituting also a real asset to unify and give coherence to the riverfront; in this framework, spatial design could thus be performed as a means to reveal the opportunities and possibilities attached to the flood threat. This perspective was expressed by Nunes himself, in the following terms (2008, p. 70):

What makes this process interesting, more than the result itself, is the way it was approached, rejecting the strictly 'engineering' perspective of limiting the initiative to solving a technical infrastructure problem, and also renouncing the strictly 'architectural' perspective of establishing an objective image, a vision of a work space, in favour of devising a new formula in which the landscape is the all-important question that has to be tackled. Therefore, on the one hand, the new approach is dynamic, and on the other hand, it is closely linked to the planning options that are implemented at any given time when taking into consideration the different circumstances, actors, etc. that are involved.

Some key ideas are presented in this quote: the way the problem was approached (that is, the actual design process) was clearly not restricted to a problem-solving stance, in either engineering or architectural terms. Focusing instead on the landscape (one could also rightly say: focusing on the "andscape"), the human-natural dynamics involved in the riverfront could be grasped in a designed solution that establishes a spatial frame in which such dynamics can evolve. Thus, spatial design takes here a role that is not simply restricted to defining a final output; on the contrary, this general and strong spatial framework devised reinforces the open possibilities in terms of output. An interesting and provocative argument raised by one of the interviewees duly portrays optimism and the acceptance of dynamism as an innate condition of riverine landscapes (although this is still seen through a dualist prism):

In a certain sense, if I overemphasize, I would say: floods actually don't exist. Because a river is a dynamic thing, and it takes the space that it needs, and it varies according to the volume of water that it has to deal with at a certain moment. It's only because we, as men, as humans, think that we have to make a line and say "this is the border of the river", but the river doesn't have a border, actually; it's like saying "where does the river start?" Saying it in a very stupid way: the water is everywhere before it is somewhere in the river, but where is the distinction between this everywhere and somewhere? The border actually doesn't exist; we as men make a mental construct, and say "nature has to obey to us." But who are we, as a culture, as men, to say this? So the river anyway takes revenge, sooner or later; most of the human enterprises that we do, nature takes revenge sooner or later. Nature does not have so many problems with floods... Of course, when the city is right there, you cannot say "flood does not exist and let's have the water flowing in it", but it was the idea to let the river talk much more as river, by the inclinations, and where the new water retention wall is brought closer to the city, so to bring the river much closer...²²²

²²² The same interviewee later complemented this argument, highlighting the context of climate change as a driver for flood adaptation: "[w]ith climate change, for cities (...) which are more or less at the level of the sea, or 50 cm higher or a metre higher, everything is about flood, and the main device of the design is this taking care of the fundamental position of the city and defining the city in such a way that it deals with flood. There's no money left to spend on anything else, anyway, so... And then it's thinking of what is acceptable in the city that gets flooded and what is not acceptable, and where are the priorities you now make; how do you recalibrate the city and areas that mix different levels of security."

In a way, floods are still viewed as an opportunity in the current implementation stage, as declared by an informant:

I think if it wouldn't be the flooding, I wouldn't have the project. There is not enough interest or urgency or money to invest in the quays publicly; (...) 25 years ago there was [the "City on the River"] competition and it didn't work out; doing nothing today is not an option, we have to work because of the flood issue, so that's actually the driver. (...) Because the [Scheldt Quays] is a publicly funded project, I usually joke that I would like to have some more of those floodings [such as the one associated to the 2013 Sinterklaasstorm, with around 80 cm of water above the quays] to have a higher sense of urgency to have more public funding for the project (not too much that there's damage, of course²²³)...

An optimistic point of view was not only present in the Scheldt Quays Master Plan, but this condition, which permeates most of Antwerp's planning initiatives since the beginning of the 21st century, was in this particular case expressed at its best. Such stance was indeed acknowledged as one of the contemporary lessons of Antwerp, as argued for example by the former French secretary of state in charge of housing, the lawyer Benoist Apparu (2011, p. 9):

Fostering attachment to the city requires a purpose, a narrative, a dream, but also strategic projects, talents, methods, funding, partnerships and social dialogue. While this task is not at all an easy one (and is made even more complex by the climate threat), the outstanding project of Antwerp's quays is a perfect demonstration that flood risk can be the basis for a great project and urban embellishment. Fostering attachment to the city thus requires resilience to channel all forces and constraints towards a better city for all.

The second theme extracted from the Antwerp case is the understanding of flood protection along the quays not as an isolated dossier but in articulation of with other urban demands, even if the related concerns are often dealt with by different administrative bodies. An interviewee made a worthy comment in this regard: *"I think it's very interesting that there was this ambition to integrate these water-protection measures into a public-space [design] project"*, to which we reacted as follows: *"Or the other way round: to integrate the public space into a water-protection device, since the flood issue was actually the main reason for intervening in the area²²⁴."* Indeed, mobility, the provision of open spaces for occasional uses and improving the city's image, among others, were additional (although inseparable) variables of this design process that duly explain the need for specific sub-studies to feed into the master plan.

Although numerous, these design variables did not necessarily appear as constraints before the master plan; *"the difficulty (...) was that some constraints only appeared during the making of the master plan, which obliged [the design team] to rethink some of the proposals they did"* (the integration of flood protection into listed buildings illustrates this

²²³ As recalled by another informant, although *"the gates were closed and there was not really any damage (not any damage that is not normal for this kind of flooding) (...), with the 2013 storm I think that it became again visible for everybody that we really need to do something because we cannot have this situation for a very long time, we need to act."*

²²⁴ The interviewee then replied back: *"Yes, that's interesting too, so the two go together now; and that was for me in the [2006] competition very important, and most of the competitors were working on that integration of both approaches."*

situation). The blend of these several issues in a single endeavour was favoured by the designers' stance of conceiving the flood-defence (civil-engineering) device as a civic-infrastructure subject, which closely reflects Smets's point of view. For the former Flemish *bouwmeester*, since public budgets tend to concentrate in "necessities" and "[i]nfrastructure is often seen as an absolute necessity (...), designers are realizing that if there is only money for infrastructure then why not make the infrastructure also a park or a public space? (...) [T]his idea of combination helps to get designers more involved" (Smets 2013b). The summary made by a member of the design team of the main conceptual idea in the competition stage, quoted above on p. 247, goes exactly in this direction, and is complemented by another interviewee as follows:

[The PROAP-led] proposal is also related to this: the sections that were expensive and the others that were economical (in different degrees), different notions of price for a public work (an infrastructure work), as a means for [the project commissioners] to realize which type of section would fit better in each segment of the city, considering the overall budget.

The inclusion of floods within the wider water issues that may be subject to design also derives from the orientations delineated in the s-RSA associated to the "Water city" image – even if the actual management of floods in Antwerp is considered too fragmented (STAR-FLOOD, 2014). In any case, the fact that the Scheldt Quays Master Plan was an initiative partaken by the municipality and the waterway agency potentially anticipated an integrated planning process, even if along the whole process there was a clear segmentation of their remits (the two design commissioners having mostly kept "to their main core business"). In order to couple urbanity with safety in the master plan, the design "has been a continuous dialogue" between the involved stakeholders, with all the challenges and limitations that stem from spatializing (that is, designing) "a dragon with ten heads" in a different way (see full quote on p. 251).

In this regard, the situation of Antwerp is similar to the one of other waterfront redevelopments around the world, in which "a viable waterfront plan is more than just a design statement or an economic development plan", in view of the underlying "reconciliation of differing perspectives and amalgamation of diverse objectives" (Grau & Kekez, 2010, p. 35). In this context, Nunes (2011, p. 1) considers that the master plan "tries to mediate the many claims on the quay area in an open-ended process", so that the city of Antwerp "reposition[s] itself on a regional scale while correcting its relation to the river on the local scale of the diverse and complex urban [fabric]". Therefore, the plan tackles not only the more tangible flood risk but also the more subtle socioeconomic threats (such as the evasion of population and activities from the city core), which risk turning Antwerp into a past urban myth without much significance in the contemporary urban world.

The third theme concerns the clear statement of the design objectives in the design brief without setting in advance the means to manage them, thus ensuring a great degree of flexibility for the design process, even though the stance towards floods has never been negotiable – that is, a defensive standpoint has always been taken for granted. Anyway, this condition became an opportunity to perform 'research by design' and to assess alternatives instead of proposing a sole and fixed spatial solution. However, without a clear vision for the city, such a strategy could have implied a waste of time and resources with

countless incongruent proposals (in line with the arguments of Viganò presented on p. 63). As summed up by Nunes (2008, p. 69), the way the design problem was framed in the design brief – that is, “not (...) limited exclusively to adapting an already-existing infrastructure by redesigning it” – somehow illustrates the stance taken by the project commissioner, which went beyond the problem’s technical dimension to focus on more complex relationships between the defensive infrastructure and the riverscape at large.

As a consequence, the master plan ended up “*not [being] too exact so that future parties (architects or construction initiatives from the city or from whatever) could also have some flexibility to still see what is, at that time, appropriate or needed...*” Although highly positive in terms of dealing with uncertainties and contingencies – being thus in tune with an evolutionary approach (Prominski, 2006) –, the plan’s ‘loose’ character has raised some concerns of external parties. As noted by an interviewee: “*because the master plan ended up being something that is on a high level, and not very concrete, maybe it didn’t, for a lot of people, come up to their expectations; they probably expected a more defined plan (but that’s a communication issue, of course).*” Interestingly, such a general standpoint reveals how culturally anchored the idea of a designed plan as a definitive blueprint is. Accordingly, the fifth theme, ‘design activity performed as an open process’, can be seen as a key implication of having clear fixed objectives and flexible means.

The fourth theme is related to ‘the previous experience and/or sensitization of the design team’, which in this case is primarily composed of PROAP and WIT. While the former is a seasoned landscape-architecture practice very keen on water issues²²⁵, the latter, a Flemish architecture and urbanism practice, also has a predilection for water-related projects (in line with a major geographical feature of the low-lying Belgian territory). This favourable condition was equally leveraged by the existence of qualified and motivated in-house municipality personnel (namely within the Stadsplanning agency), although the PROAP-led team’s experience in dealing with floods generally surpassed the one of these professionals, as made clear during the interviews. Revealing answers were for instance given to the question: “How familiar were you with urban-flood issues before this plan?” An informant confessed: “*I was no expert, I just knew something about floods but before the start of this plan I was no expert; during the making of the plan, of course, I became much more of an expert*”, while another one admitted:

Hardly... I’ve learnt a lot. So really hardly because in my career I had never worked on it, because also in Belgium it’s not that regular, and also because I think it’s new in the discipline (as a problem, it’s new), and also for urban planners, landscape designers etc., it has become a new subject; and in those years, that’s nearly ten years ago, things were getting invented so... (...) I think [the flood issue] exists as a concern, that’s sure and that will not change anymore; of course there will also be urban planners and architects who don’t take enough into account those concerns on flooding, but you can’t say that it doesn’t exist at all, that it’s really a kind of black spot in the profession...

²²⁵ In 2012, PROAP joined another winning design team to develop an additional landscape and floods project within the “Sigma Plan”, also along the Scheldt River. Headed by the Belgian practice Architecten Achtergael, the team (composed of PROAP, Stefan Schöning Studio and Antea Group) was in charge of the project “The Polders of Kruikebe”, a controlled-flood area located upstream of Antwerp, in which flood protection was combined with nature conservation and the provision of a recreational space.

After this acknowledgment of floods as a true design subject (which in this case supported an interesting learning process), the same interviewee argued that although this issue is often still perceived and dealt with as a simple technical problem, “*there are many many examples where it is integrated in a design project*”. Nonetheless, “*you have to convince the engineers to take another approach, but they are much more open to it than before*” (as it is the case, according to this informant, of the W&Z staff in charge of implementing the master plan). In this regard, the integration of floods through design indeed represents a disciplinary challenge not only for architects and urbanists, but also for engineers; a more open stance is then required from these professionals as well.

Probably also thanks to their expertise, the PROAP-led team demonstrated a high level of sensitivity towards the flood issue, which had a remarkable contribution to ‘design and floods’ in this particular case. The master plan’s document definitely puts in evidence a deep (emotional) involvement of the design team with the riverine setting, expressed for example by several references to the riverine atmosphere that extrapolate the classic “Port city” image. Moreover, due attention was given to the character of the Scheldt itself: its smells, sounds, colours and movements (see quote on p. 274), which are referred to as unambiguous references of Antwerp’s *genius loci*. Sense-making – or better saying in this case sense-reaffirming or even sense-recovering – was in fact a central task of the design proposal, as highlighted by the design team: “the new flood protection cannot only be a mere protective infrastructural device. Its design should provoke the experience of the river” (PROAP *et al.*, 2010, n.p.).

This less tangible aspect of ‘design and floods’ could be more easily grasped in this specific master plan probably thanks to its nature as a spatial framework, in contrast to a blueprint for ultimate design implementation. Indeed, one aspect that clearly differentiates this proposal from the other competition entries was precisely the evolutionary perspective taken by the design team, who straightforwardly asserted: “the masterplan will not be a blueprint but a strategy, not a project but a frame for evaluating future interventions” (PROAP *et al.*, 2010, n.p.). This point is thus closely connected with the fifth theme, ‘design activity performed as an open process’.

The last theme somehow expresses concomitantly the mindset of the project commissioners, the actual stance taken by the designers and the final product effectively achieved with the Scheldt Quays Master Plan. In fact, the idea of design as a process has underlain the city’s aspirations for this particular case, as illustrated for instance in the competition brief, which stipulated that the designer to be commissioned needed to have “sufficient process-oriented knowledge” (Stad Antwerpen & W&Z, 2006a, p. 4). According to an informant, the subject of the competition was indeed “*not only about making a good project, it [was] also about organizing a good process*”:

[W]e were looking for somebody who would go along in the process, and not somebody who made the design and then... (just the design as a project). So the process, and being involved in the process, and also the participation with the public but also the discussions between the city and the Flemish government, to be present and to incorporate all those talks and debates into their planning guides also for the system. So the Master Plan should be able and willing to start a process; that was one really important thing.

This quote illustrates that besides technical design skills, managerial capabilities (that is, soft skills) were also required for the designers to carry out their task in a collaborative way. At the same time, it reaffirms the idea that the elaboration of the master plan was only a starting point of the long-term riverfront-regeneration venture that would obviously not follow a linear (clearly anticipated) path, but face vicissitudes. Design was thus taken as a means to enable a smooth and flexible process of spatial reflection, formulation and implementation, in line with Nunes's argument (*apud* Lamster, 2007) that “[l]andscape is created by successive processes and not by one action”. Echoing Prominski (2006), such an evolutionary approach is perhaps the reason why the Municipality of Antwerp considers that the quays' master plan illustrates the city's abandonment of “static end-designs” that do not take into account the changes of the actual circumstances, being thus a “paramount example of an investment in future generations of Antwerp citizens” (Stad Antwerpen, 2009, p. 9).

Indeed, the openness and flexibility of the master plan were a strong design option taken by the design team – revealing a strategy to face the unknown and its contingencies, and not the absence of a clear spatial strategy. An illuminating comment in this regard was made by an interviewee, who considers that such characteristics are among the major qualities of the master plan, which intentionally

*leaves lots of things open; the project is a kind of zero degree of design in a sense, it only wants to design what is absolutely necessary to design (...) [Our intention was] setting the baseline and designing actually what we think had to be designed: the fundamental things of where exactly you put this line, where the basic line comes, the edges, and this and that... so we defined these things, which are necessary, and the rest we did not define.*²²⁶

Such a design strategy, which presupposes the study of several spatial alternatives, is also totally in tune with the timescale of the master plan's implementation, which was considered the main challenge within the whole process by an interviewee:

*We knew from the start that depending on how much money there would be politically with the project it could take 10 years or 15 years; and now it seems that it might take 20 or 25 years. And you need to make a design and a spatial framework that could also be relevant in 10 or 15 or 20 years, so that's a big challenge. At the same time, the intention [was] not to be too concrete or too exact at some places, but really think about what are the essential guidelines I want to put into the Master Plan and I know, I'm convinced so, that they would be relevant and are essential for the spatial quality.*²²⁷

The involved contingencies are related not only to the funding priorities stated by the project commissioners, now in charge of its implementation, but also to the dynamics to be engendered within other projects flanking the riverfront (the most eloquent example in this

²²⁶ The same interviewee complemented this argument as follows: “I think the nice thing about the Antwerp project (as for many other projects) is that the moment that simplicity starts equalling precision then you've got it (...) But [the project] is not simple in the stupid sense: its simplicity is because it is addressing in a very precise way without too much deviations and too much at-random things anchored on it; it's a few elementary elements that are able to deal with a complex situation, that's the smart thing about it, I think.”

²²⁷ A similar standpoint was supported by another informant: “I think it's good to have [the master plan of the quays] on this higher level because when we have [it] realized (if the budgeting stays like it needs to be)... we are with a plan that will be finalized in 2030, so you need to have a plan that is flexible enough to cope with things that would change in the city in ten years (we don't know for every zone what would happen there in the very long picture).”

regard being the southernmost part of the city, in which industrial uses will remain but in a renovated way). Therefore, spatial design in this case was perceived and performed as a long-term venture, in which the flood issue could be properly tackled, while the evolving city-quay-river relationships are not frozen beforehand. It is not by chance that the main planning principles underlying this design proposal (optimism and adaptability, territoriality, flexibility, sustainability) are closely related to the ones behind flood risk within climate change scenarios (such as uncertainty, openness, inclusiveness, integration and robustness).

In this case, design was really performed as a negotiation platform (Rossano & Hobeica, 2014), in which its overall objectives were clearly stated but the means to face them were not predefined (the third theme of this case). Even if the expected safety levels were not also open to discussions (floods here were in fact framed as a “simple risk” (Aven & Renn, 2010), to be technically managed), the alternatives to reach such expectations were openly debated, in a process in which the qualities of the dynamics involved “stand out in importance and significance over and above” the possible qualities of the output as an object (Nunes, 2008, pp. 70-72). The design product is somehow assimilated to the design process itself, being thus “*more like a tool (a working method) than a final plan*”, and liable to evolve.

According to an interviewee, since the competition stage the PROAP-led proposal for the Scheldt Quays did not follow

the classical way (blueprint planning, so the final state is represented in the plan, it will look like that in 20 years); but we know, of course, that it will not look like that in 20 years because in the coming 20 years there will be a lot of changes. And so their proposal was, in the first sense, a kind of flexible system, so for instance they have this kind of drawing which looks like a piano, with a lot of different profiles for the quays; they said: “Well, we want to work on a set of profiles for the quays, and then in the future they will be applied perhaps in that area or more in that area, we don’t know yet (so that we will work out during the elaboration of the master plan), but that could even be changed afterwards. So we offer you more like a working method, a tool, instead of a final situation plan.”

Diedrich (2011) also makes an interesting remark about this “*kind of zero degree of design*” (as quoted in the previous page): in the Scheldt Quays Master Plan,

[t]he designers write rules for site composition instead of writing the site itself. They propose to consider the site as a keyboard to be played both by the river (flood levels) and the city (authorities, inhabitants, other stakeholders). Design is understood as an evolutive site composition, as a game with fixed rules but no predefined result, with the landscape architects as the game masters.

In view of these characteristics, the municipality ultimately understands the master plan as “an inspirational vision and a complementary strategy with prioritisation” (Stad Antwerpen, 2009, p. 9), while it was also recognized as an example of “innovative and relevant practices” of “engagements of urbanism with water issues”, which is by far more than a “mere beautification operation” (De Meulder & Shannon, 2008, p. 7). The process approach taken here was perhaps the most adequate one given the challenges (namely the spatial and temporal scopes) within the regeneration of Antwerp’s quays; yet, it may not necessarily be replicable to other flood-prone urban projects. Indeed, although the Scheldt

Quays “belong to no one and to everyone” (PROAP *et al.*, 2010, n.p.), they constitute the very core of Antwerp’s “hard spine” and identity. Not being exclusively geared towards riverfront-regeneration projects, the evolutionary mindset that underlies the master plan (epitomized in this case in the “planning game” (PROAP, 2010, p. 210)) is surely replicable, but the “quays as keys” idea (De Meulder, 2008) definitely belongs to Antwerp and the Scheldt, and only to them.

A final note regarding this theme: in the particular case of the Scheldt Quays Master Plan, it is quite legitimate to refer to spatial design at large, beyond architecture, landscape architecture and urbanism individually. Here, not only have different scales intersected but the actual design subject is a hybrid in itself (a civil and civic infrastructure); at the same time, the frontiers between the design disciplines were in fact blurred during the elaboration of the master plan, as assessed by an informant:

First of all, there was an equilibrium, there was not so much a hierarchy, but PROAP and WIT definitely were the two main partners, I think, and they both had their own role and it was not in hierarchy (sometimes we get international architects with a local firm and the local firm just takes copies, something like that); so they each had their own input, which we liked very much. And there was D-recta as well, which is a Venice-based firm, it was more about project managing, the process itself (...), they didn't lead the process, they more supported it. Then PROAP was responsible for the landscaping; I think WIT did more exploratory design, definitely when it came to building or more architectural elements, but I always felt that they had an integrated approach and they did most of the thinking on the spatial issues as a team.

Therefore, the participation process which evolved during the preparation of the master plan was the most expressive facet of a truly collaborative design practice. Again, although this standpoint should not be taken as an exclusive condition of riverfront-regeneration interventions, it surely helped to have floods better integrated into a public-space project (or to have the ambition of integrating urban public space into a flood-defence measure). As summarized by Nunes (2008, p. 70, quoted as part of the first theme on p. 278), the success of the master plan lies exactly in rejecting narrow perspectives (either engineering or architectural ones) and favouring the landscape as a territorial expression that is at the same time natural and sociocultural.

To conclude this chapter, the five main flood-related themes that emerged in the Antwerp case are summarized in Figure 215; these themes are of course only a sample of the interesting issues raised by the Scheldt Quays Master Plan. Like in the Coimbra case, some questions unveiled here would require further investigations; three of these issues will be introduced below.

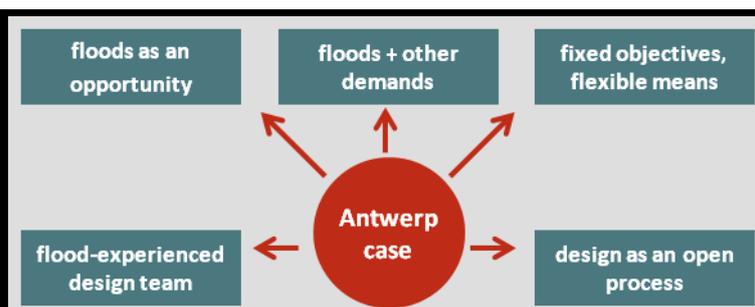


Figure 215: The main flood-related themes that emerged in the Antwerp case

Source: elaborated by the author

First, a peculiar ambiguity is manifest in this case, in which the master plan strongly aimed to re-approximate city and river while it also had to maintain a certain distance between the two in order to ensure the safety of inhabitants (given that entering the Scheldt is forbidden due to its dangerous undercurrents) – see, in the previous section, the interview quote on p. 275. Although this issue seems to be ‘solved’ through design, the operational aspects of the overall solution, at least in some quay segments (namely in Sint-Andries and Zuid), still raise some concerns (see the interview quote on 270). In fact, it seems that the sociocultural dimension associated to the dangerousness of the Scheldt also needs to be re-elaborated (redesigned?), so that safety can really be attained on the quays. In this regard, one of the informants revealed: *“I do think in signalization and in making fences at some places, we do have a task to make people more aware of the risks that the river poses in normal conditions, and then also of course when there are floodings.”*

This argument brings us to the second issue: despite the important participation and communication processes carried out, which mostly focused on the quays and the quality of the urban realm, the related occasions were not taken also as an opportunity to better sensitize Antwerp’s inhabitants about floods. As mentioned by an interviewee, *“with [the quays] project, we didn’t do any sensitization”* regarding fluvial floods, although Antwerp’s *“disaster official”* was equally involved as an advisor on safety issues (the fire brigade, which is in charge of closing the flood gates before emergency situations, participated as well with the same expert role). Yet, since the adopted stance towards floods was prevention through defence, the stages of preparation and recovery within the disaster-management cycle were eventually much less stressed, as pointed out by the STAR-FLOOD research project (STAR-FLOOD, 2014). In a way, given the prevalent flood-risk culture, the sociocultural dimension of floods did not receive the same attention as the physical one.

Lastly, although the “Water city” image delineated in the s-RSA considers the water issues in Antwerp in a comprehensive manner, the local segmentation of flood management unfortunately implies an unbalanced level of protection vis-à-vis phenomena from sources other than fluvial ones. One of the informants expressed this concern in the following terms:

I have the feeling that the Sigma protection is really a high-level protection, it protects us from a flooding that will happen not very often, and I have the feeling that we’re less protected from rainfall floodings in the city of Antwerp, it’s a different level of protection that we have there (...) The different types of flooding are not managed by the same government and they are not looked at upon the same risk level.

This comment brings us back to the argument raised by another interviewee, that particularly in this Belgian case, since *“water is everywhere”* and *“part of [the] cultural life”* (see full quote on p. 235), it should be more inclusively dealt with through design. Yet, as a general conclusive note for the Antwerp case, it is possible to say that ‘design against floods’ took here an inclusive perspective, meaning that despite its major task of dealing with a flood-defence structure, design was also performed *with* floods; some sort of adaptation is indeed proposed, namely in the existing historical buildings on the quays and in the overall layout and materials of the public spaces.

6 Plan Guide Bastide Brazza Nord, Bordeaux

Gatoume's waters, 24 July 2015

6.1 Chapter introduction

Since the 1990s, Bordeaux has been trying to reconquer the Garonne riverbanks, a process that started on the left bank and has more recently been expanded to the right one. The construction of a new bridge linking two major urban-regeneration zones in the northern part of the city brought to light the strengths of Bastide Brazza. A typical declining industrial urban fringe when considering the city limits, yet a zone rightly in the centre of Greater Bordeaux, Brazza was subject to a preliminary redevelopment study by the French practice Agence AUC in 2009-2010, and a pre-operational study (a *plan guide*) led by the Dutch practice KCAP (Kees Christiaanse Architects and Planners) in 2011-2012. In the latter, flood susceptibility was recognized as one of the main site constraints (as previously specified in the project brief issued by the municipality), but also as a driving concept behind the design proposal. The subsequent bid for the six-year operational phase (namely the *assistance à maîtrise d'ouvrage*, the AMO phase) was won by a consortium led by the Lebanese practice YTAA (Youssef Tohmé Architects and Associates); a new *plan guide* was then elaborated at the end of 2012, being now under implementation. In the current *plan guide*, fluvial floods are dealt with very differently from the previous plan.

Out of the three studied cases, Brazza Nord is the one that best represents a common urban-regeneration project being carried out in a “bad place”, encompassing actual polluted soils and the menace of floods; the potential combination of these two constraints could therefore trigger extensive environmental pollution that would by far exceed the site’s boundaries. Moreover, this comprehensive and pragmatic urban project occupying a flood-prone zone does include real estate and is being carried out by the private sector, which implies that the complexities involved in this operation considerably outweigh the existing ones in the majority of the public space interventions, whose implementation is usually concentrated in the hands of public agents (as in the other two analysed cases).

Envisaged as a mixed (multifunctional) neighbourhood project, in which the programme combines housing and other productive activities, this intervention can be considered an urban project in itself, given its role in the revamping the right bank as a whole (through the expected spillover effects on the surroundings) and the importance attributed to the public domain within the design proposal. Another factor for increased complexities in this case relates to the fact that, like in Antwerp, fluvial floods in Bordeaux are highly influenced by tides and the occurrence of storm surges in the mouth of the Garonne (the Gironde Estuary); moreover, being a generally flat area, the territory is also subject to urban (pluvial) floods. Yet, the propensity of the site in question to floods is less obvious than in the other two studied cases.

Indeed, the riverside bordering the site has a higher level than Brazza, which seems thus protected by a hard structure; but in fact the riverbank in this segment does not have a quay wall. Also, the shoreline is presently used by a private shipyard, being hence outside the Brazza design area. Disconnected from the riverside, the site arrangement does not favour the legibility of the water’s presence and potential effects within its limits, even if it is known as a water storage and transfer zone. In any case, as we will present in this chapter, the Bastide Brazza Nord project is, according to the interviewees, the first urban-

regeneration initiative in Bordeaux in which dealing with floods was posed as a design issue since its inception, following the awareness-raising effects triggered in France by the storm Xynthia, in 2010. An additional distinction of this case is the fact that the related design process has been organized in several stages, from which three design outputs could be analysed, each of them produced by a different design team. Yet, the presence of the same engineering firm (in charge of the technical studies, including hydraulic ones) in the last two design stages was a significant factor of continuity between them, having important repercussions in terms of the way of dealing with floods through design in the Brazza Nord urban project.

6.2 Geographical and institutional contexts

The first village at the origin of modern Bordeaux settled on the left bank of the Garonne River more than 25 centuries ago; since then, the riverscape has been of upmost importance for its development and configuration throughout history. This fact is clearly illustrated in the ultimate French name adopted by the city: ‘bord d’eaux’, meaning waters’ edge. One of the main local geographical features was (and still is) a vast plain with very favourable conditions for viniculture on both riverbanks, underpinning a wine industry that has been the main mark of the city’s economic and cultural life. Due to its great width (around 500 m), the Garonne was locally called ‘la mar’ (the sea) in the Middle Ages (Coustet, 2009), even if Bordeaux is actually at around 100 km from the Atlantic Ocean.

Such condition, the river’s tidal regime and the frequency of flood events, nevertheless explain why, according to the historian Robert Coustet, “the town turned its back to the river from the very beginning”: “[t]he very first settlements (...) were built on the hills along the river, at an elevation of around 10 meters, above tides and floods, on stable soil. Later on, the town expanded on the left bank only” (2009, p. 49). Despite having evolved as a prominent port city open to the Atlantic Ocean, Bordeaux was separated from its river by the medieval city walls until the 18th century. From this time on, this trade city most flourished and grew; the riverside developed into a bustling area, where port and commercial activities occupied 4.5 km of quays on the riverbank, although the shoreline kept “its natural and muddy character” (Allaman, 2003a, p. 29).

Replacing the city walls, the newly impressive urban landscape, composed of a monumental neoclassical façade and accompanying squares, was then oriented towards the ‘Port de la Lune’ (designation of the port of Bordeaux coined in the Middle Ages, in reference to the crescent-moon shape of the Garonne in its crossing of the city). The riverfront was at the time the locus of a vibrant port-city life (see Figure 216), behind which Bordeaux constituted itself with an impressively dense built landscape, the so-called ‘ville de pierre’ (city of stone, in reference to the most typical building material that gives continuity to its façades). Due to the intensity of the port activities that demanded a river corridor free of obstacles, the first crossing of the Garonne was only accomplished in 1822 with the ‘Pont de Pierre’ (stone bridge), which then defined the limits of the inner port (see Figure 217).



Figure 216: View of Bordeaux's port and central quays, by Pierre Lacour (1804)

Source: Atlas des Paysages de la Gironde

A territory marked by agriculture, inner low-lying lands and the *coteaux* (hills) offering a panoramic view of the city, the Garonne's right bank (which was in part a fluvial island in the remote past) would be the locus chosen in the 19th century for the emerging industry and some ancillary port activities, which would completely transform its ambience (Lavigne, 2010). Having been during the previous centuries only accessible by boat, the right bank had been sparsely occupied by estates conjugating villas and vineyards, constituting one of Bordeaux's first suburbs, in the classic sense of temporary, secondary residence for the elite (Coustet, 2009). The new industrial infrastructures, located by the river and closely associated to the port, would follow the ancient agricultural parcelling perpendicular to the Garonne.



Figure 217: General plan of the project of Bordeaux's new Avenue Thiers (on the right bank), in 1813
The northeastward Avenue Thiers, together with the city's first bridge, would as of 1822 facilitate the link between Bordeaux and Paris

Source: Archives Départementales de la Gironde

The port had always been the major element of the whole city ambience until the 20th century (see Figure 218); however, similarly to what happened in Antwerp, the modernization and densification of its structures meant that the right bank's quays would become physically and visually inaccessible between 1925 and 1970, when the port premises began to be gradually relocated downstream. In 1987, the Port de la Lune was definitively shut down (Chaline, 1993), but having been broken for several decades the close relationship between city, port and river (as portrayed in Figure 216 above) were already part of a memorable past, while some important tangible and intangible legacies were left by the port.

First, several built obstacles (namely hangars) were abandoned along the quays; secondly, the Garonne, which had functioned as a real barrier between the two riverbanks, although now integrated within the city's boundaries, was still perceived as a significant urban obstacle. Accordingly, like in most European riverine cities, the river propitiates the existence of two sharply different segments in Bordeaux, as regards urban occupation and human use: "the prestigious ancient centre" is settled on the left bank, while the left bank is a typical "working-class district" that has kept a more 'natural' riverine landscape (see Figure 219), despite its more recent (industrial) urban uses (Groueff, 2004, p. 27). Nowadays, the city and the river are the core of a 750,000-inhabitant metropolitan area (the Greater Bordeaux) unevenly spread over the two riverbanks, gathering 27 other municipalities²²⁸.



Figure 218: Bordeaux crossed by the Garonne River, in 1867

On the right, the major port infrastructures located on the left bank

Source: Archives

Départementales de la Gironde,

© Alphonse Terpereau

(watercourse highlighted in blue by the author)



Figure 219: The two very contrasting riverbanks of Bordeaux

On the left, the green right bank; on the right, the 'mineral' left bank

Source: author's archives

(23 July 2015)

After the relocation of the port, the derelict infrastructures in the very city centre symbolically functioned as a crude testimony of the city's decline, closely related to the

²²⁸ Established at the end of the 1960s, the administrative body of the metropolitan area (Communauté Urbaine de Bordeaux (CUB), renamed Bordeaux Métropole in 2015), centralizes several urban issues; for instance the Plan Local d'Urbanisme (PLU), the main spatial planning instrument, is elaborated by the Agence d'Urbanisme Bordeaux Métropole Aquitaine (A'urba).

deindustrialization process that has prevailed since the 1970s in most of the European continent. As a consequence of this overall context, Bordeaux lost much of its urban quality and attractiveness, and up to one-third of its population fled to the periphery (a process that had started in the 1950s, having been accompanied by urban sprawl at the conurbation level) (Chaline, 1993). Counteracting the urban decline was then taken as a key priority by both the Municipality of Bordeaux and Bordeaux Métropole, which have embraced the common ambition of becoming, by 2030, a thriving metropolis of one million inhabitants, 30% of which living in the city of Bordeaux itself (CUB, 2013; Larué-Charlus, 2013). The two administrative spheres also share the principles stated in the PLU (namely in its second chapter, the *Projet d'Aménagement et de Développement Durable* (PADD), devoted to territorial design and sustainable development): a human-scale city, reinforced urban and heritage quality, well-managed mobility, stronger economic influence, and a greener and more liveable city (CUB, 2006a).

The first intents to revamp the riverfront started at end of the 1970s, but were “slow and hesitating” (Chaline, 1993, p. 63); the regeneration of the port area only got underway as of 1995, under the new leadership of Alain Juppé at the municipality. In fact, Juppé’s mandate put a great emphasis on the urban setting as a leverage for the city’s overall development, especially when he cumulated for the first time his mayor role with the post of President of Bordeaux Métropole (1995-2004), the exclusive body in charge of urbanism (in terms of both planning and implementation) since 1969, when the A’urba was created. Nonetheless, even during the period 2005-2013 when he was not leading the Métropole, Juppé did not hesitate to create the conditions within the municipality (namely expertise and urban studies) to promote his own ambitious *projet urbain*²²⁹, with the aim of awakening ‘la belle endormie’ (the sleeping beauty was Bordeaux’s nickname in the last decades of the 20th century).

Juppé’s *projet urbain* of 1996 had three clearly interrelated objectives²³⁰: (1) to increase the accessibility and liveability of the city centre with the reintroduction of the tramway (in service since 2003); (2) to regenerate the riverfront as a wide public space, taken as a new central spine for the urban development; and (3) to highlight the heritage value of Bordeaux’s rich built environment, with the renovation of building façades and public spaces (Godier *et al.*, 2009). This initiative was taken as an opportunity to re-centre the city, harnessing the Garonne as a bonding element instead of an urban barrier. Accordingly, the impressive design for the quays on the left bank, led by the landscape architect Michel Corajoud, anticipated a new riverine promenade with the inclusion of greenery in what was

²²⁹ The French expression *projet urbain*, as used here, was translated into English as “urban transformation project” by Diedrich (2009), since it differs from the idea of *proyecto urbano* put forward by Solà-Morales (1987) or Portas (2003); the closest French expression to reflect this concept would be *plan guide*. In fact, the *projet urbain* (in this case promoted by the *maire*) usually embodies the intentions (*desseins*) attached to the urban-design mission, while the *plan guide*, professionally elaborated by spatial designers, seeks to give them form and operationalize them. One may say that Juppé’s *projet urbain* resembles more a broad and long-term urban programme or agenda that aggregates within it several possible *plans guides* (urban projects).

²³⁰ The distinction between the Municipality of Bordeaux’s in-house urban projects (*plans guides*) and the ones developed by Bordeaux Métropole was only applicable between 2005 and 2013, when Alain Juppé did not cumulate his role of Mayor of Bordeaux with the presidency of Bordeaux Métropole. Since 2014 (when Juppé was elected to lead again the Métropole), all the municipality’s urban-planning initiatives were transferred to the metropolitan level.

perceived as an overly grey ambience (see Figure 220); this vast public space proposal also included the Miroir d'Eau as an additional landmark on the quay²³¹ (see Figure 221). The successful achievement of the objectives of Juppé's *projet urbain* culminated in 2007, with the obtainment of the UNESCO World Heritage label by the 'rive minérale'.



Figure 220: A segment of Bordeaux's regenerated left bank

Source: author's archives
(28 July 2015)



Figure 221: The mirror effect propitiated intermittently by the Miroir d'Eau on Bordeaux's left bank

Source: author's archives
(28 July 2015)

The outstanding character of Bordeaux as a riverine city was the major argument sustaining this classification (Moniot, 2011). In fact, apart from the city centre's renowned built heritage, the mid-19th-century docks located in the northern segment of the left bank, the neighbourhood around them (Bassins à Flot) and a narrow strip along part of the right bank (the shoreline) were interestingly included within the inscribed site (see Figure 222). The visual links between the traditional city and the river were finally re-established, whereas physical linkages (namely access to the water) are still discouraged (see Figure 223), as stated by some interviewees, due to the dangerousness of the currents associated to the intense tidal dynamics of the Garonne:

We have to keep people at a distance from the water. It seems to be really dangerous, it's not a welcoming river, and that's what makes it beautiful on one hand, and difficult on the other hand; it is a kind of brown muddy river, where you cannot swim, so you cannot have a physical contact with the river. (...) the relationship between people and water is very poor, and it has to be poor because of risks.

²³¹ The recovery of Bordeaux's left bank is well documented; for more details, see for instance Corajoud (2004) or LAE (2009). The involved quay segment and the city behind it have dykes to protect them from floods. Yet, floods are still an issue in the northern part of the left bank (including the Bassins à Flot regeneration area, in the district of Bacalan), which was outside the boundaries of Corajoud's proposal.

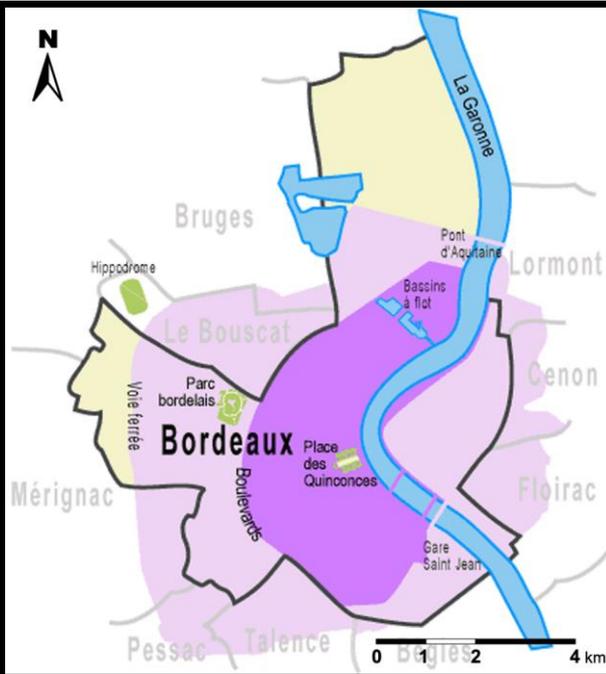


Figure 222: Bordeaux's UNESCO World Heritage site

Bordeaux's entire right bank is included, either within the inscribed sector or within the buffer zone

Legend:

- dark purple: the inscribed sector
- light purple: the buffer zone

Source: Ville de Bordeaux (2016)



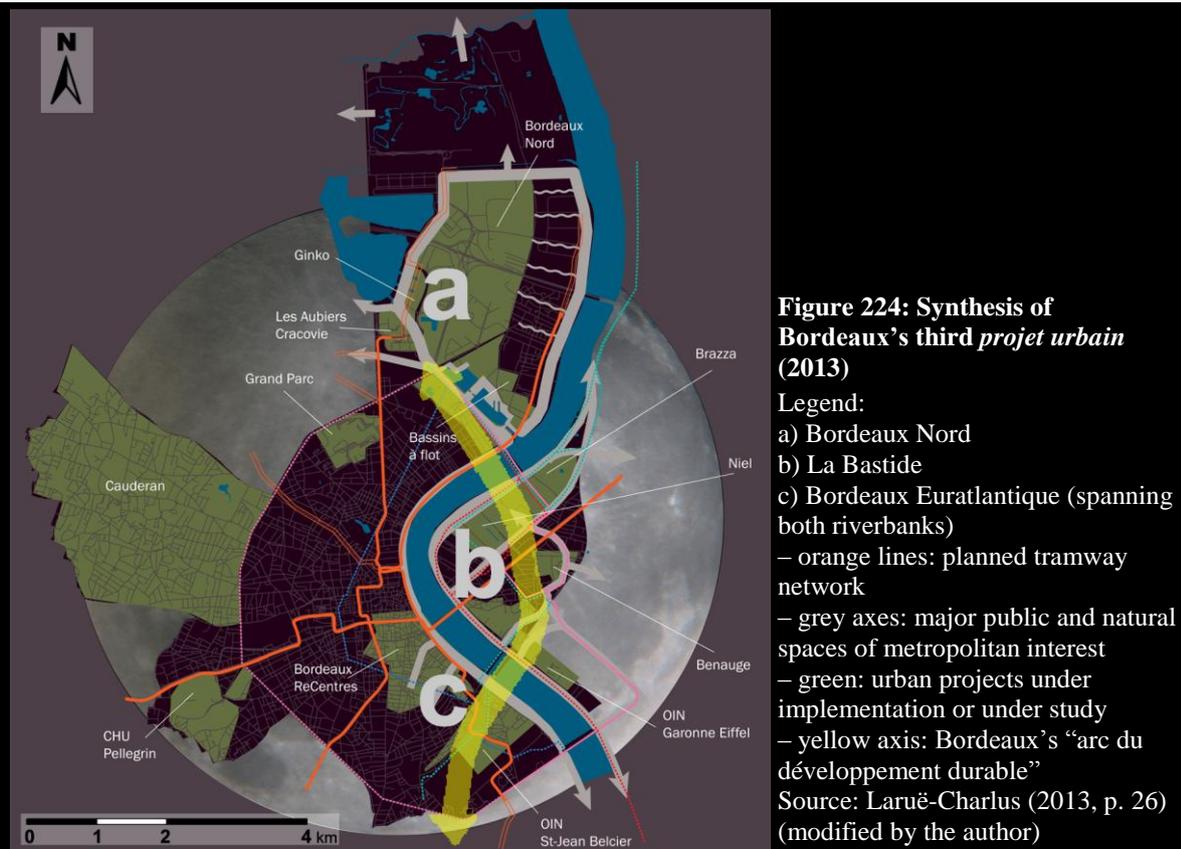
Figure 223: An improvised safety fence borders several segments of the right bank's shoreline

Even on the more 'natural' riverbank, closer contacts with the river are strongly discouraged
Source: author's archives
(24 July 2015)

Thanks to the continuity of both his political mandate and the related urban-planning activities, Juppé could issue a second phase of his *projet urbain* in 2009, named “Bordeaux 2030 : vers le Grand Bordeaux, une Métropole Durable” (towards Greater Bordeaux, a sustainable metropolis). Anchored in the idea of sustainable urban development and eco-construction, his new proposals were essentially focused on the provision of new housing as a means to anticipate the prospects of a larger population and its related residential needs within the city. Moreover, the updated *projet urbain* aimed at improving the disadvantaged boroughs near the centre (most of them located along the river and prone to floods), while the notion of urban centre was to be expanded towards understanding the whole city of Bordeaux as the actual core of the enlarged Bordeaux Métropole.

Three priority areas would configure what Juppé then called the city's “nouvel arc du développement durable”: Bordeaux Nord (on the left bank), La Bastide (on the right bank) and Bordeaux Euratlantique (spanning the southern segments of both riverbanks) (Laruë-Charlus, 2009). These areas were again taken as strategic poles in the third phase of Juppé's *projet urbain*, issued in 2013 under the motto “vers la pleine lune” (towards the full-moon shape) (see Figure 224), which mainly reinforces the previous urban

commitments: to expand the idea of the city itself and upgrade the urban environment, while combating urban sprawl (Laruë-Charlus, 2013).



These urban initiatives naturally called for the densification of the physical links between the two riverbanks. In 2013, a new river crossing was inaugurated: the Jacques Chaban-Delmas Bridge, also locally known as Ba-Ba, since it links the districts of Bacalan (in the northernmost part of the former port area, on the left bank) and La Bastide, two of the three major sites targeted by urban-regeneration initiatives. The Ba-Ba crossing was conceived as a lift bridge in order not to impede the access of large cruise ships that still moor at the quays near the traditional city centre. The location of this new river crossing was intended as well “to bridge the social and economic gap between the two banks” (Ville de Bordeaux & CUB, 2009, p. 3); the improved accessibility has then allowed the neglected right bank to be transformed into a strategic site.

Indeed, thanks to the amount of derelict land available in La Bastide²³² (450 ha) and its location within the meander of the river rightly in the core of the Métropole, “*the wrong side of the Garonne*” (as referred to by an interviewee²³³) gradually revealed itself a valuable urban asset (see Figure 225). Yet, the opportunity of regenerating this area as a major

²³² The location of the railway linking Bordeaux to Paris in La Bastide in 1851 had further boosted the occupation of this suburb by related facilities and industrial units. In 1865, La Bastide was officially incorporated into the Municipality of Bordeaux, being the sole part of the city on the right bank (Coustet, 2009).

²³³ Integral quote: La Bastide “*is a little bit the wrong side of the Garonne in the sense that the left bank has always been the centre of the city, has always been also the major expansion direction of the city, and the right bank was always a little bit the poor industrial leftover, which was built a bit by *laisser-faire* and a bit in a passive way somehow, until the 1980s and 1990s, when the first projects came*”.

Dealing with both riverbanks (400 ha), the “Deux Rives” project defined the major baselines for the following planning initiatives for La Bastide (see Figure 228), envisioned as the Garonne’s green bank (in opposition to the ‘mineral’ one), while preserving its traditional industrial subdivision of plots: large parcels, perpendicular to the river (Rambert, 1994; Lavigne, 2012). The implementation of this plan started in the mid-1990s, with the establishment of the ZAC Cœur de Bastide by Bordeaux Métropole²³⁴ (La Bastide’s section closest to the city centre), making the first move towards the envisioned renovation of the area. This initiative then brought new urban uses at the scale of the conurbation, such as a botanical garden, a multiplex and a university campus, besides real estate, already pursuing the ambition of extending the city centre towards the right bank²³⁵.

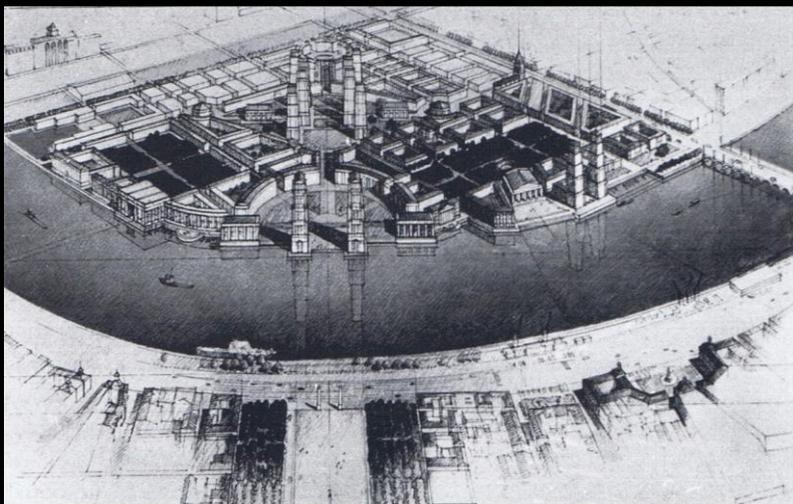


Figure 227: Bofill’s project for La Bastide (1987)

Source: Lavigne (2012, p. 389),
© Ricardo Bofill

Subsequently, La Bastide was in 2000-2004 subject to a more detailed study, the “Urban and Landscape Development Plan for Bordeaux’s Right Bank”, jointly elaborated by the architect-urbanist Bruno Fortier and the landscape architect Michel Desvigne (see Figure

²³⁴ The special development zone (Zone d’Aménagement Concerté, or ZAC) is a planning scheme introduced in 1967 by the French urbanism code. When an area receives a ZAC status, an intervention of public interest is then carried out (commonly through public-private partnerships), in which the public development agent is responsible for implementing collective urban equipment, housing etc. on public land that will later on be conceded to other (public or private) entities. This status confers some operational advantages to the developer (such as the right to land expropriations), while it presupposes the involvement of the stakeholders since the beginning, as a means to define a shared vision for the space in question. Although public meetings and workshops are among the instruments used, most of the time a top-down approach prevails in a ZAC procedure.

²³⁵ The urban sociologist Patrice Godier and the architect Caroline Mazel synthesized the planning initiatives concerning La Bastide from the end of the 1980s to the mid-2000s as follows (2009, p. 9):

“1989: Bofill and his neoclassic façade, a pastiche of the left bank.

1994: The ‘Deux Rives’ project: a contemporary concept. The riverfront will be dominantly green.

1996: ZAC Cœur de Bastide.

1997: Establishment, by the Prime Minister Alain Juppé, of the ZFU [Zone Franche Urbaine, urban free zone] Hauts de Garonne Bastide, comprising 790 hectares. (...)

1998: Public discussion regarding the crossing of the Garonne River. (...)

1999: The ZAC [Cœur de Bastide] plots are put for sale: first developments. (...)

2000: Decision to build the Bacalan-Bastide lift bridge ([estimated] opening in 2009).

2003: Launch of the tramway line A: the Pont de Pierre is reduced to two vehicle lanes; the Avenue Thiers [the central spine of La Bastide] is upgraded.

2005: Beginning of the construction of the new rail bridge crossing the Garonne. (...) Project for the Parc des Berges”.

229)²³⁶. This plan included the approach of the new Ba-Ba Bridge, as well as the proposal of a large park covering the entire riverbank of La Bastide (already anticipated in Perrault’s project), which would define the underlying urban structure of the district and guide the introduction of new urban developments in the regeneration of the derelict plots. This vast green area incorporated the idea of an “inhabited park”, identified in Bordeaux as a local trend of merging “the densification of urban hubs” and “the reintegration of the natural dimension” (Cambau, 2004a, p. 24).



Figure 228: The “Deux Rives” project (or “Plan Perrault”), in the 1990s

In red: the boundaries of the ZAC Cœur de Bastide
 Source: Ville de Bordeaux’s archives, © Dominique Perrault Architecture (modified by the author)

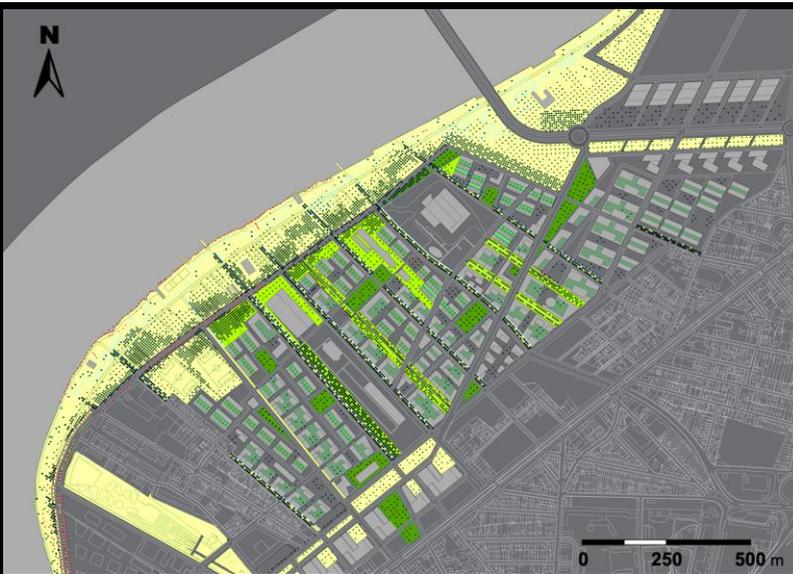


Figure 229: The plan for Bordeaux’s right bank, by Fortier and Desvigne (2004)

Source: Ville de Bordeaux’s archives, © Bruno Fortier & MDP (modified by the author)

According to Desvigne (2005, p. 25), the “ingenuous proposal [for this park] seemed absurd considering the existing uses, economic common sense and urban development projects”; nonetheless, it was fully adopted since it was aligned with the aforementioned expectations for the right bank. This vast landscape proposal (totalling around 80 ha along

²³⁶ Meanwhile, Fortier and Desvigne were also acting as advisor architect and advisor landscape architect, respectively, for the city of Bordeaux. Hence, Desvigne supported the elaboration of two baseline documents targeting the whole city: the *Landscape charter* and the *Landscape design charter* (DGA, 2006). Partly emanating from these two documents, Desvigne proposed a vast green park along the right bank, dominated by a more ‘natural look’: the then denominated Plan Guide Garonne or Grand Parc des Berges, which was eventually detailed and renamed Parc aux Angéliques (Cambau, 2004a; 2004b).

5 km, in the longer run) intended to be in harmony with the scale of the Garonne and the conurbation itself (see Figure 230), making an alluvial forest face the left bank (the least intrusive homogeneous background for the 18th-century façade). Besides the shoreline, the park would have “*a lot of ramifications, perpendicular structures, going very deeply on the rive droite*”, as described by an interviewee. The Parc aux Angéliques was thus conceived as an “urban forest”, in which existing and new buildings and infrastructures would be fully integrated²³⁷ (Desvigne, 2012). For the implementation of the park, a process approach was envisaged: groups of trees would be planted progressively, as the plots become available, from south to north (see Figure 231). The PLU was then changed in order to convert this area (which previously had a buildable status) into a ‘natural zone’, although keeping within it some segments still apt to host new constructions; when completed (around 2030), the park’s green structures would be fully interlaced with the built urban fabric (Hölzer *et al.*, 2008b).



Figure 230: Desvigne’s landscape plan for the Parc aux Angéliques (2004)

According to an interviewee, the park’s structure was intended to be “*very deeply rooted in the pre-existing fabric*”

Source: Ville de Bordeaux’s archives, © MDP



Figure 231: An already implemented segment of the Parc aux Angéliques (Quai des Queyries)

In the background, the tip of one of new bridge’s lifting structures
Source: author’s archives (24 July 2015)

²³⁷ Desvigne’s ambitious design proposal for the Parc aux Angéliques is well documented; for more details, see for instance Cambau (2004a; 2004b) or Masbouni (2011). Despite the statement in the PLU that “the design of the park must collaborate to the management of flood risk” (CUB, 2006b), this issue was not stressed in several opportunities in which Desvigne presented his project (Desvigne, 2004; 2005; 2008; 2009; 2012). Only a minor note can be found in Bordeaux’s landscape charter, referring to the envisioned floodable meadows to be located in the “inhabited alluvial forest of the right bank” (DGA, 2006). In any case, the Parc aux Angéliques was referred to during an interview as one of the design options taken by Greater Bordeaux to face floods, in line with the French metropolitan areas’ trend of shifting inwards the potential buildable areas and reserve the shorelines for (floodable) parks.

All these planning initiatives can be seen as part of the commitment of Bordeaux (at both municipal and metropolitan levels) towards sustainable development, for which urban compactness and multifunctionality are key strategies to be followed. Indeed, as explained during the interviews, the one-million-inhabitant goal is to be reached without increasing the metropolitan buildable area, thus maintaining the present (and prized) balance whereby half of the territory is urbanized and half is devoted to agriculture and natural spaces. This commitment implies investing heavily in the urban regeneration (particularly in the reconversion of previous industrial zones now in decay), as well as increasing the urban density in selected areas. Nonetheless, just like other parts of the conurbation that are being recovered, almost all La Bastide is prone to floods (both riverine and pluvial ones²³⁸) (see Figure 232 and Figure 233).



Figure 232: La Bastide (right bank) flooded on 12 February 2016

Source: Sud Ouest (2016), © M. T.



Figure 233: The Quai des Chartrons (left bank) flooded on 12 February 2016

Source: France 3 (2016), © Stéphane Estève & France 3 Aquitaine

Urban floods indeed affect the majority of Greater Bordeaux's territory, being an issue on which Bordeaux Métropole has been acquiring expertise since 1982, when important floods associated to heavy storms triggered the implementation of several mitigation measures, such as retention ponds and pumping stations (ACUF & CEPRI, 2012). In this regard, an

²³⁸ Although the distinction between fluvial and pluvial floods is correctly made in the PLU (namely in the PADD), the misunderstanding around the 'centennial flood' is oddly also present, when the document considers that the zones to be redeveloped within Greater Bordeaux should be protected from "the centennial flood risk (likely to occur once every 100 years)" (CUB, 2006a, p. 80).

interviewee noted that “for a long time there were only engineers at the Métropole (there were neither urbanists nor other professions, only engineers working essentially on water-management issues)”. On the other hand, the situation regarding fluvial floods is quite complex in this context, since the oceanic influences (mostly related to tides and winds) hinder the proper comprehension, assessment and modelling of flood processes. Yet, in spite of their predictability and their normally short duration (a few hours, roughly equivalent to the high-tide period), fluvial floods in the Greater Bordeaux area often generate significant damage when they hit non-adapted environments (Salomon, 2002).

In sum, 40,000 people, in 20 out of the Métropole’s 28 municipalities, are exposed to floods; almost one third of the conurbation’s territory lies below the *plus hautes eaux connues* (PHEC, highest known water levels) (ACUF & CEPRI, 2012). Despite this condition, several urban-regeneration initiatives are presently being carried out in flood-prone areas (see Figure 234). Overlaying the ambitions set for La Bastide (see Figure 225, on p. 297) with the contents of Figure 235 and Figure 236 below puts in evidence one of the main challenges of its regeneration: to make the urban redevelopment compatible with the possibility of experiencing floods. Given the extents of their aspirations and determination, one may say that Bordeaux’s authorities have great interest in making this compatibility as successful as possible.

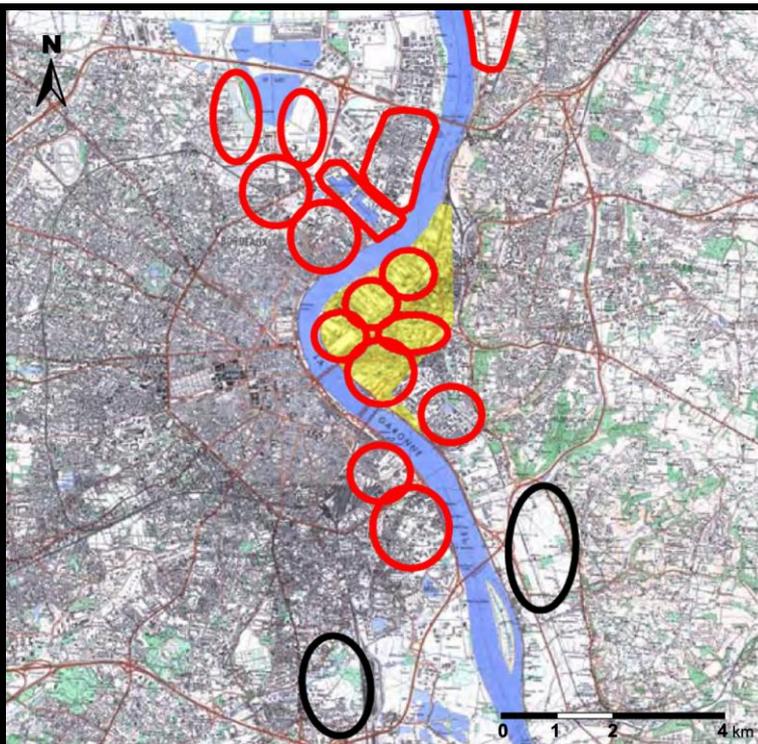


Figure 234: Some of Bordeaux Métropole’s urban-regeneration initiatives in flood-prone areas

Legend:

- in yellow: La Bastide district
- in red: some of the regeneration initiatives approved by the Plan de Prévention des Risques d’Inondation (PPRI)
- in black: greenfield development initiatives not permitted

Source: CUB (2008, p. 12)
(modified by the author)

Despite La Bastide’s high susceptibility to fluvial floods and the not-so-distant experience of a major flood event (in December 1999, linked to the storm Martin), which ended up being taken as the reference flood²³⁹, this issue only came to the fore at the end of the 2000s,

²³⁹ This event was more severe than the 1%-probability flood (the so-called centennial flood), and has then acquired the status of PHEC. See Salomon (2002) for details about the conditions and consequences of the 1999 flood in Bordeaux Métropole.

following other significant overflows of the Garonne in Greater Bordeaux²⁴⁰ (CUB, 2010a). The 1999 flood occurred rightly when a Plan de Prévention du Risque d’Inondation (PPRI, flood-risk prevention plan²⁴¹) was being elaborated at the central level (the Département de la Gironde) for Bordeaux Métropole’s entire area (DDE, 2005a; 2005f). Based on the precautionary principle and integrated in a sustainable-development approach, the PPRI has flood-risk prevention as its overall objective, which encompasses, for example, the maintenance of the floodplain and of the possibility of water flows, the management of land occupation vis-à-vis flood susceptibility, or the minimization of exposure (DDE, 2005a).

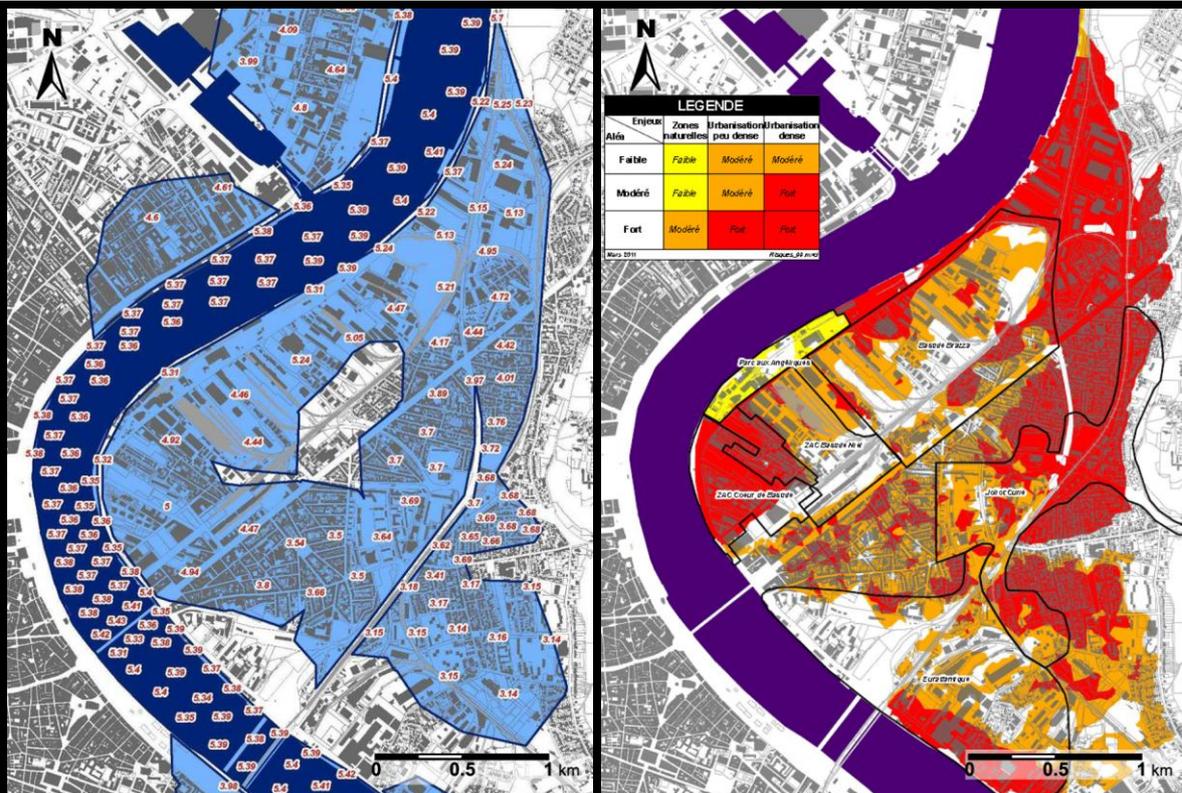


Figure 235: Flood-hazard map of La Bastide (left)

Figure 236: Flood-risk model of La Bastide (right)

In the map on the left, the floodable areas are represented in light blue (modelled scenario: the 1999 storm); considering the same scenario, in the map on the right, yellow corresponds to the areas with low flood risk, orange to the ones with medium risk and red to the ones with high risk

Source: CUB (2011a, pp. 8 and 27)

In this sense, Bordeaux’s PPRI, approved in 2005, imposes the necessity of creating space for the Garonne’s waters, as well as the pursuit of hydraulic transparency, meaning that “*water should be able to get in and out very easily*”, as straightforwardly summarized by one of the interviewees. In any case, according to another informant, since the modelling and negotiations related to the issuing of the PPRI were ongoing when the 1999 flood

²⁴⁰ Bordeaux Métropole was affected by major fluvial flood events in March 1930, December 1981, March 1988, December 1999, January 2009 (associated to the storm Klaus) and February 2010 (linked to the storm Xynthia) (ACUF & CEPRI, 2012).

²⁴¹ Created at the national level in 1995, in the framework of the law related to the reinforcement of environmental protection, the PPRs (Plans de Prévention des Risques) aimed at “ensuring that territorial planning specifically takes risks into consideration” (DDE, 2005a, p. 2). The PPRI only covers floods related to watercourse overflows.

occurred, the actual related flood features (namely the wind conditions) were unfortunately not taken into account in the PPRI's cartography and plan. Oddly, this plan was thus already outdated when it was approved. In fact, the interviews revealed that several flood studies involving the whole Gironde estuary were made after the 1999 storm (including dynamic flood modelling), all of them indicating that flood risk in Greater Bordeaux had up to then been underestimated. The PPRI's main output is a zoning related to flood risk (see Figure 237), with the definition of flood-level references and the stipulation of rules that restrict building in some areas (the flood-hazard intensity being assessed according to the water depth and the flow velocity – see Figure 238). Therefore, the PPRI totally bans constructions in some concerned flood-prone zones, while in others it imposes the necessity of adopting flood-adaptation measures.

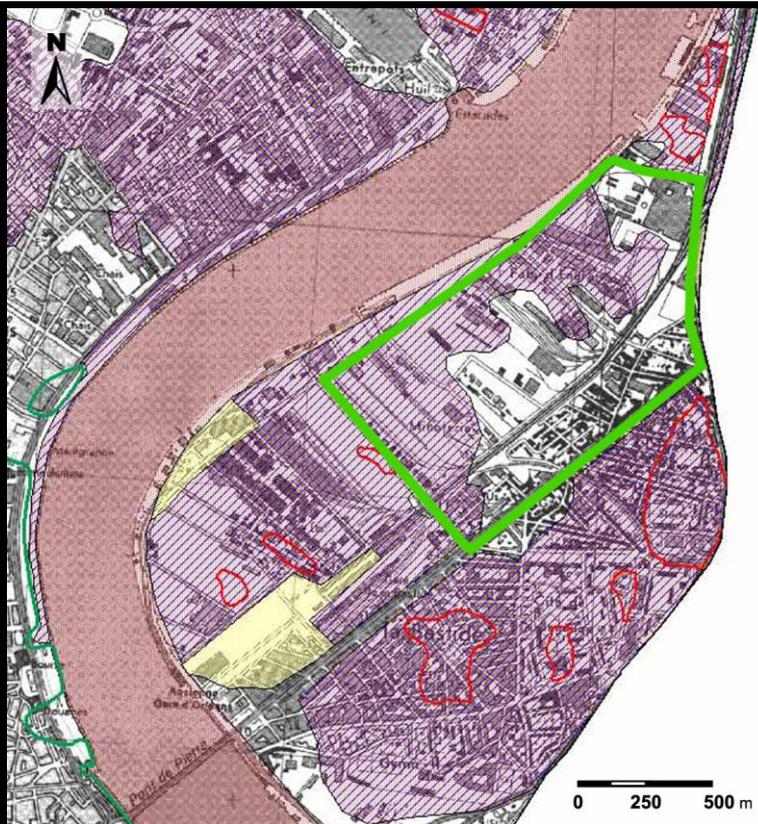


Figure 237: The binding (but outdated) PPRI zoning for La Bastide

Legend:

- light yellow: areas not submersible in a 1%-probability flood (but submersible with less than 1-m water depth in exceptional events)
- hatched purple: submersible areas (with less than 1-m water depth in a 1%-probability flood)
- hatched purple within red perimeters: lowest submersible areas (less than 1-m water depth in a 1%-probability flood, but more than 1-m water depth in exceptional events)
- dark green perimeters: previously flooded areas
- light green perimeter: Bastide Brazza

Source: DDE (2005d) (modified by the author)

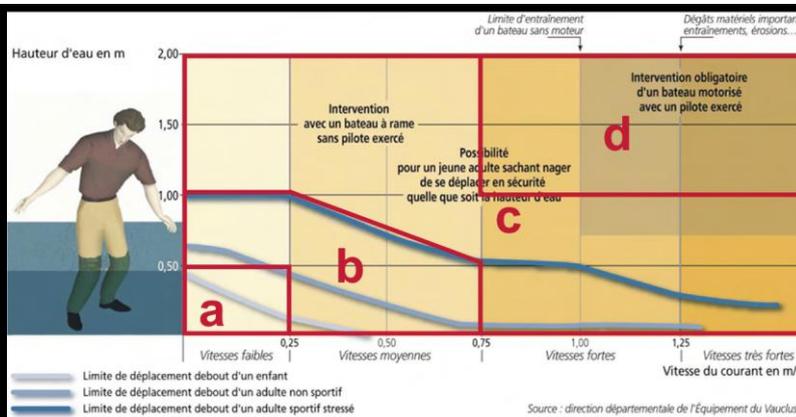


Figure 238: The general flood-hazard assessment scheme adopted in France

Legend:

- a) low flood hazard
- b) medium flood hazard
- c) high flood hazard
- d) very high flood hazard

Source: CUB (2011a, p. 27) (modified by the author)

In fact, the PPRI results from several negotiations aimed at balancing the existing potentials and constraints stated in the relevant planning documents (like the PLU), which are eventually

subordinated to the ensuing PPRI zoning. In any case, it should be noted that, as recalled by the CEPRI, the PPRs in general “act in a sectorial and partial manner, based on a zoning at the plot scale that does not support a coherent approach at the scale of an urban project. Their main objective is not urban regeneration, but the containment of urban sprawl” (2015, p. 10). Moreover, the scale used to elaborate the PPRI (1/25,000) is hardly appropriate and useful for urban-design purposes. Considering the scenario of an ‘exceptional’ flood (with an intensity greater than the 1%-probability event²⁴²), flood-adapted constructions are generally allowed in the areas subject to the PPRI zoning shown in Figure 237 above, with the exception of critical infrastructures (hosting vulnerable people or strategic functions), which are strictly prohibited in the most sensible zones (the ones encircled in red).

In its elaboration, the PPRI of Bordeaux also took into account the existence of flood-defence structures, which should be kept in good conditions to validate the stated zoning, otherwise the areas behind them have their zoning downgraded (DDE, 2005a). Therefore, the areas without any zoning in the PPRI map above are either non floodable or protected by dykes, as it is the case of a large part of Bordeaux’s left bank (especially the city core, on the bottom left side of Figure 237). Yet, the dykes and quay walls reminiscent from the port installations are considered generally not well maintained (see Figure 239) (Ville de Bordeaux, 2013). The situation on the right bank is quite similar, although some of its segments are not bordered by protective quay walls. In any case, the construction of new walls or dykes is nowadays very restricted, since this would imply transferring the risk to other locations (CUB, 2008).



Figure 239: The deteriorated quay wall of Bordeaux’s left bank

Source: author’s archives
(28 July 2015)

As shown in Figure 237, Bordeaux’s PPRI zoning corresponding to La Bastide reveals that the majority of the area falls under the category of flood-prone areas liable to development, with less than 1-m water depth in a 1%-probability flood (DDE, 2005a; 2005f). Therefore, urban redevelopment is not directly forbidden, but subject to strict regulations geared towards lowering its overall vulnerability; new buildings should hence “incorporate flood-risk knowledge into building techniques and into the choices related to the occupation of the floodable levels” (DDE, 2005a, p. 25). Yet, the zoning presented in Figure 237 does not show that the riverbank is primarily a transfer zone, while the river overflows mostly end up stored in the depression zone close to the hills in the very core of La Bastide, at almost

²⁴² The exceptional flood event taken as reference entails the following concomitant features: the tide at its maximum possible level, a 1.19-m sea-level rise due to storm surge at Le Verdon-sur-Mer (at the mouth of the Garonne), a 7,200-m³/s river discharge, and a 54-km/h wind in the estuary (Artélia, 2013, p. 25).

500 m from the Garonne's shoreline. Such condition has significant implications in terms of the selected measures to deal with the Garonne's waters in all La Bastide, since flood risk should not be shifted from a site to another one within the regeneration initiatives. Likewise, the fact that floods affecting Bordeaux (and La Bastide in particular) are strongly dependent of the tidal dynamics of the estuary nearby is absent of the PPRI zoning map.

Aware of the challenges to be faced within its territory, the Métropole has commissioned some flood-related studies to complement the PPRI data; as expressed by an informant, this has always been the chosen strategy by this body: to extensively study the territory before commissioning any urban project. With *Aménagement et développement durable des zones inondables* (carried out by Sogreah), the Métropole had two objectives: first, to make a general assessment of its flood-prone zones (including their present land uses and the expected vulnerability of the new urbanizations foreseen in the PLU); and secondly, to envisage design alternatives harmonizing flood risk and urban development (CUB, 2008; 2010b). In this document, the Métropole made a pragmatic and determined account of its ambition, as follows (CUB, 2008, p. 5):

The sustainable prevention of flood risk is closely linked to a global and coherent spatial-organization vision. It requires lucid and even bold urban-planning choices. It is precisely at the level of the conurbation that (...) we have sought the best compromise between sometimes contradictory imperatives such as densification, the reduction of people's exposure to flood risk, movement restrictions and the preservation of natural spaces and sites of special interest. (...) The periodic presence of flood waters may even constitute a major asset for new urban-enhancement options. Based on the risk-management issues at stake, a collective project can be developed to improve the city, its surroundings and its neighbourhood spaces, in which the presence of water will contribute to risk awareness and hence prevention. Between the past model of urbanization that used to ignore the risk and the total abandonment of the areas subject to the risk-prevention constraints, a range of enhancement possibilities exists. Risk reduction involves acting either on the hazard (the overflowing hydraulic event) or on the exposed assets. In our territories, acting directly on the flood phenomenon has a limited effectiveness, whereas a complementary approach focused on the reduction of the vulnerability of the exposed elements is essential for the design of new developments within the floodplain (...)

The initiative to carefully study the flood-prone urban areas before proposing their regeneration was indeed reinforced after the disastrous consequences of the storm Xynthia on the French Atlantic coast in 2010, including the death of more than 50 persons in their own houses, legally built behind a dyke (taken thus as safe from floods). Due to the alarming toll of this very recent event, flood awareness became again high among politicians and the general public alike, with two major repercussions in Bordeaux. First, the event shed light on climate change as a driver for an escalation of floods in the future, which led to further investigations about flood risk; secondly, the full revision of the PPRI was set as a governmental priority.

Therefore, the study to update the PPRI (carried out by Sogreah, merged into Artélia in 2010) took the 1999-event-plus-20-cm model for defining the flood-prone areas liable to development, becoming thus the new baseline scenario (ACUF & CEPRI, 2012). The 20-cm additional margin accounts for climate-change prospects and, as explained during the interviews, it was outlined based on the expectation of having, in 100 years, a 60-cm sea-level rise at the mouth of the Garonne. Concerning La Bastide, the Métropole commissioned

the study *Aménagement et risque inondation secteur plaine Garonne* (elaborated by Egis Eau), intended to be “a decision-support tool regarding global and local guiding principles enabling the conciliation of the urbanization needed in this zone and its vulnerability to floods” (CUB, 2011a, p. 1). Since then, it has been detailed by Artélia following a case-by-case approach, covering specific parts of La Bastide to assess both the impacts and vulnerabilities of the several urban-regeneration projects currently under elaboration or implementation there, in an attempt to find appropriate risk-reduction solutions (ACUF & CEPRI, 2012). The section of this study related to Brazza, one of the nine sectors of La Bastide, would only be ready in November 2013 (Artélia, 2013).

This general background forms part of the process of regeneration and design of Bastide Brazza Nord as a new liveable neighbourhood in Bordeaux. One question that particularly links the design context to the design process in this case is: where, on the right bank, does the newly built Ba-Ba Bridge actually lead to? “[N]owhere... [That is,] Brazza...”, in the words of an interviewee²⁴³ (see Figure 240). Located exactly at the approach of the new urban bridge, Brazza not only constitutes the northern sector of La Bastide (and indeed of the city of Bordeaux on the right bank), but is also at the very core of Bordeaux Métropole, having hosted during the 20th century an important industrial zone (presently in decline) mainly dedicated to chemical plants and shipyards (see Figure 241).



Figure 240: The right bank’s approach of the new Ba-Ba Bridge, in Brazza

Source: author’s archives (24 July 2015)



Figure 241: The Brazza area today, viewed from Bordeaux’s left bank

A still thriving private shipyard (CNB, on the left) coexists with mostly derelict infrastructures and industrial units (such as the warehouse of the former Soferti chemical plant, in the centre)

Source: author’s archives (24 July 2015)

²⁴³ Integral quote: “They had planned this bridge for a long time, it took a long time to build it, but when the bridge was completed this year [2013], there was still nothing on the other side, and I think that it was also a political issue. In Bordeaux, some people were a bit ironic, criticizing the bridge for this: a huge construction, very expensive, but then it goes nowhere... Nowhere, I mean, to Brazza...”

Nonetheless, the premises of the Construction Navale Bordeaux (CNB) shipyard are still located in the northern limits of Brazza (under a concession from the port authority). This fact means that the quays in this segment are privately used and constitute a fenced space with restricted access (as it used to be the case of most of the left bank for several decades, before the relocation of the port) (see Figure 242). In any case, the shutting down and dismantling of most of the industrial activities and the predominance of vacant land and abandoned premises (including the railway facilities that used to serve the local industries) are responsible for the ‘nowhere ambience’ that presently characterizes this non-territory, despite being still classified as a ZFU (see Figure 243). At the same time, the area is not well connected to its environs, due to several existing spatial barriers, notably the railways (behind the wall and fences on the right of Figure 243) and some busy traffic lanes in the north. These traits of the Brazza site were expressively described by an interviewee:

[T]he site is like a patchy enclave: stuck behind housing areas and factories that will remain, behind the hills, behind the railways; it’s an enclave, with a strong past, and it’s being reconnected now. So its prospects are better today. (...) There are no inhabitants (that’s very strange), and only few jobs actually, it’s under-occupied, very empty, rather dead, quite empty; in fact, it’s abandoned, it’s like a huge wasteland.



Figure 242: The private use of the Brazza quay by CNB nowadays
 In the background, Bordeaux’s new landmark (the Cité du Vin), under construction on the other side of the river
 Source: author’s archives (23 July 2015)



Figure 243: The ‘nowhere ambience’ of inner Brazza today
 Source: author’s archives (23 July 2015)

Interestingly, the major strengths of Brazza Nord are also related to the amount of derelict land and properties waiting to be redeveloped with new uses and thus reintegrated into the urban life. Moreover, notwithstanding the barrier effect of the privately used shoreline, it has a favourable location open to the Garonne, “*at the same time extremely close to the city centre (ten minutes by bicycle from the City Hall) and, looking north on the river, one could almost see the big horizons of the estuary*”, as portrayed by an informant (see Figure

244). The presence in Brazza of one of Bordeaux’s industrial-heritage icons, the Halle Soferti – a warehouse from 1905 totally built in wood (see Figure 245) –, contributes to the perception of the area as “one of the most strategic sites within the sustainable development arc of Bordeaux” (Agence AUC, 2010, p. 4).

As for major constraints, the site is prone to floods due to both drainage overflows and river dynamics, and contains polluted soils inherited from decades of chemical-industry activities (“*but you don’t know exactly what kind of pollution and how deep*”, stressed an interviewee). In any case, as recalled by another informant, “*Brazza is but a small territory (...), it’s a small issue when compared to the vast territory and the large number of urban projects in which we have to integrate flood risk*”. At the same time, although the site was almost completely flooded during the 1999 event, flood risk in this area is assessed as relatively low, as put by another interviewee:

*In Brazza, it’s not really complicated; why? Because there are no dykes, it’s not a protected territory. When we’re behind a dyke, the risk is that the dyke breaks: when it breaks, the water enters the site all at once, very fast, very strong, and this is very dangerous. In Brazza, during the river-overflow episodes, the water slowly climbs the quay before spreading into the site at a reduced pace; so the velocities are not very high, even if the water levels attained are significant.*²⁴⁴



Figure 244: The open view from the quay of Brazza

On the right, the southern end of the quay’s fenced strip, close to the control tower of the new Ba-Ba lift bridge; in the background, the Aquitaine Bridge, the last crossing before the Gironde Estuary
Source: author’s archives (23 July 2015)



Figure 245: The Halle Soferti in its current state

Source: author’s archives (23 July 2015)

²⁴⁴ The same interviewee finally complemented: “*We are talking about floods that only have a 1% chance to happen every year; it’s not a flood that will happen twice a year. So we are really talking about events that are not common (very severe floods) (...). So we are dealing with a risk that has a low probability of materializing; so flooding the garages is not very serious (even if some damage is expected), the goal is to avoid human deaths, the goal is to control the risk for the sake of the human beings, that’s it.*”

Moreover, although the area is unconventionally made up of large plots as compared to the rest of the city, only a small fraction of these is publicly owned, which in principle discourages the usual format of integrated urban-development initiatives as carried out in the French context. Consequently, this urban project does not follow the procedures of the majority of the urban operations of this kind in France (notably the ZAC), which are often totally publicly led. In this particular case, the redevelopment of Brazza has been planned and coordinated by the municipality, while the actual implementation process has been carried out by private entities, with the operational support from the Métropole (which is the body in charge of urban finance, tax and incentive issues). According to some interviewees, working within this quite rare operational arrangement has in fact been one of the great challenges of this *plan guide*. All in all, the sum of the existing physical and institutional constraints “*makes a kind of very fragile starting point for an urban redevelopment initiative*”, as stated by one of the informants. Yet, if the positive standpoint of Nunes (2008) is adhered to (see quote on p. 221), Brazza in itself epitomizes extraordinary opportunities waiting to be unleashed through design.

6.3 Process timeline

Identifying the starting point of the planning and design process – that is, clearly delimitating the origins of the Bastide Brazza Nord urban project – is a real challenge given that, as previously indicated, initiatives that directly or indirectly involve the site have been ongoing since the 2000s, commissioned either by the city of Bordeaux or by the Métropole. All these have been framing the ultimate design proposal now under implementation, which was intended to combine compactness, urbanity, greening, mixed uses (*mixité*, with productive activities included), as well as adaptation to floods. The first specific planning initiative actually dedicated to the area was the Agence AUC’s preliminary redevelopment study for Bastide Brazza, carried out between 2009 and 2010. This stage was not intended to produce a real urban project, but as a design instrument “to think about (...) the valorisation of [one of] the territories to which the bridge would lead to” (Ville de Bordeaux, 2010, p. 7).

The AUC’s study targeted the entire Brazza sector (Brazza Nord and Brazza Sud, in which the ZFU Parc d’Activités Brazza is presently located), a 120-ha area, wider than the focuses of the subsequent urban projects (see Figure 246). The riverbank’s segment flanking Brazza was not included in this study (nor in the subsequent plans): its southern part had already been contemplated in the Parc aux Angéliques’s plan and, as aforementioned, its northern part (although appearing in Figure 246 within the study’s boundaries) is still privately used by the CNB shipyard. Led by the architect-urbanist Djamel Klouche, the AUC’s study set the main lines for the future redevelopment of Brazza, as well as a strong urban image associated to them: away from ‘city fringe’ but close to ‘city centre’ (since the area was initially supposed to host almost 6,000 new housing units). It nonetheless kept the design philosophy (of a green right bank) previously proposed by Perrault, which was already followed in Desvigne’s plan for both riverbanks.



Figure 246: Boundaries of the AUC's study within La Bastide
The dashed line represents the location of the new Ba-Ba Bridge
Source: DGA (2012, pp. 6-7),
© A'urba (modified by the author)

The choice of maintaining a green image for the right bank was somehow supported by an archaeogeographical study of La Bastide, also commissioned by the city of Bordeaux (in parallel to AUC's design proposal for Brazza), which enabled “*the understanding of this territory through a different (more contextualized) urbanism approach that brings together geography and history*”. As expressed by the author of this study, the historian Cédric Lavigne (2012, p. 364), archaeogeography makes “visible the articulations between the concrete forms of long-term space occupation by societies and the present realities”, and therefore “allows going beyond the description of an ‘initial’ condition of the site and the environment, to understand their inherited condition, full of assets, potentialities, constraints or risks for the contemporary projects”. The author considers that such an understanding is indeed required in the contexts in which sustainable development is taken as a goal, since its associated principles of prevention and precaution call for “a new relationship with time and space, and invite us to take into consideration the role of memory and heritage within spatial planning” (Lavigne, 2012, p. 364).

Based on the analyses of ancient maps and other documental sources, this study identified some very interesting features in the spatial evolution of La Bastide, which are till now imprinted in its landscape, namely in the general parcelling, the enduring pathways and the pattern of the buildings' occupation (Lavigne, 2010). Two major factors behind these traits were duly acknowledged, both being related to land-water relationships. First, the study stressed the strong role played by the drainage conditions for the configuration, occupation and use of the area; for example, drainage ditches perpendicular to the Garonne were historically placed along the agricultural parcels for the management of the water, thus conforming the fabric that still prevails today (see Figure 247). Secondly, it also showed the continuous dislocation of the shoreline towards the river, due to the propagation of the meander (resulting from both ‘natural’ deposition processes and associated man-made landfills) (see Figure 248). As highlighted during an interview, given the importance of these factors and the “*clearer and more pedagogic way*” in which they were presented by Lavigne, the archaeogeographical study was provided as a reference to all the designers who would subsequently work in the Brazza design process “*so that they become aware of that*”.

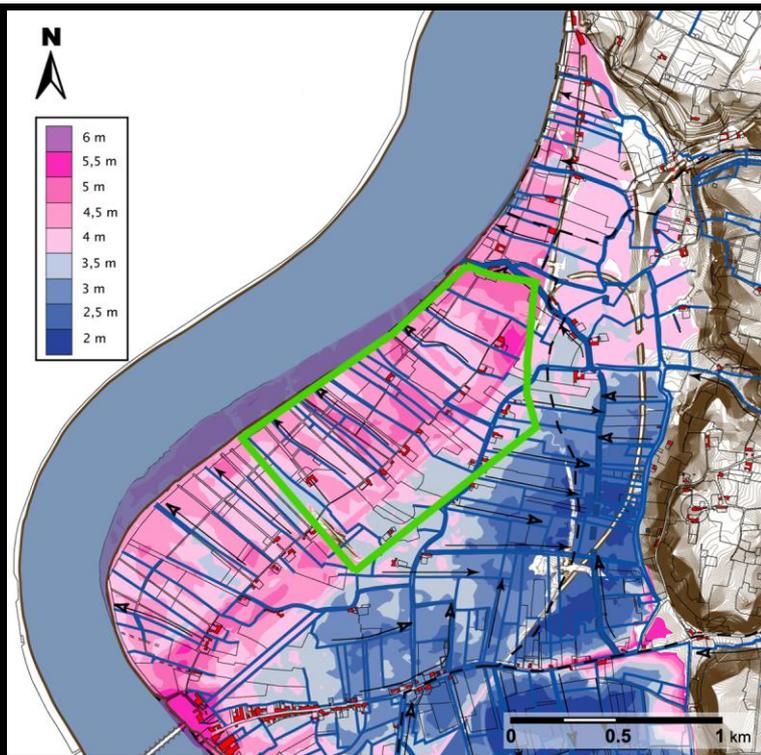


Figure 247: Drainage scheme of La Bastide

This scheme shows the 1822 plot plan of La Bastide and the current topography

Legend:

– the colour scale on the top left indicates the topographical levels (2-6 m)

– the arrows indicate the water-flow sense

– the green line represents the boundaries of Brazza

Source: Lavigne (2010, p. 46),

© Cédric Lavigne (modified by the author)

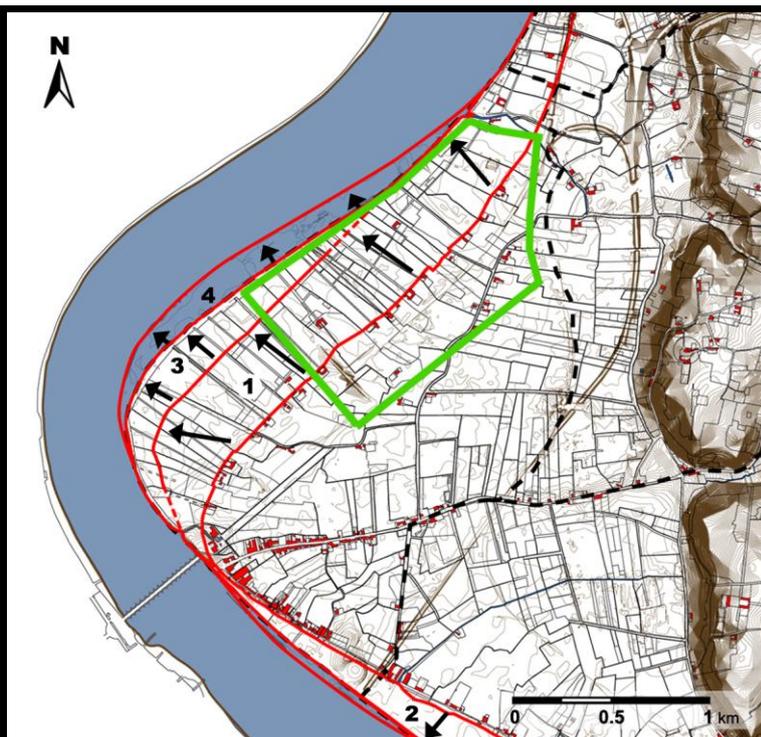


Figure 248: The dislocation of the shoreline in La Bastide across the centuries

Legend:

1) between the 15th and the 18th century

2) between 1815 and 1820

3) between 1848 and 1857

4) between 1873 and 1874

The green line represents the boundaries of Brazza

Source: Lavigne (2012, pp. 370 and 374), © Cédric Lavigne (modified by the author)

AUC's plan for Brazza particularly assimilated the findings of the archaeogeographical study, namely the territorial structure of La Bastide's historical fabric. This plan had a full scope and covered, among others, public spaces, accessibility, urban equipment etc. Although only the ones most related to floods will be reviewed here, a brief look at all the seven parts of AUC's ensuing document (Agence AUC, 2010) is worthwhile. The first part stresses the differences between the Garonne's left and right banks, regarding both landscape and urban morphology; these differences should be kept as such, in their point of

view, even if La Bastide has since then been envisioned as an integral part of the city centre. In this sense, as put in evidence by Klouche in his presentation of AUC's plan to the city council (Ville de Bordeaux, 2010), one interesting explored opposition is that the left bank, mostly 'mineral' (that is, densely built), is more related to history, while the right bank, green and loose, is more related to landscape and geography. This means that the right bank's history is to be constructed in the future, anchored in its geographical features. On the other hand, the second part of the plan states the principles that underlie AUC's design proposal for the redevelopment of Brazza (see in Figure 249 a related graphical synthesis in terms of urban programming)²⁴⁵.



Figure 249: AUC's proposal for Brazza – urban programming

Legend:

- light blue: housing and other mixed uses
- dark blue: local facilities
- green: mixed uses
- yellow: major facilities

Source: Agence AUC (2010, p. 27), © AUC

The third and fifth sections are dedicated to the public spaces: AUC's design integrates Brazza into La Bastide through a network of public spaces (see Figure 250), contemplating, as the most expressive proposal, the transformation of the 50-m-wide right-of-way of the railway track (still partially in use, although rarely) into a new green axis, along which an intense urban life should be favoured. Taking New York's High Line as a design reference, this axis intended to be La Bastide's main internal public space, parallel to (and contrasting with) the Parc aux Angéliques by the river. These two major public spaces would structure the neighbourhood, while the link between them would be ensured through intermittent green strips, following the rationale presented in Desvigne's plan.

Accordingly, the design proposed the intensification of the density and urbanity in the area: the zone with a more scattered occupation was placed along the shoreline, while the denser one, characterized by mixed uses, was located along the railway track (also as a means to lower the quantity of assets and people exposed to floods). The fourth section of AUC's plan is centred on the new connectivity engendered by the Ba-Ba Bridge and the proposition of a related street network, while the seventh part, the one most related to buildings *per se*, connects the foreseen urban ambiances to particular housing typologies, gathering several reference images of a pleasant neighbourhood within a metropolis.

²⁴⁵ The principles considered were: (1) the right bank's specificities (mixed uses and amenities); (2) ecology (sustainable development as a new paradigm); (3) density (to ensure the desired level of urbanity in Brazza); (4) mixed uses (transforming work modes, and the reincorporation of productive activities within the city); (5) urbanity *vs.* choice ('back to the city' *vs.* 'individual lifestyles') (Agence AUC, 2010, p. 25).

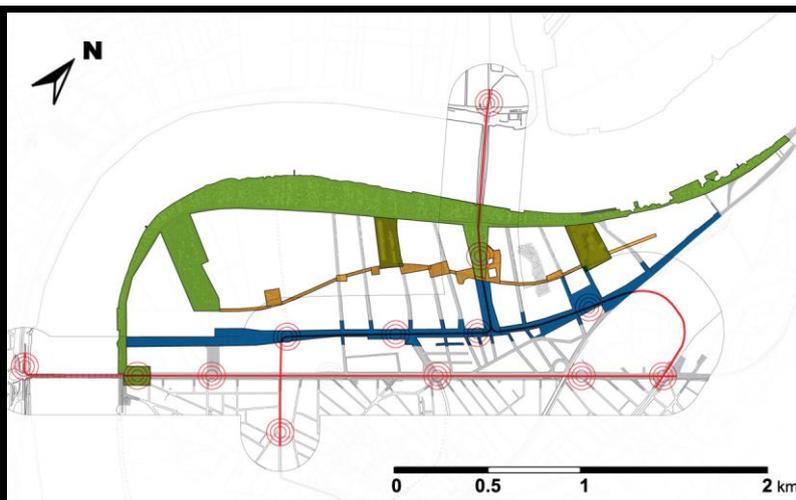


Figure 250: AUC's proposal for Brazza – public spaces

Legend:

- green: the shoreline
- orange: pedestrian path linking some squares
- blue: public spaces along the railway track
- red spots: transport nodes

Source: Agence AUC (2010, p. 28), © AUC

The part that most concerns floods is indeed the sixth section, entitled “Deux mondes” (two worlds) in a reference to the proposal of a pedestrian path (in-between the shoreline and the railway track) that would define two specific and complementary “urban ambiances” (Ville de Bordeaux, 2010, p. 6). In the very words of Klouche (Agence AUC, 2010, p. 26):

It is known that the right bank and the Brazza sector are situated in a flood-prone zone. *This constraint can become the catalyst of a design strategy that gives continuity to the identity of the right bank as a natural, green and mixed riverbank* [emphasis added]:

- one urban ambience would be directed towards the Garonne (the ‘wet environment’), with natural and open grounds that extend the river’s microclimate into the site. This typology, primarily concerning housing buildings, would form a layer on stilts, offering panoramic views towards the vegetation, the water and the sky;
- the other urban ambience would be directed towards the railway track (...) (the ‘dry environment’). This building typology would occupy the land more intensively. Large built volumes evoke great built surfaces for commerce, offices and other activities that, combined with housing, create a new *mixité*, more dense and urban.

According to AUC (2010, p. 89), these two distinct ambiances directly derive from the PPRI, taken here as “the catalyst of a new nature” (see Figure 251 and Figure 252). As recognized by Lavigne (2012, p. 390), this interesting kind of ‘water zoning’ indeed represents the incorporation of the “*mémoire des milieux*”, a solution devised thanks to the archaeogeographical study, from which AUC recovered a sinuous path along the plain that once was the limit of the ancient fluvial island, finally merged into the right bank.

Perhaps the most classic solution to deal with floods, building off the ground (on stilts) was proposed in the wet ambience as an adaptation means for the buildings closest to the riverfront, supposedly more exposed to the variations of the Garonne’s waters. This typology was also taken as an opportunity to expand the horizons on the ground level, in the same manner suggested by Le Corbusier almost a century ago (somehow following the similar aesthetic and sanitary reasons). At the same time, this sparser occupation would enable the formation of a ‘green’ buffer to camouflage the dense urban fabric close to the former railway track, which would thus not disturb the visual experience of the heritage city.

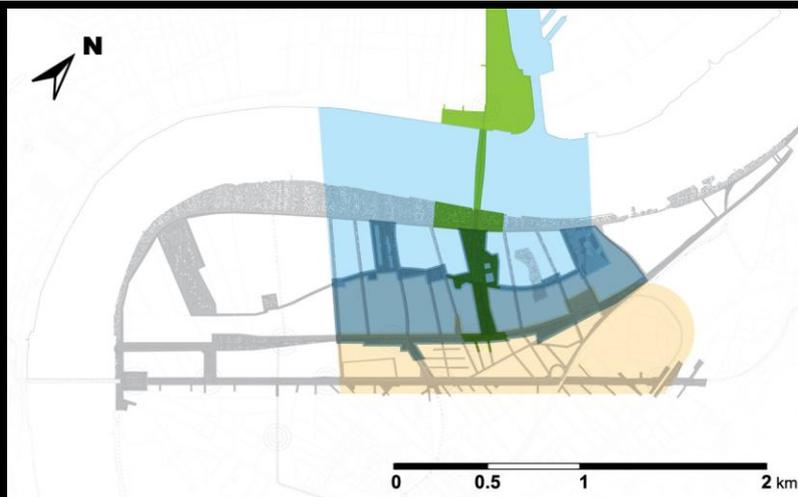


Figure 251: Three urban strategies, anchored in the site's geographical features

Legend:

- dark green: the bridge's approach
- light blue: "wet ambience"
- blue: "dry ambience" (urban intensity and mixed uses)
- light yellow: interventions in the existing urban fabric

Source: Agence AUC (2010, p. 29), © AUC

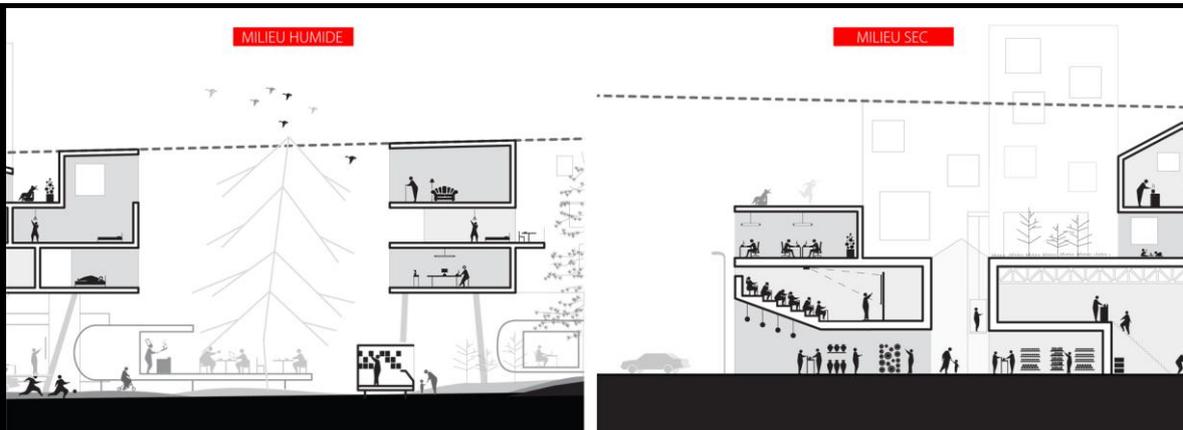


Figure 252: Brazza's "two worlds", according to AUC

Loose buildings on stilts in the "wet ambience" vs. density and urbanity in the "dry ambience"

Source: Agence AUC (2010, p. 91), © AUC

Although it only outlined a general framework and was not a final binding design, AUC's plan for Brazza was generally welcomed, as attested in Klouche's 30-minute presentation to the city council on June 2010 (Klouche, 2010a; 2010b). As regards the flood issue, both enthusiasm and, in a smaller degree, conservatism were shown by the councillors on that occasion. On one hand, the sensitivity of the design to the site's particularities (including its floodable condition) was duly acknowledged; on the other hand, one councillor exposed her general concern about the timeliness of building in a flood-prone zone. Her argument was that the PPRI should not be taken as a fixed picture (a reasoning that strongly makes sense); therefore, if (or when) new elements are taken into consideration in the revision of such flood-risk mapping, the possibility to build in the zone could even become more constrained (Ville de Bordeaux, 2010, pp. 15 *et seq.*). In any case, according to the interviews, the AUC's plan was crucial for the ultimate effective understanding that Brazza "is really [part of] the hyper-centre of the agglomeration", as well as for the definition of the area's general urban layout (including public spaces and transport networks).

A brief parenthesis should be opened to mention that in parallel to the regeneration process of La Bastide, the municipality initiated in 2006 the so-called "Rencontres de La Bastide" (La Bastide's urban-project meetings), a combination of communication forum and design workshop, aimed at discussing the future development of the district with the

concerned stakeholders. Although this was a necessary legal step before establishing the ZAC Niel (next to the ZAC Cœur de Bastide), it was taken as an opportunity to involve the local population in the planning and design process of all the sectors of La Bastide, even in the absence of the ZAC status (which was the case of Brazza). The main output of the very first of these meetings was the collective definition of a charter of intervention principles for La Bastide, namely: (1) the area is not a suburb, but part of the Greater Bordeaux's core; (2) it should have mixed uses, with the proper coexistence of housing and productive activities (priority being given to non-polluting and space-efficient activities); (3) it should have a park by the shoreline; and (4) public transports must be favoured in terms of urban accessibility (DGA, 2012, p. 11). These principles should be complied with by all the design proposals being prepared for La Bastide's sectors, including the one for Brazza Nord.

The first of the two sessions of these official meetings dedicated to Brazza (in 2010) had the participation of Klouche, who presented AUC's design proposal, while in the second one (in 2012) KCAP's pre-operational study was discussed with the landscape architect and urban planner Frédéric Rossano, the KCAP representative for France who coordinated the *plan guide* works (DGA, 2012). During these meetings, the two designers opted for a pedagogic approach, with questions and answers in both directions (being that in this particular context the stakeholders were primarily the landowners, since there are no inhabitants and only few enterprises still operate in the area). As witnessed by the published minutes of the first of these meetings, Klouche's participation in this debate was fundamental to support the construction of a shared and desired image for the new neighbourhood (DGA, 2012). "Between river and hill, accessible and connected, emphasizing nature while welcoming mixed-use sectors and metropolitan-scale facilities: Brazza may be in the future the loveliest neighbourhood of Bordeaux", according to the synthesis made by Klouche (Ville de Bordeaux, 2010, p. 6).

As a consequence of the AUC's preliminary study (whose propositions were validated by both the Ville de Bordeaux and the Métropole), the city launched an open bidding process for the selection of the design team to carry out the pre-operational study. This international tender was based on the designers' portfolios and financial proposals; hence the competition entries did not present any specific design proposal for the site, only a conceptual note. This new design phase was supposed to "specify the principles delineated by Djamel Klouche and especially to allow the definition of financial procedures and rules for the development of the Brazza Nord sector, so that the projects could be initiated as soon as possible" (DGA, 2012, p. 65). More precisely, the design brief for Brazza Nord stated that the intended *plan guide* should provide specifications in terms of layout, volume, urban programming and quantification for each of the proposed subsectors (which should include, among others, housing, public facilities, infrastructure and public spaces). This task should be coupled with the assessment of the feasibility of the intervention, through the anticipation of costs and schedules, as well as the proposition of development and financing alternatives to be put in place.

The *plan guide* should also reinforce the aim of creating a hub of activities and jobs within Bordeaux Métropole, while being fully anchored in sustainable-development principles

(Ville de Bordeaux, 2011). Among such principles, the project brief clearly put forward the flood-risk challenge: the PPRI should be fully integrated, while considering beforehand its revision process: “the proposals should (...) allow designing with flood risk by integrating water management into the definition of spatial organization and construction principles” (Ville de Bordeaux, 2011, p. 12). As a means to raise the importance of such local challenge, the aforementioned flood study for La Bastide elaborated by Egis Eau (CUB, 2011a) was included as one of the annexes of the design brief, in line with its intended decision-support role. According to an informant, the emphasis given to floods in the brief was also related to the fact that in other flood-prone urban-regeneration projects included in Bordeaux’s “arc du développement durable” (for example Bassins à Flot on the left bank, and Bastide Niel on the right bank), flood risk

*was not sufficiently taken into account at the time of preparing the plan guide, and it was necessary to redo many things. So the commissioner really wanted the issue to be considered from the outset in Brazza, in order to subsequently avoid the collapse of the project due to the omission of floods.*²⁴⁶

The tender was won by the team led by KCAP, a practice that has a wide experience in dealing with both urban and building design, and with both long-term and small-scale implementation processes. In the words of Rossano (DGA, 2012, p. 66),

KCAP is known notably thanks to its interdisciplinary and dynamic urban-project approach. We conceive the project not as a definition of a fixed form, but as an evolving process, based on a consensual and sustainable spatial framework, which integrates several issues, such as economy, ecology, transport, mixed uses and architectural quality.

Being a practice mainly based in Rotterdam, it could be added that KCAP has a strong background in dealing with floods (although the most typical Dutch way of facing these is related to the use of technical devices). In fact, the architect-urbanist Kris Christiaanse was one of the main spatial designers behind the conception of HafenCity in Hamburg (presented in Section 2.5), the “*the most iconic flood project (or flood city project) KCAP did*”, as recalled by an interviewee. Having unsuccessfully participated in a previous competition for another (partially flood-prone) site in Bordeaux (Saint-Jean Belcier, on the left bank), for which it was ranked second, the agency did not hesitate to submit a proposal for the Brazza bidding, since this case “matched perfectly [KCAP’s] experience: urban reconquest and restructuring of an industrial sector, transformation of railway infrastructures, development of a flood-adapted neighbourhood...” (DGA, 2012, p. 67).

For the elaboration of the Bastide Brazza Nord’s *plan guide*, KCAP partnered with Mutabilis (for landscaping and public spaces), Ingérop (a major French engineering company with strong know-how on Bordeaux’s context, for technical studies²⁴⁷), Oasiis

²⁴⁶ Another interviewee presented a different point of view: “*this is the novelty: in fact water has always been taken into account in the planning of the neighbourhoods, but not as significantly as it is now with the climate-change prospects.*” Another informant complemented that floods were not fully incorporated in previous urban projects due to some lack of updated knowledge (which implied that risk assessments were not effectively optimized), and (to a lesser extent) the lower flood-risk salience when they were commissioned.

²⁴⁷ For example, Ingérop has also been working on other flood-prone sites in La Bastide: Queyries, with the Dutch design practice MVRDV, and the ZAC Garonne Eiffel, with the French design practice TVK.

(for sustainability issues, mainly energy and pollution) and BMA (Bordeaux Métropole Aménagement, a local quasi-autonomous non-governmental organization, for urban programming and economic feasibility). The task assigned to the KCAP team was supposed to closely follow the previous study and was expected to be the last design step before the implementation phase (this time, the area subject to design covered 67 ha – see Figure 253).

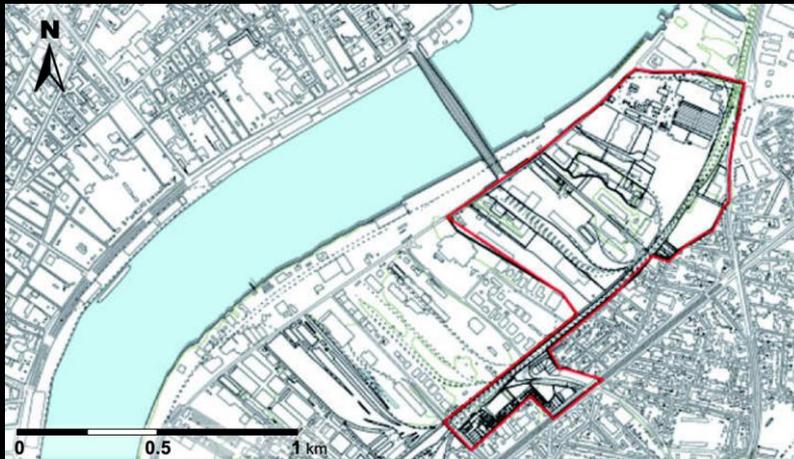


Figure 253: The boundaries of the pre-operational study for Bastide Brazza Nord

The small appendix in the south was a site for the project of a new school

Source: DGA (2012, p. 64), © KCAP

The presentation of the KCAP team’s proposal in the “Rencontres de La Bastide”, one week before its official submission to the city council in February 2012, was well received by the participants (DGA, 2013b). “*We had positive reactions in the sense that people were quite surprised and satisfied with the amount of detail we had*”, according to an interviewee, who complemented:

The only criticism I can remember actually was that some people (maybe few) were a bit shocked by the density and the urban character of the project. There was an interesting dialogue, because the person was a bit saying: “well, we were expecting an éco-quartier²⁴⁸ (so an environment-friendly neighbourhood), and we get towers and big industry and office buildings...” And if I remember well, I explained why we came to this density, but the density was maybe seen as important compared to what was there (of course, it was empty) (...). But at the end, it was the director of the architecture department of the city of Bordeaux who actually answered this person, and I think she gave a very good answer: “well, part of being environmentally conscious is being dense in a city, to avoid sprawling the city all around the border”, and I think she made a very clever answer.

The argument then used by the director of the architecture department is totally aligned with Bordeaux’s urban commitments, as well as with the first assessment of KCAP’s design proposal made by the municipality, quoted below (Ville de Bordeaux, 2012b, p. 5):

We now have a strong design that combines ambition and modesty. It allows us to develop a structuring riverfront by the Garonne, consistent with the other [ongoing] urban projects and the Bacalan-Bastide Bridge, and at the same time to provide a suburban-like urban fabric that favours mixed uses and smooth linkages with the existing neighbourhoods.

²⁴⁸ Although being included in Bordeaux’s “arc du développement durable”, the Brazza Nord urban project was never intended to strictly comply with the *éco-quartier* standards (such as water recycling or 100% energy self-sufficiency), as it was for example the case of the ZAC Niel, next to the Brazza Sud area.

An example of such ambitions was the idea of having five high-rise buildings by the shoreline, based on the following landscape reasoning: “*we thought that’s the right scale of the river: the river is 400-metre wide, so why should we build five floors, like in the 17th century?*” Yet, this proposal was perhaps too ambitious for a site that has been known as an urban “*blind spot*”, as complemented by the same interviewee: “*the reactions [to that idea] were extremely cautious, I think.*” As the local sociologists Patrice Godier and Guy Tapie (2009, p. 11) pointed out, “sustainable development calls for innovative solutions that question defensive and established practices, such as the rejection of urban density”; in this case, the cultural barriers underlying these practices seemed to have prevailed over a more contemporary standpoint, as the one proposed by the director of the architecture department.

The feedbacks to Rossano’s 15-minute presentation to the city council were also generally positive (KCAP *et al.*, 2012b; Rossano, 2012b). As regards the flood issue, the councillor in charge of habitation highlighted what she named “an extremely smart principle” for dealing with floods, referring to the proposition of dry streets and wet alleys (Ville de Bordeaux, 2012b, p. 13). A Green Party councillor commented as well that such integrative approach “corresponds to the contemporary vision of urbanism”, which does not hide flood risk “behind big dykes that generally do not resist in stronger flood events”, but instead works with it (Ville de Bordeaux, 2012b, p. 16). The *plan guide* was subsequently validated by both the Ville de Bordeaux and the Métropole in June 2012.

In general terms, the KCAP team’s proposal was composed of five sub-quarters with particular identities and hosting an intense urban programming (see Figure 254), while keeping the overall existing plot structure oriented towards the river (which somehow mirrored the landownership context):

- Allée Brazza, extending the bridge’s approach into an urban boulevard that would gather some centrality functions (thus liberating the avenue by the quays from a more intense traffic, and fostering better linkages between the neighbourhood and the river);
- Bordeaux Estuaire, along the quays, composing a riverfront with a wide promenade to counterbalance the privately occupied shoreline, flanked by some high-rise buildings;
- Brazza Quartier Actif, concentrated in the northern part of the area (where the Halle Soferti is located), with more intense and mixed uses, bordering the CNB’s premises;
- Ville Intime, in the central part, composed of blocks with low-rise buildings (mostly for residential uses) and individual houses, organized around a vast green park; and
- Mayaudon, an urban focal point around a new school.

The *plan guide* also proposed to equip the area with some other institutional premises, such as a congress centre, a library, two additional schools, a gymnasium and a waste-recycling unit. The area’s subdivision and the varied programme were the means used to achieve high urban density and great diversity in terms of forms and functions (for a general view of the quarter, see Figure 255). Closely following AUC’s proposal and acting as a bond for these sub-quarters, the Forêviaire (a portmanteau word combining *forêt* and *ferroviaire*, in reference to the public space along the sub-used railway track), also intended to connect – both visually and physically – Brazza Nord to La Bastide as a whole.



Figure 254: Synthesis of the plan guide for Brazza Nord proposed by the KCAP-led team

Legend:
 – pink lines: boundaries of the proposed subareas, with particular atmospheres
 – yellow strip: Forêviaire

Source: KCAP *et al.* (2012a, p. 27), © KCAP (modified by the author)



Figure 255: General view of the Brazza Nord neighbourhood proposed by the KCAP-led team

Source: KCAP *et al.* (2012a, pp. 14-15), © KCAP

Flood susceptibility was one of the key points of KCAP’s *plan guide*; although brief, one of the ten chapters is specifically dedicated to the issue, which was included among the concepts supporting the proposed urban structure (see Figure 256), namely the double river-city orientation. Flood susceptibility was indeed among the several constraints of the

site that had to be dealt with by the design team²⁴⁹, as made clear in the interesting ‘sandwich’ diagram (see Figure 257), representing Brazza’s existing challenges (KCAP *et al.*, 2012a). As for the potentials and assets of Brazza, these were gathered among the site’s “development engines” (KCAP *et al.*, 2012a, p. 17).

Even if some of the considered themes could be seen as strictly technical issues, both constraints and development engines were treated in a perspective of “pragmatic realism” and “urban ambition”, aiming to reach a feasible design proposal in terms of a rational and flexible implementation (KCAP *et al.*, 2012a, p. 17). The ultimate goal was to envision a neighbourhood that adheres to the contemporary sense of urbanity: sustainability, openness/connectivity, variety (*mixité*) and liveliness.

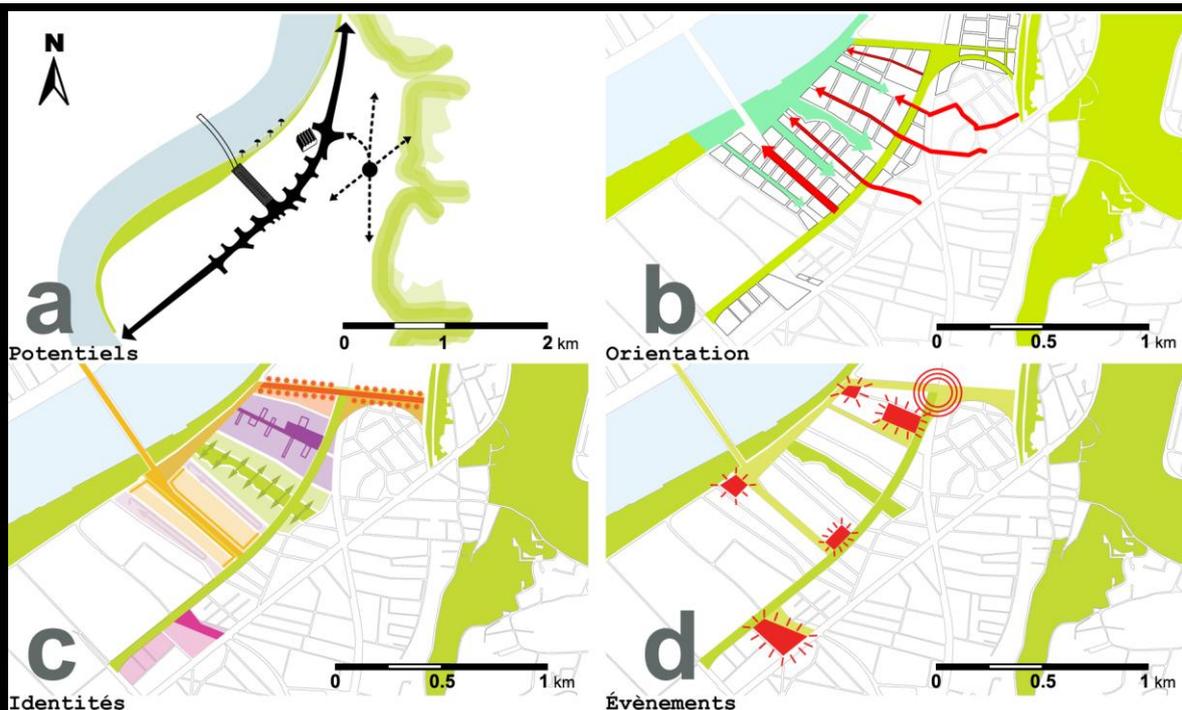


Figure 256: Four urban concepts behind KCAP’s design proposal for Brazza Nord

Legend: a) assets; b) orientation; c) identities; d) events

Source: KCAP *et al.* (2012a, p. 3), © KCAP (modified by the author)



Figure 257: Brazza Nord’s ‘constraints sandwich’, according to the KCAP-led team

Legend (the ‘ingredients’, from top to bottom):

- PPRI
- [related] ongoing projects
- risks related to [industrial] pollution
- public utilities
- accessibility [topography, urban fabric, railway]
- heritage [Halle Soferti]
- real estate [organizational scheme]

Source: KCAP *et al.* (2012a, p. 13), © KCAP

²⁴⁹ As often, floods were not directly included among the environmental requirements in this *plan guide*, being dealt with separately from, for example, the other issues related to water management.

Due to the existing requirements, Brazza should remain a floodable neighbourhood, with floods expected from both overflows of the Garonne and as a consequence of heavy rains. Accordingly, Brazza was acknowledged as a temporary retention zone; that is, the segment closest to the shoreline transfers water to the centre of the area, while the water starts to be stored near the railway track, built on a landfill (see Figure 258). Therefore, dealing with floods was not restricted to safeguarding the people and assets located within the area, since the design’s potential repercussions on the bordering neighbourhoods were also taken into account. This is indeed the approach towards floods emphasized in the French law (and the PPRI), being followed in all the urban projects of La Bastide.



Figure 258: The underpass in the easternmost part of Brazza Nord

This is the sole spot by the railway track in Brazza Nord in which the water is not retained but transferred to the inner part of La Bastide

Source: author’s archives (23 July 2015)

The KCAP team used a ‘research by design’ approach, in which different flood-adaptation scenarios were studied in an iterative mode. First, four (more or less severe) flood-hazard maps were analysed: the PPRI (the most conservative, but known as outdated), the 1999-event and 1999-event-plus-40-cm models by Egis Eau, and the most recent 1999-event-plus-20-cm model by Sogreah (KCAP *et al.*, 2012a; 2012b). The last map, the only one with an estimation of the involved water volume, was considered more accurate and was finally chosen, even if it represented a still ongoing study (“*they were still too far from having results and clear ideas*”, according to an interviewee) and although other studies anticipated worse cases in terms of floodable surface (see Figure 259).

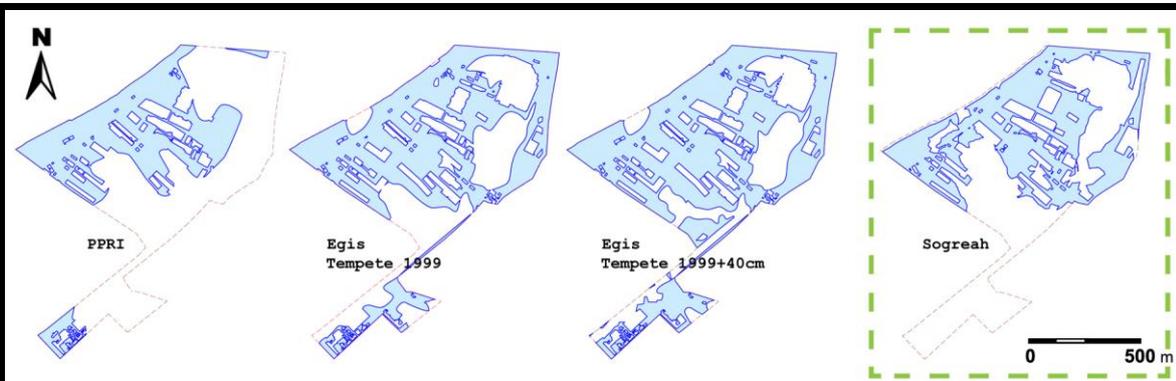


Figure 259: Four different flood-hazard models for Brazza Nord

The model retained within the KCAP-led design process is surrounded by a dashed green line

Source: KCAP *et al.* (2012b, p. 16), © KCAP

The proposed urban structure, in which more than 50% of the plots are prone to floods, was then overlaid with the chosen flood model (see Figure 260) and some adaptive scenarios were studied, in which the same ratio of urban occupation (that is, the same projected urban layout) was kept. This procedure makes evident that the proposed urban structure was defined by several other factors besides floods, which entered as a secondary design criterion. In any case, according to the hydrologists consulted by the team (as referred during the interviews), the main urban proposition should keep untouched both the floodable surface and the retention capacity (volume of water) of the current situation. This means that the new design should not have any impact, either on the water level or on the water flow velocity, in line with the hydraulic-transparency principle.

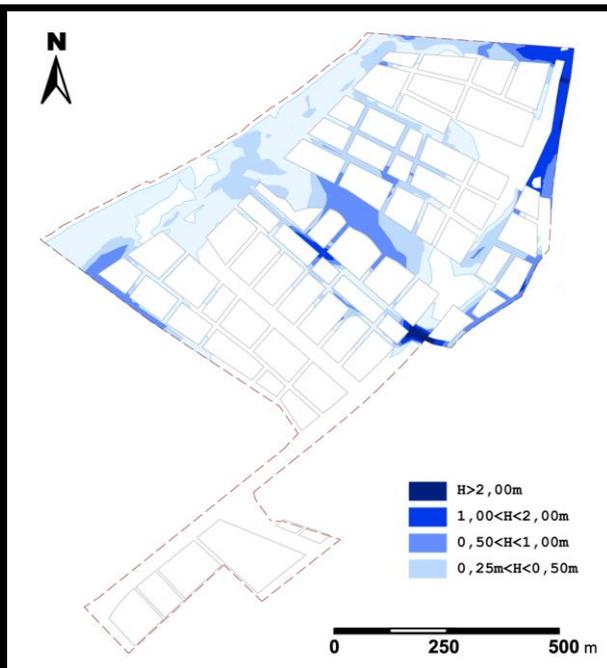


Figure 260: The urban structure proposed for Brazza Nord overlaid with the site's flood proneness

The colour legend at the bottom right indicates the modelled water heights

Source: KCAP *et al.* (2012b, p. 17), © KCAP

“During the design process, we explored different possibilities to secure a big water-retention capacity, so retention in the sense of creating space for the Garonne’s high waters”, as expressed by an informant. Accordingly, the team envisioned five strategies, presented here in the decreasing order of their water-retention capacity (see Figure 261): the wet shoreline, the wet-street network (including the small squares), the floodable crawl spaces under the building blocks, the central park (tentatively named Cornubia Park), and finally the floodable alleys (other strategies not retained comprised the creation of basins inside the area and the use of ditches).

These strategies were then combined with each other to generate adaptive scenarios; the ensuing results were finally tested through state-of-the-art 2-D flood modelling, which considers the flow dynamics and not only the level attained in previous events. Yet, no allowance was made to increase the retention capacity of the new neighbourhood, despite the potential relationships of the project with the wider scale of the river basin (one of the interviewees argued that the flood solution proposed within the area could indeed generate wider territorial benefits in terms of better accommodating the Garonne’s waters). After several analyses, the design team concluded that almost the whole neighbourhood surface actually had to remain open for floods, which, according to an interviewee, represented “a

very interesting [design] challenge, to think: ‘OK, how do you make floodable streets and buildings and still make sure that people stay dry, that housings stay dry, that people can evacuate if they have to?’”.

The final response to this question was driven by an urban-design concept that did not intend only to prevent flood damage but also to anticipate the reactions of the proposed structures during future events (thus following the same approach adopted by KCAP in the HafenCity project). Indeed, alternating wet and dry streets in a careful combination of flood susceptibility and accessibility, as suggested by the double river-city orientation (see Figure 262), would ensure the provision of a safe access to every building within the area, hence duly facilitating evacuations in case of an emergency. This scenario meant elevating some streets to a safe level, while retaining the possibility of having floodable basements in some blocks (see Figure 263).

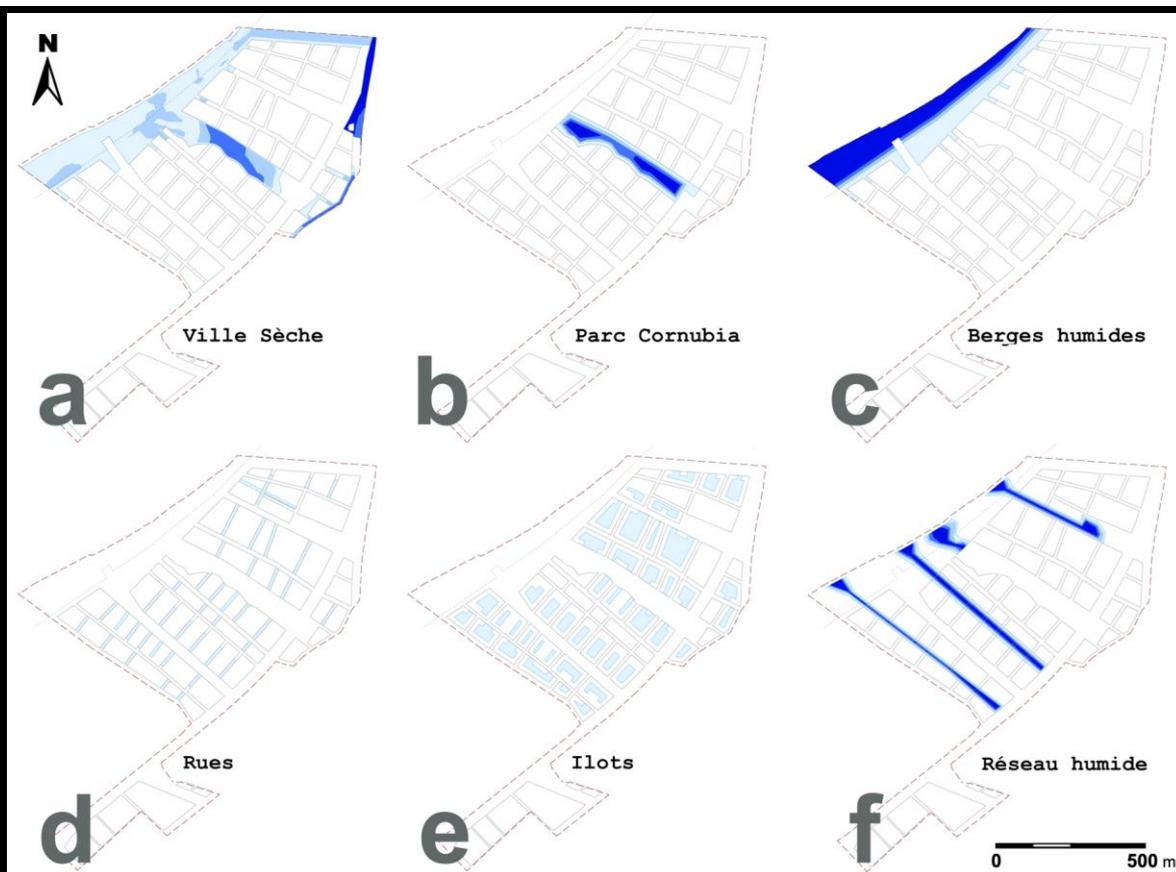


Figure 261: Five strategies to keep Brazza Nord a floodable neighbourhood

The baseline situation (a) is followed by the actual strategies: retaining water either in the Cornubia Park (b), in the wet shoreline (c), in the alleys (d), under the blocks (e) and in the wet streets (f)

Source: KCAP *et al.* (2012b, p. 20), © KCAP

Another related measure (which was indeed retained in one of the PLU’s revisions) is that “the ground floor [in the housing units] should be well above the level of the highest-known flood level, meaning that all the buildings in the area would have elevated ground floors”; “it sounds somehow very simple, but it’s not that easy to implement”, as noted by one of the informants. In fact, according to the interviewed designers, the conciliation of elevated ground floors with the obligation to warrant the access of disabled people to every

building (whatever its use, as required by the French building regulations) demanded an additional ‘research by design’ effort: “we had to be really creative... we had to think of where wheelchairs could come and where the water could come, and we had to find routes somehow for elements and people according to the different ways of motion”. As recalled by another informant, this measure was also favourable to tackle a further important site constraint, as placing people’s living spaces well above the ground clearly minimizes potential contaminations by the polluted soils.



Figure 262: Detail of the double river-city orientation proposed for Brazza Nord

This strategy would ensure safe emergency accesses during intense flood events (the orange streets would remain dry)

Source: KCAP *et al.* (2012a, p. 186), © KCAP

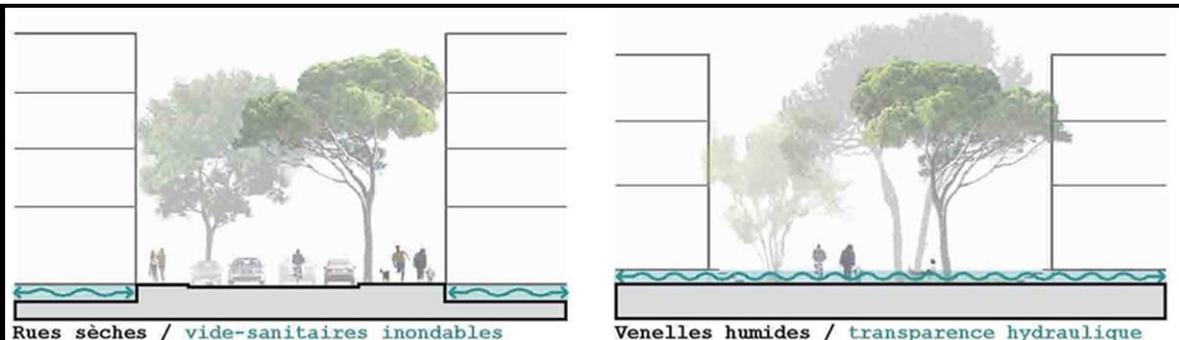


Figure 263: Section of the double river-city orientation proposed for Brazza Nord

On the left, “dry streets / floodable crawl spaces”, on the right, “wet alleys / hydraulic transparency”

Source: KCAP *et al.* (2012a, p. 186), © KCAP

Although having the greatest water-retention capacity, the hypothesis of ‘re-naturalizing’ the segment of the quay bordering Brazza was early abandoned, since the area’s current private use by CNB should be maintained, at least in the medium term (Bordeaux’s authorities are keen on keeping afloat this economic activity that presently employs 600 people). Only the quay’s segment before the bridge’s approach could indeed be reserved for a wet bank, but as previously mentioned the design of this area was already included in the plan of the Parc aux Angéliques. In any case, the design team was fully aware that “these [flood] studies would only be feasible if we had in Brazza (...) a ZAC; then the

municipality buys the land and develops all in once”, as recognized by an interviewee. This statement reveals that the implementation arrangements would be a crucial factor for the success of all flood-adaptation alternatives presented in Figure 261 (on p. 324).

Indeed, the best solutions should fit not only spatially (regarding the attained water depth and velocity) but also in operational terms (that is, in relationship to the human and institutional dynamics, and all the contingencies involved in the execution of the intervention). Envisioning these alternative adaptation scenarios was nonetheless a necessary step to define the strategy towards floods finally retained in the *plan guide* by the KCAP-led team; after that, the design task “*was more about how to deal with the architecture and the public space within this strategy of flooding principles*”, as complemented by one of the interviewed designers. Following several iterative combinations between the five adaptation strategies, the design ‘solution’ chosen to keep the neighbourhood floodable, hydraulically transparent and safe was to retain water in the wet (floodable) streets, in the central park, in some of the squares and partially under the building blocks (crawl spaces) (see Figure 264).

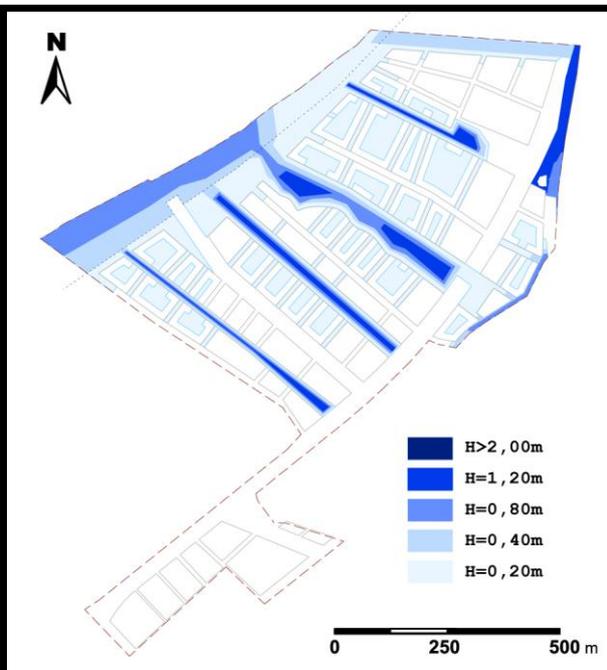


Figure 264: The combined flood-adaptation strategy adopted in the KCAP-led *plan guide*

The combination included: the Cornubia Park + the wet street network (including some local squares) + (partially) under the blocks (the colour legend at the bottom right indicates the modelled maximum water heights)

Source: KCAP *et al.* (2012a, p. 185), © KCAP

This combination was considered a “more flexible scenario for future requirements” (KCAP *et al.*, 2012b, p. 23); yet, the design team noted that such ‘solution’ should be further calibrated, through advanced hydraulic modelling, taking into account the impacts of the solution itself on the remaining buildings within the site and also outside the area (KCAP *et al.*, 2012a). The results of these ‘research by design’ exercises were presented and discussed in a design workshop specifically dedicated to floods, which also gathered municipality officers (KCAP *et al.*, 2011). The ensuing urban-design proposal for Brazza thus managed to incorporate in a balanced manner all the ingredients of a contemporary sense of urbanity and flood adaptation.

As a consequence of this second design stage, some of the PLU’s planning rules were changed (in November 2012) to allow mixed uses in an area that had solely a ZFU status

(therefore, housing became permitted in Bastide Brazza Nord), and the site's fraction that comprises the Halle Soferti was finally acquired by the municipality. For the next stage, called 'operational' or AMO phase, a new bidding process had to be initiated, following the same characteristics of the previous one (as described on p. 316). The related design brief stressed the importance of the continuity of the works undertaken until then (the *plan guide* was at the time considered validated) (Ville de Bordeaux, 2012a). In fact, the new phase was intended to be less related to design – in terms of form-shaping and sense-making spatial conception – and more linked to counselling and planning, including such tasks as coordinating the design's implementation, supporting the municipality and following up on relevant activities (with the very optimistic expectation that the first building permits would be granted in 2013).

The implementation scheme was clearly presented in the brief: as private entities would be in charge of the execution of the *plan guide*, a platform for exchanges and negotiations would be put in place by the municipality. Gathering private and public stakeholders, the so-called Atelier Brazza Nord follows the same governance structure already used in for the Bassins à Flot urban project, on the left bank. As regards flood risk, this theme is now only slightly mentioned in the bidding brief (when referring to "the adaptation to floods" as one of the guiding principles behind the design output of the previous phase) (Ville de Bordeaux, 2012a, p. 4). Indeed, if dealing with floods was to be understood as a technical issue, this was already duly accomplished within the works undertaken by the KCAP team. This point was confirmed during the interviews:

So I think that, in the vocabulary of project management, when a subject is taken as solved, one hardly refers to it, and for them [the municipality], this is basically considered solved. So I'm not sure that they still talk much about it; they consider flood a technical issue that has been solved, that's it.

I think that for [the public authorities] it was already taken for granted, it was not a novelty... It means that at the beginning (in the first plan guide), this issue received a definite importance because it was a very central one; it was always around, in a significant manner, so we emphasized it in the design brief. Then we noticed that there were possible urban responses that incorporated the water issues, so these were not problematic anymore, they had become design inputs just like others (...).

In October 2012, the result of the new bidding process was announced, the winner being the consortium composed by YTAA (for architecture and urbanism), Michel Desvigne Paysagiste (for landscaping) and the same local engineering company Ingérop (for technical studies)²⁵⁰. According to an interviewee, given the particularities of the implementation scheme, the commissioners envisaged the appointment of

a team that will be able to work with us while sharing our mindset; in our current negotiated-urbanism context, this means a team (and an architect-urbanist) who is able to adapt (...). So we are in a negotiation context, so we have to find design teams who are able to negotiate and to accept the proposals (...). Today's contexts are always shifting, and therefore we can no longer say "we know how to do"; in fact we do not know at all how to do it, so we should know how to deal with what we do not know, but not everyone knows how to deal with the unknown.

²⁵⁰ KCAP, which should have perhaps been a natural contender, did not participate in this bidding process.

Unexpectedly (when considering the content of the bidding brief²⁵¹), a new *plan guide* was then issued, for a slightly smaller area (53 ha) (see Figure 265), with a brand-new motto: “urbanisme en liberté” (DGA, 2013b, p. 42) – or “urbanism unfettered”, as translated by the designers themselves (YTAA, 2013). According to an interviewee, the new design team did not have to strictly follow the previous *plan guide*, since the commissioners were open to new inputs: “that’s what we always say: ‘replicate the good ideas and what has already been validated [from the former plan], then you may re-examine the rest’.” In this *plan guide*, the intended freedom is mostly related to two aspects: the future inhabitants of Brazza will have more choices as regards housing options (compared to the first plan), and some buildings (the *volumes capables*) will not have a predefined use, being allowed to host, at the same time, housing and productive activities. Moreover, these buildings will not be delivered as finished products, since the design anticipates their spatial evolution, for example through upward extensions.



Figure 265: Boundaries of the YTAAs-led *plan guide* for Brazza Nord

Source: YTAA, MDP and Ingérop (2013, p. 7), © YTAA, MDP & Ingérop

As argued by the architect-urbanist Youssef Tohmé (2013), in order to counteract urban sprawl Brazza Nord will be an inner city neighbourhood with the qualities of out-of-town developments: extensively green, with individual houses and not-so-high urban densities. In this sense, and regarding floods, some of Klouche’s proposals are again incorporated (such as building on stilts), while some more ‘technical’ features of the KCAP-led plan were kept. Having reviewed in this section the first two design initiatives for Brazza (the proposals by Agence AUC and the KCAP team), the final *plan guide* for Brazza Nord will be examined in the following section, keeping our flood lenses as the major guideline.

²⁵¹ The following information is provided in the second bidding brief: “The aim of this contract is to support the city of Bordeaux and the CUB in the implementation of the Brazza Nord urban project through an architect-urbanist advisory mission that supervises the urban integration of the architectural and public-space projects, ensures their overall coherence and their adequacy as regards the objectives of the urban project and the *plan guide* designed by the KCAP practice, in accordance with the particular methodology adopted in this intervention” (Ville de Bordeaux, 2012a, pp. 4-5).

6.4 Resulting plan and projects

One of the major characteristics of the YTAA-led *plan guide* for Brazza Nord is that, in order to facilitate the implementation procedures, it maintains the large parcels' orientation that presently marks the area. As justified by an interviewee, the “*process of managing time obliges us to work with this pre-existing composition, and when you think that it's related to the history of water management, agriculture then industry, it's strong, it has a meaning*”. In this regard, the existent river-oriented morphology was definitely reinforced in the current plan (see Figure 266), with the proposal of two main types of strips perpendicular to the river. On one hand, three wide green strips – the *lanières vertes* – give continuity to the “inhabited park” on the riverbank (the Parc aux Angéliques), which prolongs itself into the neighbourhood as initially envisaged by Desvigne (2005; 2009).

With their access restricted to public transports, emergency vehicles and some local traffic, these large strips define the major traits of the intended “*landscaped neighbourhood*” (as summarized by an interviewee), being directly derived from the ambience of the left bank's Place des Quinconces, Bordeaux's largest public space, which is surrounded by geometrically laid out greenery (see Figure 267). Indeed, as pointed out by another informant, at this vast 19th-century open space one feels that “*in fact, we're in the city but surrounded by trees*”. Some equipment located at the Place des Quinconces also provided formal inspiration for the proposal of the *places programmatiques* (see Figure 268), small squares dedicated to particular urban programmes (such as commercial and leisure activities), most of which located along the *lanières vertes* (DGA, 2014).

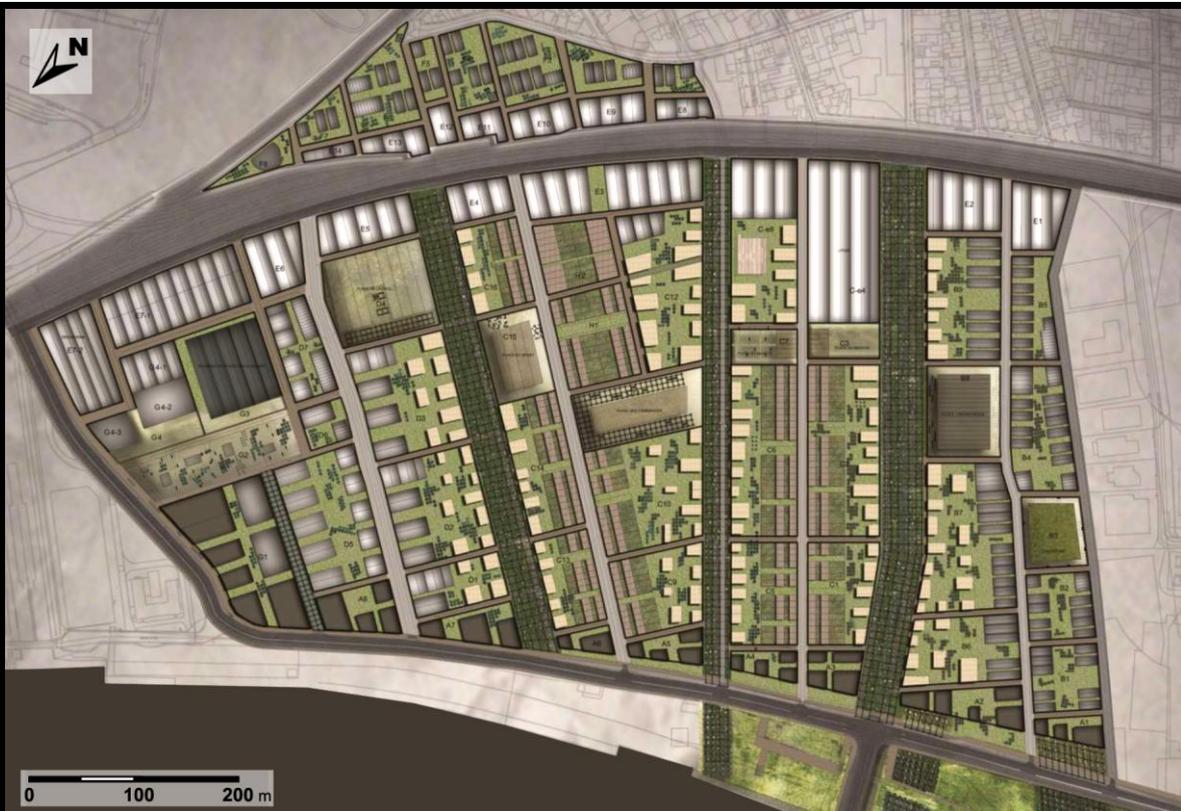


Figure 266: Synthesis of the *plan guide* proposed by the YTAA team
Source: YTAA, MDP and Ingérop (2014, p. 7), © YTAA, MDP & Ingérop



Figure 267: The Place des Quinconces as an inspiration for the ambience of the *lanières vertes*
 Source: author's archives (24 July 2015)



Figure 268: The Place des Quinconces as an inspiration for the ambience of the *places programmatiques*
 Source: author's archives (24 July 2015)

On the other hand, grey and narrow ('mineral') strips somehow replicate the dense urban morphology traditionally encountered in the old city on the left bank (see Figure 269), yet without the intention to mimic them (see Figure 270). In any case, narrow stone-paved streets are already present in Brazza Nord, although devoid of any urban character (see Figure 271). The current proposal hence combines in a single design the green vein strongly associated to the image of Bordeaux's right bank with the narrow streets typical of the left bank, which are somehow camouflaged within this 'forested neighbourhood'. As expressed by Juppé in his last *projet urbain*, "the new district will be thought of as a forest, with residents hardly outnumbering trees" (Laruë-Charlus, 2013, p. 97). In the appreciation of the present design team, what is at stake in Brazza Nord is "*not a hesitation between landscape [and city centre], but it's a combination, a designed combination*", which mostly results from the alternation between green and grey strips in the proposed layout of the neighbourhood.



Figure 269: An example of Bordeaux's traditional narrow 'mineral' streets (on the left bank)
 Source: author's archives (28 July 2015)



**Figure 270: The proposed
ambience for Brazza’s new
‘mineral’ streets**
Source: DGA (2013c), © YTAA,
MDP & Ingérop



**Figure 271: An example of the
narrow streets existing in Brazza**
Source: author’s archives (28 July
2015)

A general view of the proposed neighbourhood puts in evidence the importance given to greenery in the design proposal (see Figure 272). In line with this, the new suggested building typologies are closely related to the urban structure: the *lanières vertes* will be flanked by buildings on stilts, conceived exclusively for social housing. This building typology “is linked to the desire to bring in the landscape of the Garonne, through an integration between the *lanières*, the *poplars*, the *stilts* and the *underneath vegetation*.” In their turn, the grey strips will host private residences, mirroring and updating a local 19th-century dwelling typology (the *échoppes*) (see Figure 273). Two additional building typologies relate to the riverfront and to the railway track, including multifunctional buildings inspired by the industrial sheds (the *volumes capables*) (see Figure 274).



Figure 272: General view of the Brazza Nord neighbourhood as proposed by the YTAA team
Source: YTAA, MDP and Ingérop (2014, p. 6), © YTAA, MDP & Ingérop (modified by the author)



Figure 273: Examples of Bordeaux's traditional *échoppes*, in La Bastide

The steps at the entrance of these dwellings denote the means traditionally used to deal with sporadic flood events

Source: author's archives (23 July 2015)

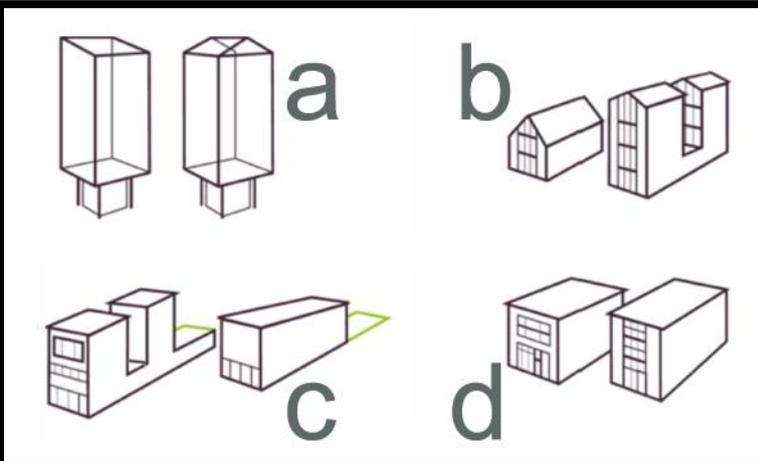


Figure 274: The four building typologies proposed for Brazza Nord

Legend:

a) collective dwellings on stilts

b) *volumes capables* (multifunctional buildings)

c) *échoppes* of the 21st century (individual dwellings with private gardens and extension possibilities)

d) Garonne riverfront's buildings

Source: DGA (2013a, p. 7), ©

YTAA, MDP & Ingérop

Klouche's idea of two worlds (see Figure 251 and Figure 252, on p. 315) was somehow reclaimed and reinterpreted in the YTAA-led *plan guide*; however, the two new ambiances proposed are not related to the water anymore, nor do they keep any distinguished spatial relationship with the riverside. In fact, alternating green and paved strips expresses the same idea of composing with a pair of 'opposite ambiances'; at the same time, as in the AUC plan, the denser urban ambience is also placed behind the more prestigious one (in this case the green ambience attached to the three *lanières vertes*). In any case, a porous urban fabric is now proposed, which is fundamentally related to the possibility of occasionally having the Garonne's waters in the neighbourhood. Indeed, the present flood-adaptation strategies derive directly from the strengthened green image and its related urban structure.

Even though "the design's main idea and guidelines were not [dictated by] floods (they were positively affected by the constraints of the flood, but there were much more layers)", as coherently argued by a member of the design team, three main flood-adaptation strategies were pursued through design. These correspond to "respecting the present local topography", "hydraulic transparency between buildings" and "hydraulic transparency of some buildings" (YTAA, MDP & Ingérop, 2013, p. 39). To respect the topography means to minimize the use of land grading within the area in accordance with the modelled floodable areas (see Figure 275), a strategy also linked to the fact that the soil is heavy polluted. Such a cautious approach strongly contrasts with the previous 'double river-city

orientation'; although it would be very helpful during the (quite infrequent) emergency situations, it would require the overall redesign of the site's topography to achieve the alternating scheme of dry and wet (floodable) streets and alleys. At the same time, the maintenance of the topography as it presently is would also reduce the need for new infrastructural constructions (under the responsibility of the Métropole) and above all ensure that the private implementation of the each plot would more easily comply with the flood-related requirements.



Figure 275: Brazza Nord's floodable areas and their modelled buildability

Legend:

- grey: areas modelled as non-floodable (footprint of the existing buildings)
- red: the Garonne and areas not liable to be redeveloped
- light green: areas modelled as floodable but liable to be redeveloped (with the adoption of measures to reduce the vulnerability of the new buildings)

Source: Artélia (2013, p. 31)

As explained during the interviews, the hydraulic transparency between buildings implies not creating significant obstacles for the water flow in the urban layout (see Figure 276). In fact, the existing plot structure perpendicular to the river favours in itself the flow of the water back to the river after a flood event. Yet, if the existing strips were continuously flanked by buildings, this would potentially imply magnifying the water-flow velocity, thus increasing the associated risk. In this sense, the plan envisages several openings in both sides of the 'mineral' streets (an aspect that was altered after several rounds of flood modelling), creating small alleys that will concomitantly function as main accesses to the building blocks and as paths for better spreading the water and slowing its flow down. The same logic was applied to the riverfront, which was also modified with the provision of more space between the buildings flanking it in order to facilitate the runoffs back to the Garonne. According to an interviewee, the underlying principle, which can only be attained through careful design, is that the Garonne's waters enter and exit naturally, using the least technical means.

At the individual building's scale, the hydraulic transparency follows the same reasoning and includes three design principles: the re-adoption of buildings on stilts as a major typology (as proposed in the AUC study), the provision of floodable car parks within the building blocks and the allocation of floodable crawl spaces under some larger buildings. Traditionally used in many floodable zones worldwide, buildings on stilts are one of the most hydraulically transparent (and thus flood-adapted) construction types, but they have only been slightly present in Bordeaux up to now (one of the few examples being a landmark restaurant on the right bank's shoreline – see Figure 277). In their turn, the other

[W]e want the water to be visible, so we want people to know that they live in a special neighbourhood... so people should wonder for example: "Why are we on stilts?" And at a certain point, we could tell them why: "Because it's floodable." "Oh, so it's floodable! Oh, water can reach my neighbourhood; well, OK." And when the water actually reaches their neighbourhood, they know, they are not caught by surprise; they know that the site is flooded, that's it. We also want to make things visible, not to conceal them (to manage them technically, and then the day when it happens people wonder why, people had forgotten that the site is floodable). So this is really the guideline we're following.

In any case, the adoption of these three strategies – perhaps simpler, but as effective as the previous ones – was only made possible thanks to the existence of updated, more detailed and reliable flood data and modelling. The pragmatism through which floods were dealt with in the new *plan guide* is strongly related to its execution, hence maximizing the chances of the smooth adoption of the adaptation strategies, as indeed aimed for by the municipality. This point was made clear by an interviewee: *"the objective was to find out a very simple flood solution that all private developers could adopt, we did not propose any complex solution"*. This interviewee also complemented that the simplicity of the flood-adaptation solutions was equally taken as a means not to increase flood risk during the implementation phase, when the site will not present either its 'previous' configuration (the one before the project) or the expected one with the project.

Another informant pinpointed that the origin of such simplicity lies in the way of viewing floods as a straightforward process; the interesting argument then presented makes a link between the physical and the sociocultural dimensions of flood risk:

We all have a lot of knowledge, I mean it's very easy, flood is something very empirical; geographers and geologists know that very well, it's easy. What is not easy is reality, how to deal with properties, with existing buildings, people, time, money... So in theory, one could probably tell you that we have incredibly strong inventions about ditches, water management, which is fake; I mean, this is very well known for centuries, for more than centuries. Humankind, agricultural practices have been dealing with water and floods forever (for a very long time). So we know exactly what to do, it's very easy, it's very empirical. (...) what is not easy is to deal with reality and society, and people and money.

The simplicity of the design proposal corresponds to a realistic way of dealing with the involved human dimension. When asked about the site's most important constraints, another interviewee provided a good example of the strong pragmatism underlying the new *plan guide*:

In general, we put the constraints, because we are designing the site. Flood is not a constraint... I think there actually isn't anything called constraints, but it's more of negotiations of rules and regulations, but we have height, flood, circulation, roads, we have the bridge (...) So the constraints are really present in any neighbourhood or in any city, but we don't have anything like "No, we cannot do that."

By the end of the interview, the same informant came back to the site-constraint issue through a different point of view, which is not only pragmatic but also very insightful from a design perspective. The site's constraints were then considered a very important input for the design, since *"they help us to be more contextual, because if we can construct this anywhere in the world, it will not function. So, the constraints make the project contextual:*

it belongs to Brazza, rive droite, à Bordeaux, and not anywhere else". This positive understanding of the site's constraints was somehow underlined in the archaeogeographical study of La Bastide, which was a timely supportive tool for the proposal of a plan that is well anchored in the territorial imprints of history.

The proposal to keep unoccupied a great portion of the ground in Brazza, through the use of stilts, may have two implications. On one hand, it clearly lowers the vulnerability to flood hazard of the exposed buildings (and their inhabitants), while the ground's permeable surface is increased (a primary mitigation strategy, especially regarding urban floods). On the other hand, the extent of surface devoted to greenery (40% of the area) may however lower the sense of urbanity of the area (see Figure 278), at least in the typical sense of a dense, vibrant and mixed ambience. But since green alleys alternate with more 'mineral' streets and buildings on stilts are not the sole typology envisioned in the area, the ambience is not really threatened. Indeed, for the designers, the enhanced green character of the neighbourhood can instead pinpoint to a new sense of urbanity for the 21st century (YTAA, 2013).

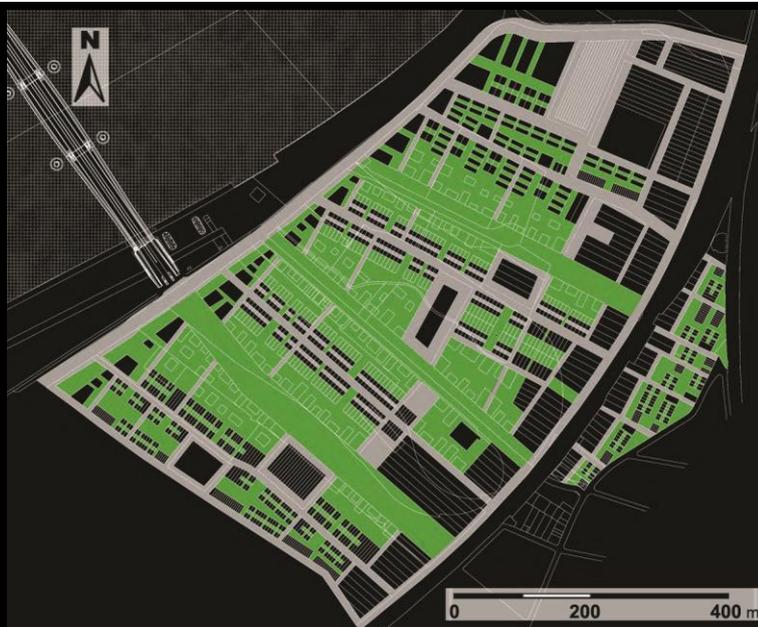


Figure 278: The public-space identity of Brazza Nord

Legend:

- green: mostly green surfaces
- grey: mostly mineral surfaces

Source: YTAA, MDP and Ingérop (2013, p. 34), © YTAA, MDP & Ingérop

The fact that the *plan guide* is strongly anchored in the territorial traits and proposes “*a layout that is very spacious*”, which enables “*a great degree of flexibility (to remove, to put back, to add, to combine, to dissociate...)*” is considered “*one of the great assets of this project*”. As complemented by the same interviewee,

[w]e could have built more; but precisely, if we had built more, we would have been more in trouble with flood risk. The plan guide is really adjusted to the flood risk (...), it is adapted to the site and at a certain point it enables flexibility and evolution, since tomorrow is an unknown for us urbanists (we don't know how to read in a crystal ball) (...). That's the essence of the city: it is a perpetual movement, and we must enable this movement (instead of preventing it); so it's also up to us to ensure that our rules and our urban projects are flexible.

Following the same methodology used by the previous design team, the ultimate *plan guide* and the hydraulic modelling (shown, respectively, in Figure 266, on p. 329, and in Figure 275, on p. 333) were conceived and blended in an iterative mode as a means to

reach a valid adaptation alternative in terms of both urbanity and safety. Anyway, “specific and detailed hydraulic modelling should be carried out by each private development individually to verify its compliance with the legislation in force” (YTAA, MDP & Ingérop, 2013, p. 39). The preparation of a dedicated report on floods is indeed an additional legal requirement in France, enforced by the environment code, for all developments in floodable zones. Despite the high level of pragmatism shown in the new plan, the implementation of these ‘simpler’ flood-adaptation solutions also had its limits, as recognized by some interviewees. More generally, “*it’s not easy to deal with the water plot by plot, it’s not really the scale of water management...*”; on the other hand,

it’s necessary to know, now, how we make it real and in which order, because if we start to insert all the new buildings without removing the ones that are already there, we will have a problem. Nowadays we already have buildings (the existing ones that will be demolished), and if we start constructing the new buildings before demolishing the old ones, the buildings’ footprint will be greater, it’s just like putting more pebbles into a water bowl.

Despite the peculiar implementation arrangements for the Brazza neighbourhood, it is notable that the overall approach of the current *plan guide* presents the same underlying idea applied by KCAP and ASTOC in HafenCity: the general establishment of both strict principles and flexible rules²⁵². The proposed rules for redeveloping Brazza Nord thus intend to formalize a general framework, being “*more the regulations of spatial relationships*” between buildings, public spaces and greenery than the definition of a fixed layout for the ultimate urban fabric and buildings, as revealed during the interviews. In any case, the motto “urbanisme en liberté” has no connection at all with the principles put in place to deal with floods: in fact, no flexibility is allowed regarding flood risk, as clearly stated by two interviewees, one of them in the following terms:

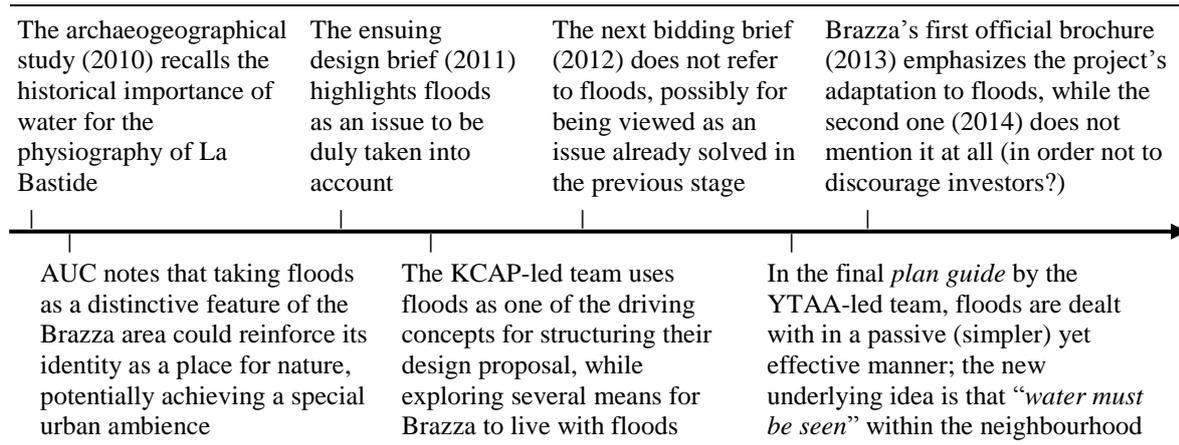
We don’t have too much leeway when it comes to floods, because every time we want to demonstrate something, we have to go through really burdensome technical things (models, analyses, justifications to the concerned public bodies, legal files...). No, we really don’t have much leeway regarding floods; indeed, the water doesn’t stop at the plot’s boundaries, it flows to the neighbour, and it is far-reaching; so this is not a domain in which we can be flexible, and thus we can’t do whatever we want. No, [the plan guide] is not flexible regarding floods.

6.5 Chapter summary and tentative conclusions

The milestones of the Bastide Brazza Nord urban project’s design process are synthesized in Diagram 2 (the upper row features some contextual issues related to the contracting party and its demands vis-à-vis floods, while the lower row contains the designers’ major responses to them).

²⁵² This point was further developed by an interviewee: “[HafenCity] is interesting because you need a high degree of control to make sure that safety is guaranteed, for instance only by the topography, by the level of the ground floors, by the evacuation routes. All of these have to be clearly defined and respected by all the developers and architects, so a high degree of control. And at the same time, the way of working at KCAP was always to introduce diversity in projects and finding the right scale of development; so not developing a thousand dwellings in one go but maybe some units or hundreds, or playing with the scale of development, so that the city can be on the global scale a well-functioning organism, and on the local scale have enough specificity to be recognizable, to be comfortable, to become your own place also, and to be developed in a way that makes it possible to speed up or slow down depending on the demand of the market also.”

Diagram 2: Timeline of the Bordeaux case



Source: elaborated by the author

The Bordeaux case was especially rich in terms of information shedding light on some of the particular vicissitudes of designing flood-prone neighbourhoods; this is patent for instance in the number of quotes from interviews used to ‘tell the story’ of the Brazza urban project. Accordingly, it was not straightforward to identify the most relevant underlying themes, and several ones ended up not being retained. The following themes were finally selected to be further developed in this concluding section: (1) ‘floods viewed as either an environmental issue or a technical constraint’; (2) ‘the role played by the legal framework’; (3) ‘the scope of the challenge as an important driver for flood-adapted design’; (4) ‘sensitized and interested commissioners’; and (5) ‘experienced and/or sensitized design team’²⁵³.

The first theme relates to the identified ambiguity of framing floods in some instances as an environmental issue (thus related to sustainable development) and in others as a purely technical constraint. In the Brazza case, despite the great interest in guiding the redevelopment of the whole La Bastide towards sustainability, “*strangely enough, water management and flood management were not really seen as part of the sustainability strategy*”, as noted by one of the interviewees of the KCAP team, who complemented:

Clearly, we were asked to have ambitions on the sustainability level, but I think that, for the commissioners, sustainability meant dealing with trash, dealing with energy, dealing with energy consumption, energy production, transports (...), but the flood problem was seen as a kind of technical constraint we had to solve, and then not with too much stress on it, not too much emphasis. And I remember having a very short exchange with the Mayor of Bordeaux, Alain Juppé (...), who is himself keen on sustainability issues and urban sustainability, [and who] basically said: “well, you’re not doing too much for sustainability, ecology.” And I was a bit surprised because we had clearly presented how Brazza could be a new way to address flood risk, but in his mind, I think, the flood-risk issue was not a question of sustainability (he thought we should recycle trash into a burning power plant etc.; I think for him this was sustainability, not dealing with floods and climate change). For me it was a bit a disappointment not to be able to somehow be proud of what I thought was actually a very important side of the project.

²⁵³ The other unselected themes include ‘access to reliable flood-related data’ and ‘cultural background’. In its turn, ‘clear communication of the commissioners’ interest in the design brief’, firstly thought of as an independent theme, was finally incorporated into the broader ‘sensitized and interested commissioners’ theme.

The identified ambiguity seems to be closely related to the two senses associated to ‘the environment’, particularly in France, as explained by another informant: the first sense is generally restricted to the regulatory framework around sustainable urban development and includes for example attaining some established standards (such as the HQE, the French standard of high environmental quality) in the final design output. This is in fact the notion of ‘environment’ referred to by the Mayor of Bordeaux in the quote above (and perhaps also the one present in the idea of Bordeaux’s “arc du développement durable”). In contrast, another more holistic sense is related to the intrinsic characteristics of the concerned territory in itself, an acceptance summarized by the same informant in the following terms:

The environment, at least the notion with which we work in the Brazza project, is taking the territory into consideration as it presently is: for example, are there plants that should be safeguarded? What are the pollution levels? Are there problems related to noise? Are there problems related to floods?

While the first notion is concerned with all the technical apparatuses put in place to minimize possible negative effects of the human footprint on the territory, the second relates to “*the stuff that surrounds us (the air, the ground, the water, the rain, the climate etc.), and in that way flood has everything to do with the environment*”, using the words of another interviewee. According to this designer, the second notion, close to the one of milieu, “*is a little bit in conflict with a kind of technicist notion which turns environment into technical devices that go from recycling dirty waters to greening the roofs or having better isolation for the housing; so very confusing...*” The same designer complemented:

[P]utting a green layer on all the roofs to retain rain water is a good thing for the environment, but it’s not the environment, it’s just a technical device maybe to lower the impacts of urbanization. And I think there’s a big confusion on the notion of environment; in my idea, environment should concern a holistic relation, our holistic relation to the natural context we are living in.

From the first standpoint, it does not seem straightforward to consider floods within the environmental issues, for they are hardly taken as a sign of mismatched human behaviours and/or anthropical interventions on the territory. In the Bordeaux case, floods are indeed predominantly considered a ‘natural’ risk, a fact that is quite understandable in this particular situation in which the natural forces behind the flood hazard are very powerful (related not only to river dynamics but also oceanic ones); humans are hence perceived as rather incapable of influencing at least this facet of flood risk. As a consequence, differently from pollution or litter that are clearly human-driven factors with significant impacts on the proper functioning of the environment (that is, on the equilibrium of the ‘good’ nature), floods are rarely understood among those factors in Bordeaux. Conversely, since floods were not dealt with through strict technical means in the design process, it may be difficult to place them under this first technicist category. On the other hand, an *éco-quartier* initiative (which often follows the first acceptance of environment) offers in principle some advantages for its future inhabitants such as plenty of greenery, energy saving or climate-friendly transport means, which end up being expressed in the price of the properties, while flood susceptibility is all but considered an attractive urban asset.

Indeed, flood-prone lands normally have lower prices, but the costs incurred with flood adaptation often make their regeneration more expensive when compared with non-floodable areas, as recalled by an interviewee; floods are finally integrated in *éco-quartier* initiatives thanks to the environmental legislation. This point implies that flood adaptation is only worthwhile when duly justified by the other values concomitantly at stake in a given neighbourhood. Nonetheless, as pinpointed by some interviewees, floods cannot be disregarded as an environmental issue when one considers them an intrinsic part of the existing milieu – that is, as attached to the territory in question, hence as an expression of its physical and sociocultural dimensions altogether. Placing floods outside the environmental issues oddly implies that they become viewed more simply as a technical constraint calling for remedial human interventions to ‘correct’ the deviations of the ‘good’ nature, in a caricature. Within such a framework floods can hardly be tackled more holistically, for a problem-solving approach is the one that better fits into the prevalent mindset. In any case, several interviewees expressed a somehow optimistic opinion as regards the gradually increasing importance given to floods among the overall environmental issues, as illustrated by the following quote:

I think that things are changing. I mean, 15 years ago, we were not good at dealing with the environment, and this has changed (it's something that is now well integrated in the procedures). I think that it's floods' turn now; this is the field in which projects are now going to be improved. I also think that the difficulty when it comes to floods is that they are difficult to understand, and that there are few people who know how to deal with them; it's not easy to grasp the related phenomena (there are many regulations, a lot of modelling, it's like talking about acoustics or air issues, it's complicated too, it's a bit the same thing). People immediately say: "Oh, no! We will have to make a model, it will be expensive..."; so people stay away, because it's expensive. So my big hope is that the projects will be steadily improving in terms of dealing with floods.

Even if the key message of this quote is the need to technically understand flood processes as a means to tackle them, the argument above also anticipates that the flood issue is perhaps now in the same path trailed by other environmental concerns, which required several decades to be considered legitimate design subjects. For another designer, the integration of floods among the environmental issues is actually “*improving, but very slowly*”; clear signs in this direction are shown in the discourses, “*but what happens in real life is going very slowly, incredibly slowly. It's sometimes very difficult to understand*”. Viewing floods mostly as an environmental issue or a technical constraint seems to be a subject that should be brought to the fore, debated and agreed upon at the beginning of the design process in order to guide the intervention accordingly. The existing legal requirements vis-à-vis floods may play an important role in this regard, bringing us to the second theme raised in the Bordeaux case.

Similarly to the Coimbra case in which this theme also appeared as relevant, ‘the role played by the legal framework’ was sometimes reported as a negative contextual factor in Bordeaux, although it was as well sometimes referred to positively by the consulted stakeholders. At first sight, the PPRI impositions may have had a positive role in the design process, inciting proactive moves for the integration of flood risk into the regeneration of Brazza, when stating, as synthesized by a designer, that “*you cannot prevent the site from being flooded, you have to accept the water (it is a top-down*

restriction)”. In a closer inspection, however, the same PPRI may have impacted negatively the design process, since it does not leave much leeway for design experiments and innovations. This is not to say that the legal framework should simply impose the addition of technical devices in the neighbourhood to impede the water from entering the site (flood defence), but it could have been formulated in a way that fosters thinking alternatively about how to accept floods. The ensuing conservative standpoint may be one of the reasons why more predictable solutions (namely building on stilts) could eventually seem more appropriate means to deal with floods in the *plan guide*.

In this vein, the PPRI and its associated rules may indeed have become an institutional constraint even more important than floods themselves, as argued by an interviewee: “*the floods problem was also a specific problem because it was not only a question of design; it was also very much a question of what is allowed, what is legal*”. In another instance, the same stakeholder complemented as follows: “*for Brazza Nord, it was actually a kind of survival issue for the project: either we managed to deal with the flood situation, or the State (and the Préfet, the representative of the State locally) could have simply said: ‘you’re not allowed to build, point’*”. Anyway, as noted by other interviewees, the PPRI is not a binary system in which there are only two zoning alternatives (buildable or unbuildable flood-prone areas); in reality, new constructions or the renovation of buildings within certain flood-prone areas might be allowed, provided that the vulnerability of the exposed properties is duly assessed and adequately managed through design. In Bordeaux, the negotiations involved in the conciliation of these two antagonistic options are totally related to the scope of the challenge (the subsequent theme), and were illustrated by an interviewed urbanist in the following terms:

We argue that there is a third way: we can build [in a flood-prone zone], under certain conditions, after examining and weighting what is at stake; the exposed assets and the level of risk, since in some territories the risk is small while in others the risk is high, so the approach is not at all the same. (...) So each time the weighting of the urban issues at stake will open up ranges of possibilities, to be explored wisely (...)

Accordingly, the legal framework in force in France calls for using design as a means for spatial adaptation, and this has an important positive implication: the integration of flood concerns into design must then be fostered ever since the inception phase²⁵⁴. This condition was considered a “*primordial*” one by an interviewee, who further complemented:

If floods are not integrated in it from the start, the plan guide will not be effective from floods’ point of view. So it has to be done simultaneously; we cannot say: “Let’s start with the plan guide, we’ll deal with the floods later on” (this does not work). And if we do consider floods from the start, we can achieve good results; it’s feasible... Well, human beings have always lived in floodable zones, we just need to learn (or to learn again) how to do it; we just forgot how to live in floodable zones, but we actually knew how to do it. So I think that floods have to be dealt with straight away...

²⁵⁴ Integrating floods in the very beginning of the design process also means avoiding mismatching and rework. As noted by some interviewees, in several other urban projects in Bordeaux floods were not taken into account in a timely manner; the design was in an advanced stage when flood studies showed the real scope of the issue (evidencing thus that flood susceptibility had been rather omitted in the elaboration of these plans).

Since humankind has generally forgotten how to adequately build and live in floodable zones, the legal framework (although perceived as excessive by some stakeholders) ultimately plays the role of bringing such issue to the fore again. In any case, these requirements are obviously open to criticism, as pondered by one of the interviewees: “*do the [flood-related] rules allow us to achieve good urban projects? Do the rules hamper the achievement of good urban projects? Do the rules allow us to reflect? Do the rules hamper our reflections?*”

Being in itself the result of several negotiations, the legal framework ensuing from the PPRI is in principle also allowed to evolve, while keeping its major goal of “strengthening environmental protection” (DDE, 2005a, p. 2). Although not configured to foster regeneration *per se*, the PPRI cannot ignore such urban challenge, especially in contexts in which the floodable areas represent an important and central part of the territory, as it is the case in Greater Bordeaux. This fact brings us to the third theme raised in this case: ‘the scope of the challenge as an important driver for flood-adapted design’.

The amount of floodable land in Bordeaux waiting for redevelopment (highlighted for example in Figure 234, on p. 302) calls for a great dose of pragmatism to choose between two alternatives: either flood-adapted urban regeneration or the overall maintenance of an urban degeneration situation. Focusing particularly on the Brazza case, a designer made an interesting point when reflecting whether it makes any sense to build in flood-prone areas:

[A]ctually, you could ask the Municipality of Bordeaux: “If this place is going to be flooded, why do you bring people to live here?”, for example. But you cannot just have this kind of empty space there; I mean, the municipality wants to have a nice city, meaning also having people living there with some density.

The scope of the challenge, namely in terms of the size and location of floodable areas to be redeveloped, has revealed itself an important driver for flood-adapted spatial design in Greater Bordeaux (and if one also considers floods from all other sources, the scope of the challenge is even more extensive, as recalled by an interviewee). The involved authorities are thus well aware that it would make no sense to convert into non-territories (or alternatively transform into urban parks) all the areas encircled in red in Figure 234 (on p. 302) because of floods. At the same time, they agree that it is totally counterintuitive, at least in terms of the adopted sustainable-development discourse, to carry out urban-regeneration initiatives without (carefully) pursuing much higher urban densities than the ones attained in out-of-town developments. This reasoning was illustrated by an informant in the following terms:

[B]oth the municipality and the Métropole agree that in any case, since the Garonne’s banks are entirely floodable, it is better to build in a flood-prone zone in the already urbanized area than to build in a flood-prone zone in non-urbanized areas; it is better to manage the urbanization within the existing city than in the countryside. So everyone agrees that it is better to densify Bordeaux’s right-bank plain than to continue spreading the conurbation of Bordeaux up to the Bay of Arcachon.

Therefore, besides protecting people and assets from floods in already built zones, the authorities in Bordeaux have also been questioning themselves on how to efficiently

redevelop their flood-prone territories; the case of Brazza Nord is just one among several other regeneration initiatives currently being carried out in this metropolis. For that reason, the integration of floods in the design of this particular project is not only a necessity but also a sign of coherence if one considers the municipal aim for the right bank to “give back nature its place” (Ville de Bordeaux, 2011, p. 4), which somehow takes us back to the first identified theme. In any case, as stressed by an interviewee,

at the origin of the project, it was “either there is a flood-management strategy or there is no project” (so it was binary). But of course, once you have addressed the flood aspect, you still have 20 other aspects to address, so it’s not purely a flood project: it’s also an urban project, also a mobility project, also a social project, economic project... Of course, once you have addressed that theme, there are 20 more layers coming on top of it. So it’s not purely a flood project.

This statement duly recognizes that floods are but one constraint among several other issues to be managed simultaneously in the design of the new neighbourhood. However, a ‘pure flood project’ would probably mean the simple conversion of floodable areas into space for the river, which could nevertheless be occasionally used by people, but this preventive stance would not be considered valid given the scope of the challenge.

Yet, despite the vast amount of floodable areas in Bordeaux, no real intertwining of design scales has been considered in their management approach up to now, hampering for instance the consideration of adaptation strategies with a more enlarged territorial span. This fact may oddly derive from the legislation imposing hydraulic transparency at the plot scale as a sufficient solution, as well as from the several institutional levels in which the floods issue is presently considered²⁵⁵. Following this perspective, the possibilities of designing a flood-prone urban area that can be more than simply hydraulically transparent and thus better accommodate and mitigate the risk at a larger scale are unfortunately disregarded²⁵⁶.

At the same time, the amount of flood-prone areas and the challenge to effectively redevelop them contrast with the invisibility of the water within the city (namely flood issues) and the dynamics involved (indeed, the most flood-susceptible area is not located by the shoreline, but much behind in a lower zone). This fact is especially relevant in the Brazza site, as expressed by an interviewee: “*flood is one part [of the site’s characteristics] but you never feel it while you’re there, never... This is why I tell you it’s technical for me, because everything else is very powerful, to the extent that you forget the flood.*” This somehow biased risk perception is nonetheless hardly escapable (everyone would have the same first impression when visiting the site), and is perhaps the reason why

²⁵⁵ In addition to the PPRI, the French context stipulates, at a higher level, the PAPI (Programme d’Action de Prévention des Inondations – flood prevention action programme), which in the Bordeaux case addresses a much larger area than the Métropole, comprising 10,000 ha of floodable land. This is actually the level at which the weighting of flood-adaptation strategies can be envisioned, including the raising of dykes or the building of new ones. The PAPI of the Gironde Estuary was elaborated in 2015.

²⁵⁶ In any case, the same restrictive reasoning underlies the idea of passive buildings as regard energy conservation; fortunately, some designers (such as the ones of the XTU practice) presently consider that achieving passive buildings is not enough: buildings should generate further energy to feed the urban network as well (Hémery, 2015).

some of the interviewed stakeholders consider that water should be visible in the neighbourhood, at least during floods²⁵⁷.

Also regarding risk perception, it is notable that despite the involvement of stakeholders (in the “Rencontres de La Bastide”), there is so far no declared intention to clearly inform future inhabitants about the flood proneness of the site (e.g. using a kind of guide on how to behave during floods, as it is the case in the German examples HafenCity and Zollhafen). Perhaps it is still too soon to raise the subject, but it should indeed be anticipated, even if it might have a discouraging effect on potential investors and new inhabitants. According to the interviewees, flood risk in the area generally engenders less fear than the one associated to polluted soils, since the latter is difficult to be accurately assessed, while the former is strongly regulated by the concerned authorities. Anyway, the development of flood risk culture (through communication activities, awareness raising and training) is among the actions being taken within the PAPI.

The fourth theme concerns the existence of ‘sensitized and interested commissioners’ in the Bordeaux case. It is worth noting that the commissioners of the *plan guide* for Brazza are somehow hybrid: this role was first played exclusively by the Municipality of Bordeaux, being shared later on with the Métropole. In fact, the Métropole could not be left aside in this process, since it is the body in charge of the legal procedures for the implementation of all urban projects in the city. As already mentioned (on p. 301), flood issues have for a long time been part of the agenda of the Métropole, whose staff were allowed to gradually develop in-house expertise on the subject; Bordeaux Métropole is presently one of the most active members of the CEPRI.

Besides the role of the legal requirements in force, the sensitization of the Municipality of Bordeaux vis-à-vis floods was recently heightened thanks to at least two concomitant factors (an internal and an external one). First, the overall impacts of the storm Xynthia (2010) on the French Atlantic coast and the related political effects of this disaster (as mentioned above on p. 306); secondly, as highlighted during an interview, the elaboration of the archaeogeographical study for the Garonne’s right bank (2010), which recalled the strong role that water had held in configuring that territory. These two reasons eventually functioned as true drivers of flood adaptation within the design process²⁵⁸. The following quotes from two public servants suitably explain the commissioners’ reasoning as regards dealing with floods: “[t]he goal is clear: we have the Garonne, we have global warming, it’s a fact, so [the Brazza area] can be flooded, so we work with water. The goal is clear: we work with water”.

²⁵⁷ The following extract from an interview can be quoted in this regard:

Question: “You said ‘*water must be seen*’; in your opinion, is awareness raising a desirable aspect of the Brazza *plan guide*?”

Answer: “*No; it is not desired. That’s my personal wish [laughs]. I think that in fact Brazza is just the beginning...*”

²⁵⁸ As an example of its sensitization about the theme, the Ville de Bordeaux hosted in 2011 the “AIVP Days”, a two-day meeting of the Association Internationale Villes et Ports (now renamed Réseau Mondial des Villes Portuaires – Worldwide Network of Port Cities), around the theme “River, port, city: the challenge of modernity”. This meeting included, among its five themes of discussion, “how to integrate flood risk for innovative urban projects” and “riverfront architecture, how to take advantage of the water” (AIVP, 2011).

On the other hand,

our job is to ensure that the projects being conceived constitute the best response to the related territories; that is, we need to start by understanding the territories, making assessments and studies. This costs money and takes a lot of time (some elected officials think that we spend too much time analysing), but once the urbanist starts working, closely knowing the concerned territory is a must, so that the ensuing project provides the right answer (otherwise the project may look nice but fails to give the right answer). And the flood issue exactly follows this logic: first, to gain a good knowledge of the risk and to assess it on the territory; and then, once we know exactly how the territory works from the hydraulic point of view and its susceptibility to floods, we can call upon an urbanist to work on the design – and not the other way round (and this reasoning applies for pollution and for a lot of other topics). So Bordeaux Métropole puts a lot of money into preliminary studies before elaborating and proposing urban projects; I think it's a good practice.

These two quotes highlight the importance of geographical traits within the reasoning of the design commissioners, but also the fact that the articulation between urbanization and flood risk does not shock them, as it may be the case in other more conservative contexts. However, some interviewees consider that the expressed ambitions in this regard could have been much higher. Indeed, the design commissioners did not intend to conceive the Brazza urban project as an exemplary flood-adapted neighbourhood, as it happened in several other flood-prone French interventions (see for instance the initiatives presented in Terrin (2014) and Bonnet (2016)). As exposed by an informant, “*the city wanted to address flood risk, but in a kind of under-covered way; they didn't underestimate the dangers (I think they were very aware of the risks), but they didn't want to make a strong statement*”²⁵⁹. Another interviewee presented a similar reasoning: “*the city didn't seek to develop a project focused on the flood issue, it has just taken this constraint and has tried to do with it (the best as it could, but with it)*”. This stance was also confirmed by the following arguments of a third informant:

But in any case, since the beginning, since 2009, the water issue has been taken into account, although the solutions have been very different: these can be either very technical or more natural (in the sense of adaptation to the context more than a technical management); so there's a great variety of things. However, since we're not really used to working with water as vigorously as in other countries, we end up experimenting. We don't have standard responses, we don't have a framework that relates specific problems to predetermined solutions. (...) we told the urbanists: “there's the water issue, you have to take water into account”, then each of them has proposed different solutions.

Despite the expressed good intentions behind this reasoning, another informant considers that the design commissioners were quite timid as regards flood adaptation since

²⁵⁹ This argument was complemented by the same informant as follows: “*they didn't necessarily make a global strategy for this (they were also not ready to) also simply because they had commissioned a study on the whole estuary (from the coast to Bordeaux) to the Sogreah engineers office (if I'm right) and they didn't really have the information*”, a reasoning that is totally in line with the previous quote from an interviewed public servant. Indeed, the lack of synchronization between the availability of accurate flood data and the elaboration of the design proposal could not favour the best adaptation solutions. As regards the first *plan guide* for Brazza, “*the flood maps and simulations were actually being made at the moment we were finalizing our design, which is a bit unfortunate*”, as complained by a member of the KCAP-led team.

they indeed didn't have the will (as Hamburg had) to make a clear statement: "we are getting ready for flood and climate change." It was clearly less voluntaristic and less courageous in a way, but it didn't mean they didn't care, it just meant they didn't want to put that question at the centre of urban planning.

Reinforcing this argument, another interviewee provided the following answer, when asked to what extent the Municipality of Bordeaux was interested in associating the new identity of Brazza to flood adaptation:

In fact, they were not interested... I don't think they were interested in associating... I don't think that this was the underlying idea; I think that's a legal requirement, a basic legal requirement. How to say that? How to transform a constraint into a strength, this is an omnipresent issue; it's not a question of personal preference, they don't have the choice.

Anyway, we can generally say that the existence of 'sensitized and interested commissioners' in the Brazza case was an additional factor to foster flood adaptation through design, even acknowledging that the degree of sensitization and interest was not the same for the Municipality and the Métropole, at least in the early stages of the design process (information from interviews)²⁶⁰. During that period, while the city put more emphasis on the architectural aspects of the new neighbourhood, the Métropole was also interested in "*big-scale planning and water issues*", as recalled by an interviewee. Despite this initial difference, they were able to clearly communicate their *desseins* in this regard in the first design brief (although in the second brief floods were not mentioned, as if they were an already solved issue); furthermore, the commissioners closely tracked the evolution of the flood-adaptation strategies all along the design process²⁶¹.

Finally, the fifth theme in the Bordeaux case is related to the fact that the Brazza *plan guide* was elaborated by 'experienced and/or sensitized design teams', with a diverse composition, which, in combination with the Métropole's in-house expertise about floods, could finally make a difference as regards flood adaptation through design. Concerning the first team, not only has KCAP extensive past experiences in flood-adapted design, but Rossano (KCAP's project manager for the Brazza project) is also a researcher on the subject of flood management and landscape design. At the same time, Ingérop is very knowledgeable about the local physical context (Bordeaux's entire La Bastide) and has a wide-ranging experience in the flood-management domain. This engineering firm has been indeed playing a very active role in the design task, as expressed by the testimony of one of

²⁶⁰ The strong role of the interest demonstrated by the commissioners for an issue to have a high level of importance in the urban agenda should not be disregarded. For instance, the reasoning presented by Diedrich (2009, pp. 50-51) to explain the regeneration of Bordeaux's left bank is very illustrative: "[w]hat now sounds so convincing was not that easy to implement. (...) It needed a mayor with an almost absolutist rule (a tradition in France) who, moreover, as the President of the Bordeaux Urban Community was also able to draw the surrounding municipalities, numbering 460,000 residents, into [his *projet urbain*]. [The left bank's project] needed the kind of speed in decision-making, planning and construction that is rarely attained outside of Latin countries – a mere nine years, counting from Juppé's start in 1995 (...)"

²⁶¹ This was made clear by a comment by a member of the YTAA-led team: "*all the quartier was designed in relationship to the flooding, which was very important for the municipality (...), each time we change two or three buildings, they send the plan for a restudy of the flooding system (if it works, how we can move...).* These buildings on the Garonne and the plots were made a little (all of them) smaller in order for the water to penetrate inside and not be blocked in one building. So it was very much studied, this issue is very important for the municipality."

the designers: “I also have to give the credits to our engineers, Ingérop, who also worked on the 3-D modelling to make sure that we could combine the topography of the project and the water capacity, they were extremely willing to experiment with us.”

Thanks to the continuity of Ingérop’s staff along the process, the second design team and its *plan guide* “integrated very well the flood issue right away; I’m not sure that it would have been so had [Ingérop] not been there”, as stated by an informant. Moreover, the fact that Ingérop has been the sole local firm within the current design team was also acknowledged as an asset of the design process; since its staff already know the stakeholders from previous projects, the dialogue with the involved institutions locally is pragmatically facilitated. It is worth noting that the timing of Ingérop’s participation in the elaboration of the *plan guide* for Brazza contrasts with the overall practice in France, whereby engineering consulting firms usually do not join the design team in the earliest planning stage (Brun, 2010), thus following a more classical way to manage floods within the urban projects.

As for the second design team, the fact that the Brazza *plan guide* was the first project with an urban scope for the YTAA practice did not represent a real problem for at least two reasons. First, the experience of its partners (MDP and Ingérop) initially compensated its lack of direct contact with floodable sites; secondly, Tohmé and his colleagues had the chance to learn from their hands-on involvement as the project developed. An interviewee made an interesting note about the evolution of the Brazza project, given the participation of multiple designers in different stages. On one hand, the interviewee recognized that the process was overall very time consuming and also represented a high investment in financial terms; on the other hand, the final design product could be enriched through the sum of multiple and different points of view that have contributed to the maturation of the overall responses.

Another informant synthesized the importance of working with an ‘experienced and/or sensitized design team’ as follows:

[T]he important thing is to manage to have people in the urban-project teams who are able to understand and explain the phenomena, so that these are well integrated right away. (...) [A]nd above all, when an architect looks at the plot, it is not possible to understand where the water comes from, how it arrives and what should be done to make the project work well. So it’s always the same issue: urbanism has to do with multidisciplinary teams. If we are in a flood-prone zone, we need people who understand floods. (...) [I]n Bordeaux, you have to work with flood specialists, otherwise you don’t accomplish good urban projects²⁶².

The five major flood-related themes that emerged in the Bordeaux case are summarized in Figure 279. Although located outside the area under study in this thesis, the regeneration of Bordeaux’s left bank would also convey an important symbolic message: configuring a transient puddle on the quay, the shallow fountain of Corajoud’s emblematic design keeps recalling that the water reigns in that space – and that riverine quays are often naturally

²⁶² The final design was also assessed by the fire brigade and the utility providers, in terms of the expected adequacy of the overall layout and the performance of their services within Brazza, when the area will be under waters.

flood-prone spaces. Such message is even more striking here since the fluctuating atmosphere of the Miroir d'Eau (intermittently dry, wet and misty) also recalls the ever-changing character of river spaces (see Figure 221, on p. 294, and Figure 280 below). On the right bank, a similar message is suggested by the aquatic garden, the pedagogic space in Bordeaux's newly built botanical garden, close to the quay (see Figure 281).

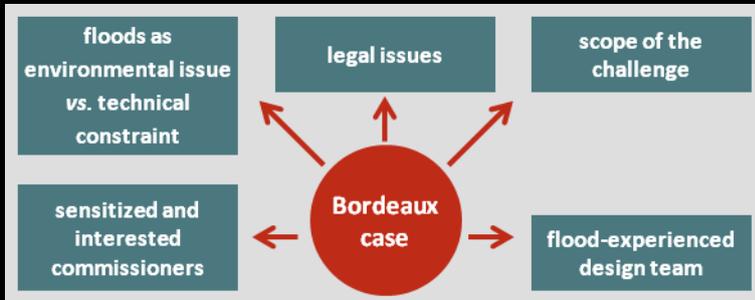


Figure 279: The main flood-related themes that emerged in the Bordeaux case

Source: elaborated by the author



Figure 280: The playful mist propitiated intermittently by the Miroir d'Eau on Bordeaux's left bank

Source author's archives (28 July 2015)



Figure 281: A view of the water in the Jardin Botanique, on Bordeaux's right bank

A project jointly designed by Jourda Architectes and the landscape architect Catherine Mosbach
Source: author's archives (24 July 2015)

One of the issues brought to the fore but left open in the Bordeaux case is the interaction of scales as regards flood adaptation through design. In this case, people's role in designing floods was not emphasized and could be further explored; for instance, given that it is not (yet) presently straightforward that floods are among the environmental concerns, what are the steps needed for them to be acknowledged as a truly socio-environmental issue? In any case, as a general tentative conclusion for the Bordeaux case, it is possible to say that spatial design has been properly performed *with* floods, as intended by the commissioners (and imposed by the law), in a truly "*faire avec*" perspective.

Part III: **Foreground**

Dear Lord, give us our daily bread

Geachte Heer, geef ons ons dagelijks brood en af en toe een kleine overstroming.

A Dutch adage

and once in a while a little flood.

7 Spatial design and floods

7.1 Chapter introduction

The projects around the Coimbra Polis Programme, the *plan guide* for Bastide Brazza Nord and the master plan for the Scheldt Quays exemplify in a way the ‘design and floods’ perspective, even if the intensity of the interactions between the two processes is quite different in each of them. As briefly delineated in Section 3.5 and put in evidence in Part II, although the three interventions share some common traits (such as being one of the main drivers to reach the ambition of re-centring the city on the river), their overall contexts and flood processes are not at all comparable, nor are the related design processes and outputs. This aspect is duly reflected in the tables presented in Appendix F, which summarize the main characteristics of the focused cities and urban projects. Moreover, their different timings also contribute to distinguish them, given that the Communitarian flood legislation (under which all of them were subsumed) has sharply evolved since the beginning of the design process of the Parque Verde do Mondego, the oldest of the three analysed interventions. Accordingly, floods have become more a territorial subject than a solely technical one. Indeed, time has also had another important repercussion, since for the two more recent cases it was possible to learn from the experience of some highly mediatised flood events, such as the ones associated to the hurricane Katrina (in 2005) and the storm Xynthia (in 2010), which have boosted the awareness of many territorial players involved in the formulation of these urban projects.

Despite the variety in their fundamental conditions (and without disregarding the abovementioned concerns), it was possible to comparatively analyse some broader issues within the three cases, in order to identify the more general reasoning behind and patterns of ‘design and floods’. The first of these issues was the local stance towards floods – at the very core of our second research question –, which may be taken as the key feature that somehow connects and simultaneously differentiates the three analysed urban projects. The stance towards floods, considered a significant aspect of holistically pursuing ‘design and floods’ embedded in the local flood-risk culture, eventually underlies the design context, process and product of these urban projects (Hobeica & Santos, 2016). Such a stance was chiefly explored through the contents of the design briefs and the profiles of key involved actors, while the actual proposed layouts also provided hints in this regard. At the same time, we took into account the fact that the stance towards floods is as well shaped by the very hybrid traits of the flood risk, being related to both its physical dimensions (such as the expected intensity of the hazard or the damage potential), and its social ones (including risk perception and acceptability).

Another issue that could be reasonably compared within the three projects was the local stance taken towards design, as pursued in each of the three cases. The interest here was not related to the methodological steps taken within the design process, but to the way such

process itself was performed and how this related to the consideration of floods. Closely associated to this, a third issue that could be consistently contrasted concerned the actions of the main stakeholders within the design process and their underlying values (which are eventually attached to the prevalent flood-risk culture). Although involving different people and organizations, the roles taken by some of these actors (especially the most prominent ones), when compared, may shed light on important human aspects of dealing with floods through design. These three broader topics, as well as the identification of favourable background conditions, were finally the mainstays of the retained research questions, to be tackled in this final part of the thesis.

This chapter therefore constitutes the core of the research ‘foreground’, including, firstly, the content that emerged and was constructed throughout the elaboration of the three case studies individually and, secondly, some possible ‘answers’ to the research questions resulting from a cross-case synthesis and analysis. By resorting to different tables that juxtapose and compare the related information, the former is presented in Section 7.2 (“‘Design and floods’ within the three cases”), following the key concepts linked to the cases themselves, while the latter are included in Section 7.3 (“Searching for tentative answers”), focusing on the more general phenomenon of ‘design and floods’.

Deriving directly from these two groups of considerations, Section 7.4 contains an extrapolation exercise, in which we envisaged some degrees of fluvial-flood adaptation through design, expressed in a scale measuring the interactions between urbanity and safety, the two main dimensions of ‘design and floods’. Ultimately, the three flood-adaptation degrees considered – tolerating, accommodating and welcoming floods – may equally be related to the wholesomeness of the “andscape” (Prominski, 2014) – understood as the unitary condition that takes into account the dynamic relationships between living and non-living organisms and their settings – actually pursued in flood-adapted riverine urban projects. Section 7.5 summarizes this chapter, while the overall conclusions of the thesis are included in Chapter 8, which relates the contents of Chapter 7 to the ones of the Introduction (Chapter 1). The final chapter thus aims to briefly discuss the research ‘results’ (that is, the potential answers to our research questions) within the context of the literature, while also dealing with some of their possible implications in terms of theory, policy and practice.

7.2 ‘Design and floods’ within the three cases

To begin the discussion about ‘design and floods’ within the three studied cases, it seems worthwhile to recapitulate the main themes emerged from them, now grouped in Table 11. In this section, the results (and tentative conclusions) from each of the three cases are compiled and considered from an aggregated point of view. As raised in Section 4.5, the arguments here developed about the Coimbra case were mostly derived from the Parque Verde do Mondego’s project, without taking equally into account the design for the requalification of the Monastery of Santa Clara-a-Velha. Accordingly, when the arguments refer to the latter design experience, we made this point clear in the text. Although the reasons behind them are always different (given the uniqueness of each design situation),

some of the identified themes can be found in more than one case: ‘flood-experienced design team’ appears in the cases of Antwerp and Bordeaux, while ‘legal issues’ are clearly present in the cases of Coimbra and Bordeaux. Despite the importance of ‘legal issues’ also in the Antwerp case, this topic was not considered among the most relevant ones for integrating floods through design into the Scheldt Quays Master Plan. The same reasoning applies to the themes ‘scope of the challenge’ and ‘sensitized commissioners’, highlighted in the Bordeaux case, which are also present in the case of Antwerp, although in a less relevant way (thus not included in Table 11).

Table 11: Recapitulation of the main themes emerged in each studied case

Coimbra	Antwerp	Bordeaux
C1: nature paradox	A1: floods as an opportunity	B1: floods as environmental issue vs. technical constraint
C2: legal issues	A2: floods + other demands	B2: legal issues
C3: floods as a scapegoat	A3: fixed objectives, flexible means	B3: scope of the challenge
C4: awareness not followed by proactivity	A4: flood-experienced design team	B4: sensitized and interested commissioners
C5: residual risk = ‘failure’	A5: design as an open process	B5: flood-experienced design team

Source: elaborated by the author

These broad themes were then grouped into the four categories related to our research questions, as presented in Table 12, a systematization that had not been anticipated when preparing the individual case studies. Unsurprisingly, most of the themes fit into the first category (background), which highlights the importance of the overall design context, not only related to floods’ physical characteristics but also to their social dimensions. In contrast, the less represented category is the one related to the stance taken towards spatial design.

Table 12: Categorization of the main themes emerged in each studied case

Focus	Themes
Background	C1: nature paradox C2 and B2: legal issues A2: floods + other demands A3: fixed objectives + flexible means B3: scope of the challenge B4: sensitized and interested commissioners
Stance towards floods	C3: floods as a scapegoat C5: residual risk = failure A1: floods as an opportunity B1: floods as environmental issue vs. technical constraint
Spatial design	A5: design as an open process
Spatial designers	C4: awareness not followed by proactivity A4 and B5: flood-experienced design team

Source: elaborated by the author

Although the three cities share the intention to strengthen the role of their respective rivers as a key structural tie within their urban fabric, the analysed urban projects have very contrasting contextual dimensions. It is “important to clarify these [contextual] questions because the project of the city is related to that”, as cleverly stated by an interviewee who complemented: the designers do not work “in an abstract context, but in a social, political, economic context, and this makes... I mean, certain conditions really make the difference”. Moreover, the two more recent urban projects also have climate-change prospects as a chief background condition. In the Coimbra case, the studied project was prompted and developed after major regulation works that ‘stabilized’ the watercourse; accordingly, the Parque Verde do Mondego’s project somehow assumed the river as stationary, a standpoint that illustrates the flood-defence paradox. At the same time, this project was consolidated within the Polis Programme, which in spite of its strong declared environmental ambitions, was mostly focused on the imagetic role of riverfronts (floods were thus not taken as a particular relevant concern).

In the Antwerp case, the Scheldt Quays’ urban project was in itself amalgamated to a major flood-management initiative, taken as an opportunity to upgrade valuable central urban land by the river. In its turn, due to legal constraints, the *plan guide* for Bastide Brazza Nord was developed without anticipating any external flood-defensive measure to be put in place. In any case, according to an interviewee, the definition of unbuildable floodable areas in France is simply related to the expected flow velocity and height in the site during flood events, and not to the fact of being or not protected. Yet, we here took into consideration that flood-defensive devices are normally executed to lower these two parameters and thus minimize the final risk. Just as the other “bad places” being reconverted in La Bastide, this new neighbourhood had no other alternative than to deal with floods on its own – that is, through its intrinsic design. These major contextual aspects are summarized in Table 13.

Table 13: Relationship between the studied urban projects and relevant flood-management initiatives

Coimbra	Antwerp	Bordeaux
Urban project carried out after river regulation works	Urban project carried out within a flood-defence initiative	No external flood-management initiative expected to protect the area of the urban project

Source: elaborated by the author

These background differences are well reflected in the themes that emerged in each case. For example, it is notable that the first identified theme in the Coimbra case (‘the nature paradox’) directly derives from the mindset then established with the regulation works, although the idea of controlling the river has always been present in that context. The two background themes of the Antwerp case (‘floods + other demands’ and ‘fixed objectives + flexible means’) are also closely related to the fact that the Scheldt Quays Master Plan intrinsically had to manage at once two important flood-management issues and several urban ones. In the same line of thought, ‘legal issues’, ‘scope of the challenge’ and ‘sensitized and interested commissioners’ could only be assessed as relevant themes in the Bordeaux case thanks to the absence of external flood-management initiatives as a baseline condition for all the regeneration projects being carried out on Bordeaux’s right bank.

From these general background themes, ‘legal issues’ deserve some attention, not only because they appeared in two cases but mainly due to the way they were framed within these cases. Table 14 presents the major legal instruments in place in each context, excluding the Communitarian flood legislation that regulates all of them (at least since 2007, when the EU Flood Directive came into force). Although this aspect was not taken as a central one in our study, it is interesting to note that, excluding Antwerp’s Strategic Spatial Structure Plan (the s-RSA), these instruments mostly have a restrictive role, their contents being only to a certain extent subject to broad and open negotiations, as already pointed out in the three previous chapters.

Table 14: Main relevant legal instruments to be complied with by the studied urban projects

Coimbra	Antwerp	Bordeaux
REN (defining environmentally sensitive and risk areas)	“Sigma Plan” (flood-management plan at the regional scale)	PPRI (flood zoning, formulated at the level of the <i>département</i>)
PDM (local land-use planning instrument)	s-RSA (strategic spatial plan at the city scale)	PLU (local land-use planning instrument)

Source: elaborated by the author

From the point of view of some designers, in both the Coimbra and Bordeaux cases the legal requirements in force were often viewed within the design process as an ‘evil’ associated to restrictive conditions that should necessarily be surpassed, as expressed for example in the quotes on pp. 209 and 341. On the other hand, as shown in the Bordeaux case, by stipulating that the water must be accepted within the sites being regenerated, the French legal constraints were also viewed by some stakeholders as a positive incentive for adequately integrating floods into urban projects from their outset. Precisely because of this legal background, the Bordeaux case is the only one among our three projects that does not show an emphasis on defence (in both its discourse and the actual urban project), but instead on the adaptation to flood processes.

As such, more than as a mere ‘evil’, these restrictive legal aspects were portrayed as a ‘necessary evil’ in the framework of flood-adapted urban projects, as clearly expressed by an informant:

I am convinced that there should be a legal constraint. I wouldn’t be able to do my job correctly in this regard [flood adaptation] if I wasn’t backed by the law... I would, in some specific instances with some partners, for example, but not in a comprehensive manner; that would not be possible, I’m sure.

This quote somehow recalls PROAP’s positive standpoint as regards overall design restrictions, as cited in the introduction of the Antwerp case (see p. 221). Together, these two statements contrast with the view expressed in the Coimbra case that following the procedures imposed by legislation necessarily means repeating anodyne and seasoned solutions, as illustrated in the same quote on p. 209. In fact, two of the three studied cases suggest that the flood-management regulatory framework has up to now been conceiving restrictive rules more than stimulating guidelines to support effective adaptation, while it has not been dialoguing enough with other urban-management demands. Such situation

was perhaps even more acute before the publication of the EU Flood Directive, in which a clear relationship between spatial planning and flood-risk management was then proposed (see p. 18). Therefore, although being pessimistic, the arguments presented in the Parque Verde do Mondego's project regarding the flood-related legislation, in a way shared by some of the designers of the *plan guide* for Bastide Brazza, seem duly justifiable.

In contrast, in the case of the Scheldt Quays, floods were taken as an urban subject to be dealt with through design just as, for instance, heritage and mobility; it was hence possible to extend their scope from a purely technical issue to unveil other potentials, particularly related to their temporality. The idea of managing floods concomitantly with other demands (instead of competing with them) is also present in Bordeaux, being somehow included in the theme named 'scope of the challenge', which is specifically related to the fact of having a vast intra-urban floodable area to be regenerated. Another important condition associated to the latter, which certainly favoured the proactive attitude towards floods of the local authorities in Bordeaux, was the gradual development of in-house expertise on the subject (namely within Bordeaux Métropole), a major asset that was also possible to identify within the Brazza design team itself.

The *plan guide* for Brazza and the master plan for the Scheldt Quays show that the explicit inclusion of floods in the search through design for a balance between the site's constraints and opportunities cannot be achievable without the active commitment of the urban project's commissioners. And although appearing as a particular theme solely in the Bordeaux case, the existence of 'sensitized and interested commissioners' as regards flood issues was a prime condition in the Antwerp case as well. Yet, it would be biased to fully acknowledge such condition in that case, given that the Flemish waterway administration agency (in charge of flood management) was also one of the project's commissioners. Sensitization in these two cases may result *inter alia* from the fact that these two cities experience river variations on a daily basis due to sea tides, which perhaps nurtures people's perception of the riverfront as an unstable (and possibly vibrant) urban setting.

The sensitivity of the design commissioners in the three studied cases also resulted from the occurrence of an important mediatised flood event (not necessarily in the city in question), which heightened the risk prominence and the sense of urgency while fostering changes in political terms. For example, Antwerp is one of the estuarine cities that has been learning from the experience of the hurricane Katrina in New Orleans and the failure of its hard defences; on the other hand, the damage, deaths and political effects of the storm Xynthia in France has had an important sensitization role on local public administrations (including the Municipality of Bordeaux). The same effect was also present in Coimbra after the 2001 flood, although other conditions (for instance the flood-defence paradox) had a greater importance in the framing of the design process of the Parque Verde do Mondego's project. Moreover, in the Antwerp and Bordeaux cases, the ensuing commitment of the design commissioners to flood issues was clearly communicated to the designers since the earliest stage of the design process (namely the elaboration of the design briefs), in order to effectively engage them.

Being a key document containing the overall principles, goals, demands and constraints of a given project, the design brief actually presents in a condensed way the cultural and (to a lesser extent) the physical backgrounds that would underlie the design's trajectory. The overall stance taken towards floods in each of the three cases could somehow be anticipated by the way this issue was approached and framed in the project specifications (see Table 15). For example, while floods were rather understated in the competition brief in the Coimbra case (CMC, 1995), they were in contrast highlighted in the specifications for the pre-operational study as an important site constraint for redeveloping the Brazza sector (Ville de Bordeaux, 2011). In the latter, floods were explicitly mentioned as an environmental concern, being included within the design objective of "embedding the project in a significant sustainable development endeavour" (Ville de Bordeaux, 2011, p. 12). As for the Scheldt Quays Master Plan, properly dealing with floods was the *raison d'être* of this ambitious regeneration project, in which the restructuring of a defensive device was taken as an opportunity to reinforce the quays' role in the urban realm (Stad Antwerpen & W&Z, 2006c).

Table 15: Floods as portrayed in the design briefs

Coimbra	Antwerp	Bordeaux
Mentioned only indirectly among the PDM's overall constraints	One of the three drivers of the project itself	A crucial site constraint to be necessarily taken into account

Source: elaborated by the author

Although neither the word '*cheia*' nor '*inundação*' is found in the competition brief for the design of the Parque Verde do Mondego, it would not be reasonable to say that floods were completely dismissed by the project commissioners, especially considering the testimonies made during the interviews by some CMC stakeholders involved in the design process (see namely on p. 157). In any case, it is not possible to conclude whether the absence of the flood issue in this design brief may be taken as a simple (yet serious) communication gap or, conversely, as a general sign of the excessive trust put on the dams system, in a clear illustration of the flood-defence paradox. Indeed, such moral-hazard phenomenon somehow also explains why in the Coimbra case floods could have finally been viewed 'as a scapegoat', being presented as an 'external' (or uncontrollable) factor to justify decisions based on other more general or diverse concerns.

One may argue that viewing floods as a scapegoat in Coimbra also derives from the fact that, in the design of Parque Verde do Mondego, they did not clearly dialogue with the other projects' demands and constraints, as it was the case in the other two analysed urban projects. For example, given the 'scope of the challenge' in Bordeaux, floods could hardly be left as a scapegoat, even when it comes to potential additional costs to be borne by contractors and ultimately the final purchasers (new households and businesses), since they had to be duly acknowledged as a real contingency within the redevelopment of the area of La Bastide as a whole.

In Coimbra, the Mondego's seasonal variations – which in the past were quite severe and perceived as undesirable – are now definitely smaller, thanks to anthropical interventions: the hazard-mitigation measures (dams system) in place. However, also due to the flood-

defence paradox, the expressions of these variations (which were not fully eliminated) have been perceived as ‘surprises’, and the residual flood risk has thus been assimilated to a general failure. In any case, after the regulation works, the existing flood risk in Coimbra somehow represents the ‘accepted’ residual risk (since it was previously mitigated), even if this has been increasing due to the rather uneven management of the dams system. In contrast, in its assessment in the other two cases, flood risk was not only taken in its full potential (without any mitigation effort) but also included an allowance for taking into consideration climate-change induced increments, revealing a stance both proactive and precautionary (the apparent absence of reflections on climate-change adaptation in the Coimbra case was briefly discussed in Section 4.5, namely on p. 214).

Despite being included in the first design brief within the environmental concerns to be duly considered in the Brazza urban project, floods were nonetheless, according to some interviewees, mostly portrayed by the commissioners during the design process as a technical issue, which would thus call for a strict technocratic approach. This stance was made clear in the second design brief for the so-called ‘operational phase’ (the ongoing one), when this ‘problem’, taken as actually ‘solved’ within the previous design stages, was finally left aside. Interestingly, during one of Bordeaux’s interviews, a bit surprised by the content of our questions, the interviewee asked us why we were interested in floods, if they are such a technical issue. In a way, the theme ‘floods as environmental issue vs. technical constraint’ in the Bordeaux case goes hand-in-hand with ‘the nature paradox’ theme of Coimbra. As already pointed out in Section 6.5, the oscillating framing of floods as an environmental issue or as a solved technical constraint has some implications.

Even if the overall understanding of society and nature is based on segregation in both situations, in the first one the anthropical contributions are duly acknowledged, while in the second the human involvement refers precisely to the ‘correction’ of a dangerous malfunctioning of ‘nature’ itself. And when this ‘problem’ exclusively related to safety is finally taken as technically ‘solved’, the design stakeholders may feel exonerated from further thinking about and dealing with the issue; the potential contributions of water variations to the enhancement of the urban realm may thus be simply dismissed. We are not arguing for fluvial floods to be taken as *the* central focus in riverine urban projects within regeneration initiatives but for them to be considered in the full range of their potentials (that is, not confined to a technical subject), in the same way as all the other involved design variables.

Conversely, the most interesting theme related to the stance towards floods emerged in the Antwerp case, although some hints of it could be captured in the other two cases as well: ‘floods taken as an opportunity’. As the original leverage of the Scheldt Quays Master Plan, floods actually appeared as a timely issue to envision the quays as a decompressing space between city and river, in which both could temporarily and plentifully manifest themselves. Following the same positive mindset, ‘inoffensive’ floods are now in a way ‘desired’ in Antwerp (see quote on p. 279) as a means to increase the sense of urgency and accelerate the implementation of the master plan. In the Coimbra case, the flood susceptibility of the riverbanks is also perceived as the condition that had preserved such a large undeveloped parcel within the city centre (see quote on p. 205) – indeed a potential

illustration of risk as an asset. However, the opportunity of grasping the Mondego's (new) dynamics was only partially capitalized within the design of the green park.

On the other hand, floods were not exactly viewed as an opportunity in Bordeaux, but pragmatically taken as a “*survival issue for the project*” that had to be duly accounted for to make feasible the revamping of the area (see quote on p. 341). In fact, this was the only studied case in which permanent urban activities (including housing) were planned in a floodable zone, while in the other two mostly temporary uses were envisaged, in recognition of the transient nature of riverine urban spaces. In sum, we can say that, one way or another, the three cases share the perception of floods as an opportunity, although in different manners. Without floods, Coimbra would have never had that amount of valuable vacant land near the city centre to be converted into a park. Without floods, Antwerp would keep on wasting its riverfront with car parks. And in Bordeaux, even if floods were not taken as a truly territorial asset as heralded in the publication *Atout risques* (Bonnet, 2016), the Brazza urban project took as a strong foundation the idea of ‘doing with them’. Anyway, floods were eventually recognized in this case as an important element that makes the Brazza site unique and “*the project contextual*”, as highlighted by one of the interviewees (see the integral quote on p. 335).

Although the three rivers in question are unanimously central elements for both the image and the structure of their respective city, they were taken into account differently in the three analysed projects. Even if the Parque Verde do Mondego has some very interesting water features in its design, the Mondego itself was mostly incorporated as a pleasant background and no real place was left for its dynamics: its overflows, indeed severely restricted since the commissioning of the dams system, seem now to be simply tolerated within the park. In contrast, the Scheldt and the Garonne were taken as lively elements within the design of the Scheldt Quays and Brazza, a liveliness that in reality is partially due to the daily tidal influences. In the first case, the water overflow is accommodated in different scenarios, while the river is also allowed to co-design the shoreline in Droogdokken, the sole quay segment in which the Scheldt's ‘natural’ banks are not contained by a quay wall. In the second case, the acceptance of the overflows was a binding condition even if the planning area did not include any part of the shoreline. In spite of the distinctive ways of viewing and dealing with floods in Bordeaux and Antwerp (partially due to the dissimilarities of their urban projects’ typologies), the two cases have some points in common in terms of their demonstrated stance towards floods, as summarized in Table 16.

Flood modelling was actively used in the Antwerp and Bordeaux cases to support the evaluation of the envisaged design solutions. In this regard, it is interesting to note that, in the former, flood modelling was first performed at a higher level (the regional scale), within the “Sigma Plan”, mainly for the definition of floodable areas and the prediction of damage costs, being subsequently detailed during the elaboration of the quays’ master plan. Even though recognized by some designers as an expensive and specialized technique (which had to be outsourced), flood modelling was performed in the Bordeaux case as a design tool at the very local scale since the first sketches of the KCAP-led pre-operational study. The design proposals were elaborated through several iterative rounds of

investigations of spatial alternatives coupled with flood modelling, and involved different categories of spatial designers (architects, engineers, landscape architects and urbanists). Moreover, in the present operational phase, all the adjustments in the *plan guide* (no matter the reason) have been carefully flood tested and then calibrated through modelling, while the ongoing detailed designs for each individual real-estate operation also have to follow the same procedure.

Table 16: Main features of the stance towards floods portrayed in each of the three cases

Coimbra	Antwerp	Bordeaux
Floods only enter effectively into the picture after the 2001 event	Floods as a design issue since the design brief	
No clearly identifiable stance	A clearly positive stance	
Water as a stable, outside scenic element	Water as a dynamic and integrated scenic element	Water as a dynamic (but an outside scenic) element
No real place for river fluctuations	Acceptance of river fluctuations	
Flood modelling performed only as a response to the 2001 flood event	Flood modelling performed within the “Sigma Plan”	Flood modelling performed within the <i>plan guide</i>
A sense of certainty (safety) emanates from the defensive measures in place	The only certainty is that sooner or later floods will happen again	
Flood adaptation (besides flood defence upstream)	Flood defence	Flood adaptation

Source: elaborated by the author

In each of these two cases, the project’s commissioners were well aware that floods will sooner or later happen again and decided to anticipate such events: in Bordeaux, this was done by adjusting accordingly the urban fabric under regeneration, while in Antwerp by strengthening the defensive structures in place. Therefore, the idea of flood adaptation, as supported for example by the CEPRI (2015), is clearly portrayed in the case of Bordeaux (although it is also present in Coimbra’s urban project), while flood prevention (through defence) is the major strategy followed in Antwerp. This difference in a way illustrates the overall contrasting cultural background of northern and southern Europe²⁶³. Interestingly (and almost ironically), the Scheldt Quays’ urban project is the only one that gives some room for the river’s variations and intends to foster their experience by the city’s inhabitants; moreover, the PROAP-led design also left some room for the evolving urban

²⁶³ Divergences in terms of flood-risk culture and management can also be found at the country scale. For example, according to one of the Belgian interviewees, the main difference between Belgium and France is that while in the former the focus is on the protection of people by the state, in the latter people are expected to know how to behave before, during and after a flood event. In any case, a Belgian interviewee commented that flood-management officials are aware of the downside of protecting people: “*it would be convenient that people would also know that these things can happen, and that they also have some sort of responsibility.*” The same interviewee complemented that this stance towards floods may change in the future: “*maybe someday when we don’t have enough measures or maybe there will be some point where we start educating people about things that can happen to them where the government cannot protect them, the government can do anything to make them comfortable but cannot protect; maybe there will be some day any major flooding or something... You notice that when there was the flooding in 2013 people are again aware (‘oh, yeah, flooding can happen’), but then after a few years it’s away, it’s over (‘oh, yeah, it wasn’t that bad’), but when it happens tomorrow, they would be ‘oh, no!’ So I think it’s like a time spirit at the end (Zeitgeist in German) that we have now here, we don’t have really big disasters and people get a little bit used to not having problems of that kind.*”

demands, by proposing a flexible framework for restructuring the quays instead of a finalized plan.

In the Coimbra and Bordeaux cases, our understanding of the stance towards floods was complemented through a special feature of the related interviews. Indeed, some of these included in their initial part an assessment by the respondent of the overall importance conferred to floods within the design of the urban project being discussed (this was the only closed-ended question, to which we expected an answer from one to ten)²⁶⁴. Only by the end of each interview, when the subject was already well discussed, we asked the interviewee to justify his/her score. Table 17 and Table 18 gather the scores and justifications given by the three concerned respondents in Coimbra (1C, 2C and 3C) and the six ones in Bordeaux (from 1B to 6B)²⁶⁵, followed by an identification of the ensuing ideas then raised.

Table 17: Floods’ importance within the design according to the interviewees from the Coimbra case

I	Score	Main justification quote (•) and ensuing idea (→)
1C	10	<ul style="list-style-type: none"> • “[the site’s flood proneness] was taken into consideration in the initial strategic-planning phase [of the Coimbra Polis Programme] but not in the ensuing proposals, especially since the [hydraulic] study was not ready. After the finalization of the hydraulic study, the issue has received a high level of attention, the highest level, I would say.” <p>→ The importance of having updated knowledge of floods before dealing with them</p>
2C	8	<ul style="list-style-type: none"> • “eight, for a very simple reason: the river is an integral part of the park. You know, the Parque Verde is like this [indicating in a map: one wide strip that includes the river in its centre]; it’s not like that [indicating in a map: two parallel strips straddling the river]. So the river, which is blue, is also the green park.” <p>→ If the river is taken as an integral part of the park, fluvial floods had to be duly considered</p>
3C	4	<ul style="list-style-type: none"> • “if I were extremely cautious I would start with hygiene and safety, and say ten. But I never start with these issues. For me, the most important issue (the one I would rate ten) is the quality of the space and its experience by the user. The rest are constraints to be complied with, some way or another, in order to complement the quality of the space with comfort, safety and other such things. In the specific case of the Mondego’s flood (it happened once in the last 15 years [interview held in 2013], and it was due to human error), I wouldn’t say that this should really affect the way we work. I don’t think this is something that shapes the project in a significant manner, except when the phenomenon is overvalued and leads to excessive restrictive ideas. So the issue is more how to bypass some restrictions than to comply with some good-behaviour norms.” <p>→ Difficulty to integrate in a more positive manner floods (or safety concerns) within the design, for they are perceived as technical issues that cannot add to the quality of the project</p>

Source: elaborated by the author

²⁶⁴ This question was not systematically posed to all respondents since it was added to the interview schedules after a large part of the Coimbra case’s field work had been carried out.

²⁶⁵ One of the scores in the Bordeaux case was not considered valid (and thus not included here) since it was possible to infer (during the rest of the interview) that the question had been misunderstood by the respondent. What was actually assessed (as “three or four”) was the perceived degree of flood risk in the Brazza area (and not the importance conferred to the flood issue within the urban project), as clearly expressed by the interviewee: “Brazza is an illustration of what can be done in a susceptible territory where the flood risk is relatively low.”

Table 18: Floods' importance within the design according to the interviewees from the Bordeaux case

I	Score	Main justification quote (•) and ensuing idea (→)
1B	10	<p>• <i>“It’s a difficult question; I am unable to give this evaluation. I mean, it’s not about Brazza, it’s about the whole right bank, and while we were trying to convince people to give more width to the river, it was of course related to floods. (...) So it’s extremely important, about quantity, about design; all this park [the Parc aux Angéliques] is directly related to floods, of course. But, the park does not give the rules for floods; I mean, there are a lot of regulations as you know (PPRI...), they are moving anytime, we have had to adapt our project to this moving regulation, but intuitively, in a very simple way, our park will help to deal with floods. So, an answer from zero to ten, I have no idea, but let’s say ten. It’s very important of course.”</i></p> <p>→ Design as an important flood-adaptation strategy should not simply comply with the existing flood regulations (which are not fixed, but also change with society’s expectations and goals)</p>
2B	10 or 4	<p>• <i>“It’s difficult... I mean, the way we assessed it, I could say ten; but the framework that we had to assess it was maybe four. (...) We put a lot of efforts to try to solve problems, but the framework that we had, the kind of legal freedom we had to do anything, that was very limited; so we had to deal with flooding issues within a very constrained situation or within a very constrained law framework.”</i></p> <p>→ When not open to negotiations, flood regulations may hinder better flood-adaptation solutions through design</p>
3B	8	<p>• <i>“I think eight because if flood was not addressed in this urban design, there would be no urban project (so it’s very one-on-one); and it’s not ten because still the biggest part of the work we did was urban design and not flood management.”</i></p> <p>→ The weight of the legal framework: flood adaptation is compulsory when regenerating flood-prone areas</p>
4B	8	<p>• <i>“[The issue] is not at the core of the project... but well, it still constitutes a strong constraint.”</i></p> <p>→ In spite of the increasing importance given to building environmental standards (which indeed became a label of project quality – not only in France), floods are not integrated within them</p>
5B	8	<p>• <i>“I would say that [the issue] was actually taken into consideration since the start, and this is very encouraging; what was really encouraging is the fact that both the municipality (the client) and the rest of the team said: ‘OK; we will take into account the flood risk just as it is.’ They did not try to bypass the issue, they did not hesitate... The team said: ‘OK, it’s floodable, this is how it is.’ And this is reflected in all the building typologies, several types of solutions were put forward... It’s also fairly easy to explain how the issue is taken into account, I think the eight score is also due to the fact that the project is ultimately feasible, meaning that we didn’t do anything complicated, and I think the chances are high that it will be actually implemented. Indeed, the project is realistic, the solution we came up with is realistic, feasible, and integrated into the plan guide; the eight score is due to the fact that the project is feasible, shared, and integrated into the plan guide. It’s not something that was just added on top of it.”</i></p> <p>→ Flood adaptation as the due integration of floods into the design’s process and output</p>
6B	2	<p>• <i>“Two, because we were really cooperative with all the rules they gave us; at the beginning we said: ‘OK, flood should not be an issue; we should adapt to anything they give us related to the flood. The important part is to have a quartier en liberté, and to have these negotiations happening between the five typologies of buildings that empower Brazza, either with the flood or without the flood.’ So every time they came and told us ‘This building etc. etc.’, we reacted positively directly, and we said ‘We want to resolve this issue at the beginning, and then move on’, because if not, every time we’re going to propose something, they will tell us ‘No, because of the flood, because of flood...’ (...) So we took all the constraints positively, but we never compromised on the design, we took them and we tried to have them part of what we have; and then forget about the flood [laughs] and move on (...)”</i></p> <p>→ In spite of the related legal framework, floods not viewed as a limitation for the design</p>

Source: elaborated by the author

The justifications for the lowest scores (4 in the Coimbra case and 2 in the Bordeaux case) are very interesting, since the idea of design underlying them is beyond the pure problem-solving approach, being more aligned with design as a means to move away from the *status quo*. Yet, both seem not to accept floods as a design issue, but to relegate them as a process external to the design sphere, as revealed by the expressions “*other such things*” (to refer to the second-order issues among which floods are included) or “*they gave us*” (floods as a first-order design issue are conveyed by the clients, not through the understanding of the site by the professionals). Curiously, the supported standpoints in the two respective statements as regards the floods’ legal framework are completely different. While the first interviewee considers that “*the issue is more how to bypass some restrictions than to comply with some good-behaviour norms*”, for the second one being “*cooperative with all the rules*” was a key smart attitude to get rid of floods as a design constraint. While the former denies the flood issue within the design as an avoidable “*human error*”, the second took the flood constraint “*positively*” in order not to compromise the design’s overall process and product, and thus to allow the flourishing of the other intentions for the neighbourhood (an attractive green quarter close to the city centre).

The discussion about the importance conferred to floods within the design task would obviously make less sense in the Antwerp case, since floods are intrinsically associated to the regeneration of the Scheldt Quays (the assessment question was hence not included in the interviews). Moreover, one of the specificities of the Antwerp case was the emergence of a particular theme related to spatial design (‘design as an open process’), for it did not follow the same traditional blueprint rationale as the other two cases (even if in Bordeaux the *plan guide* was not exactly conceived as a fixed one). In this regard, the theme ‘design as an open process’ has two complementary meanings: a design process that was open to the participation of an enlarged range of stakeholders, and a design product that is open to evolve with time. Although the prevailing stance towards design was not explicitly conveyed in each of the three cases, our understanding of it was based on the features presented in Table 19 (on the other hand, Table 20 compares the procedure used for contracting the design services in the three analysed urban projects).

Table 19: Main features of the stance towards design identified in each of the three cases

Coimbra	Antwerp	Bordeaux
Several problems to solve at once (except floods)	Several problems to solve at once (including floods) + raising meaning	Several problems to solve at once (including floods)
Urbanity as the design concern	Both safety and urbanity as design concerns	
The plan was not envisaged to evolve	The plan was envisaged to evolve along with societal (and market) needs	
The actual product as the design output	‘Research by design’ approach	
	The “planning game” and a flexible product as the major design outputs	A flexible product as the design output

Source: elaborated by the author

Table 20: Procedure for the selection of the design team in each of the three cases

Coimbra	Antwerp	Bordeaux
Open international design competition	Limited international design competition	Open international bidding (without a specific design proposal for the site)

Source: elaborated by the author

As in all urban-regeneration projects, the three cases had to face, negotiate and ‘solve’ several ‘problems’ at once through design, yet having in mind that technically speaking floods are always associated to a restrictive requirement, for they may endanger people’s life and bring severe material losses. Although being considered an important site constraint during the design process (especially after the 2001 event), floods were not explicitly included among the ‘design problems’ in the Parque Verde do Mondego’s project (safety was entrusted to engineering structures upstream), in contrast with the other two analysed cases.

Anyway, the design outputs to respond to the diverse challenges posed in each of these three singular situations present a simple layout able to withstand flood events (even if this formal trait is also related to other pragmatic issues, such as implementation costs, operationalization and the actual project feasibility). In the case of Coimbra, the simplicity of the design output was directly related to the fulfilment of the REN requirements, which imposed the maintenance of the permeability in at least 90% of the park’s area. For the designers in the case of Antwerp, the simple design equated to the accurate definition of two key elements: the location and type of the flood barrier (see quote in footnote 226, on p. 283). As for the Bordeaux case, the simplicity of the designers’ proposals lies in the autonomous character of the suggested flood-adaptation solutions (see quote on p. 335).

As an underlying quality of these three urban projects, simplicity goes in parallel with flexibility, also favoured within the design outputs. For example, the low occupancy of the Parque Verde do Mondego’s area potentially enables design adjustments and/or further developments in the future (that is, the implementation of more equipment), although this is not permitted by the current municipal land-use law. However, the master plan in the Coimbra case, although not completely binding, was not envisaged to evolve, even if its designers consider that “*design projects are interesting precisely because of their evolution*”. In the other two cases, the flexibility of the spatial proposal is most of all related to the future uncertainties in general; it is indeed a means to cope with the inherent contingencies of urban projects that are expected to be implemented in several years (or even decades).

In the Antwerp case, flexibility is the natural consequence of a master plan conceived as an open process that finally structures broad guidelines more than it puts forward strict rules for land occupancy and use on the quays (which would define the shape and size of future developments). On the other hand, the flexibility attached to the “*urbanisme en liberté*” motto in Bordeaux is closely linked to the implementation phase *per se*, the resulting *plan*

guide being indeed a flexible framework that may encourage the developers to ‘redesign’ its sections in which their own operations are located.

The simplicity and flexibility of the design product in these two cases can also be considered expressions of a particular way of conceiving the design process itself, as expressed by the ‘research by design’ approach adopted within them. In Antwerp this exercise was explicitly requested by the design commissioners in the project brief, while in Bordeaux it was embraced as designers’ planning methodological choice. Anyway, in these two cases, the problem-solving perspective was geared towards a more complex and process-oriented one, which included leaving space for different scenarios: the final design outputs were not fully anticipated, being thus allowed to evolve along with societal needs (and also market demands, in the case of the Brazza neighbourhood).

The “planning game” (PROAP, 2010, p. 210) proposed by the PROAP-led design team and submitted as its competition entry is a design output that timely expresses the collective process-oriented approach trailed by the team during the whole design process. The game was also a successful tool to bring to the fore a more intangible role played as well within the elaboration of the Scheldt Quays Master Plan: strengthening the meanings and values of the quays for Antwerp’s citizens. Although being orchestrated by experienced professional designers, the master plan was finally conceived as a collective endeavour, that is, as an occasion for civic expressions related to one of Antwerp’s most praised urban assets: the city-river interface.

In sum, in the Coimbra case we can distinguish ‘design’ and ‘floods’ as two different domains that crossed each other just by chance; they were actually taken as parallel processes without any intentional relationships. In contrast, given the resort to a defensive structure, the Antwerp case would conform to the classic ‘design *against* floods’, but thanks to the ambitious programme for the quays and the qualities of the attained solution, we can identify in this instance ‘design *and* floods’ as an integrated endeavour. In its turn, using the own words of the designers and stakeholders of the Brazza urban project (“*faire avec*” floods as a necessity), we can say that in the Bordeaux case we find a more pragmatic ‘design *with* floods’ as a manifest positive relationship (see Table 21).

Table 21: The dialogue between design and floods in each of the three cases

Coimbra	Antwerp	Bordeaux
‘Design’ and ‘floods’	‘Design <i>against</i> floods’, but also ‘design <i>and</i> floods’	‘Design <i>with</i> floods’

Source: elaborated by the author

When it comes to spatial designers themselves, two themes emerged from the analysed cases: ‘awareness not followed by proactivity’ (in Coimbra) and ‘flood-experienced design team’ (in Antwerp and Bordeaux). Although in the master plan for the Parque Verde do Mondego the designers demonstrated that they were aware of the flood issue, the plan itself did not show any clear repercussion of this fact besides recommending the compliance with the 21-m flood-safe reference level, defined (in a top-down manner) by the concerned authorities after the 2001 flood. One may argue that this situation possibly

illustrates a cultural barrier regarding the extension of architecture's traditional domain of action to include floods as a design subject. If so, it would probably be impossible for the designers to have a more proactive standpoint, even for those well informed about floods (and the flood-defence paradox would also play a role in this regard in such situation).

In Bordeaux, the achievements of the two 'flood-experienced design teams' (led by KCAP and YTAA) in conducting their tasks derive *inter alia* from the active role of all partners and their contributions to the design output, as referred to during the interviews (see quote on p. 347). In the pre-operational phase, besides KCAP itself, two other involved practices (namely Mutabilis and Ingérop) had previously worked with the design of flood-prone territories, being therefore well aware about the issue and the possibilities to deal with it through design. Being an important asset for their 'research by design' efforts, the KCAP-led team's previous flood-related design experiences were praised by the commissioner, as noted by an interviewee: "*we started our meetings with the city of Bordeaux showing also ways how we solved this problem for other projects in similar locations, and they were very happy to hear those explanations*".

In the ongoing operational phase of the Brazza project, although the team leader (the YTAA practice) had not worked with flood-adapted design before this *plan guide*, its partners (MDP and Ingérop) already had extensive experiences of dealing with and designing floodable sites, both in other cities and in other locations of Bordeaux's right bank. Another significant distinction of the Bordeaux case is the fact of having an urbanist with a geography background as the manager of the Brazza urban project. Indeed, the territorial sensitivity of this player not only fostered the elaboration of a timely archaeogeographical study for Bordeaux's right bank but also supported emphasizing floods as a crucial subject. In this regard, one may add that the overall performance of the designers in Bordeaux was favoured as well by the awareness of the commissioners (as discussed hitherto) and by their existing in-house flood expertise, although this is not specifically related to fluvial floods. Moreover, in this case, the design of the two analysed plans for Brazza was a truly interdisciplinary undertaking since the beginning, not following the traditional linear process that basically starts with the architect-urbanist's sketches and only later on, when these are well established, the engineers enter into the picture²⁶⁶.

Interdisciplinary design was also to some extent present in the Antwerp case, but differently from Bordeaux the interviews revealed that the municipal officers working on the Scheldt Quays' project got acquainted with flood issues along the elaboration of the master plan. The fact that these issues had previously been hardly known for them is quite understandable in that context, given the prevalence of a flood-defensive stance in Flanders and its neighbouring regions; indeed, the baseline conditions of this wet low-lying territory have always been defied, redesigned accordingly and highly controlled to enable its occupancy and use. Also in the Antwerp case, the expertise of PROAP as the

²⁶⁶ An emblematic example of this process is provided by Yaneva (2012) in her analysis of the Sydney Opera design; however, as referred to by the architect Eduardo Souto de Moura (2015), this linear process is gradually becoming outdated, in a context in which architectural projects are more and more collective endeavours.

leading practice in the design consortium was particularly complemented by the know-how of WIT, whose professionals had been working with ‘water urbanism’, either as academics or as designers, in Belgium and abroad. Indeed, in both the PROAP and WIT practices, the principal designers have also been active design scholars, a condition that certainly collaborates to the open-mindedness demonstrated in their professional activities.

Involving both professional and non-professional designers, the key stakeholders in each of the three cases are synthesized in Table 22, which includes the clients, the contractors (the design teams) and other important actors.

Table 22: Key (design) stakeholders in the studied urban projects

	Coimbra	Antwerp	Bordeaux
Clients	The Municipality of Coimbra Sociedade Coimbra Polis	W&Z The Municipality of Antwerp	The Municipality of Bordeaux
Contractors	The MVCC-led design team	The PROAP-led design team	The AUC design team The KCAP-led design team The YTAA-led design team
Other actors	The Mondego River (mainly the 2001 flood event) The regional water agency The regional body in charge of environment and territorial planning	The Scheldt River (mainly the 1976 flood event) Antwerp’s <i>stadsbouwmeester</i> The Flemish <i>bouwmeester</i> Antwerp’s inhabitants	The Garonne River (mainly the world-heritage status of its riverbanks) Bordeaux Métropole

Source: elaborated by the author

Interestingly, the ‘other actors’ line gathers very different categories of players in the three cases, besides the respective rivers. In Coimbra, under the label ‘regulation’ we can group the agency in charge of regulating the water issues (its major role in the project was described on p. 173) and the regional body in charge of environment and territorial planning (which ultimately defined the 21-m flood level for the design of the green park). In Antwerp, the other major players identified embody the category ‘spatial quality’, being composed by the two design-quality champions at the regional and municipal levels. In its turn, having only been involved in the terminal stages of the elaboration of Brazza’s *plan guide*, Bordeaux Métropole can be associated with the label ‘operationalization’, for it was at the time (and still is) the funding and implementation actor for the Municipality of Bordeaux’s in-house urban projects (since urbanism is under the remit of Bordeaux Métropole).

These three categories of actors (‘regulation’, ‘spatial quality’ and ‘operationalization’) are also good representatives of what was particularly at stake in each analysed urban project; at the same time, they put in evidence the remarkable difference between the three projects in terms of their implementation stages. When the works in the Antwerp quays and in the Brazza neighbourhood gain momentum in the years to come, the ‘other design actors’ will likely be more diverse; other categories may then represent them better than ‘spatial

quality' and 'operationalization'. The same ought to happen in the Coimbra case, when the subsequent segments of the Parque Verde do Mondego's project are finally implemented.

Despite the different forms of planning, design and implementation arrangements presented in the three cases, and the diversity of public bodies involved (or conversely, thanks to these peculiarities), three key professional designer roles with relevance for 'design and floods' could be extracted from the analysed urban projects: instigator, negotiator and orchestrator. In Antwerp, the role of instigator was performed by the Flemish *bouwmeester* and the *stadsbouwmeester* (namely in the elaboration of the design brief), as part of their general quest for spatial quality within the projects being elaborated. In Bordeaux, the engineering company Ingérop took such a role, first by technically supporting the design alternatives for dealing with floods, and secondly by giving continuity to the design process as a whole. At the same time, in both Antwerp and Bordeaux, the mayors were key champions of the two analysed urban projects at the time of their inception, being or having been personally involved in the entire design process, as referred to during interviews.

The designer as a negotiator was a particularly present role in Coimbra and Bordeaux: in the former, the head of MVCC was very active in trying to attenuate the restrictions then associated to the site's susceptibility to floods. In the latter, the head of YTAA successfully managed the transition in 2013 of the Brazza project from an exclusive initiative of the Municipality of Bordeaux to a shared endeavour of Bordeaux Métropole; more recently, the designer's negotiation task has been performed within the Atelier Brazza, the *plan guide*'s governance structure gathering developers and construction firms. The designer's negotiation role involves going beyond the technical endeavour of envisioning new spatial arrangements to also embrace the (more) political task of managing conflicting worldviews and goals. In Antwerp, the PROAP-led team held more the role of orchestrator than the one of negotiator, by setting the tone of the design process without imposing strict rules; like in an orchestra, several instruments and actors had to be mobilized and synchronized to produce a harmonic urban project.

To conclude the discussion about 'design and floods' within the three studied cases, we should recall an issue already raised in Chapter 3 (see p. 116): the limits of comparing design situations in different stages. Even if we have centred it on more substantive aspects of the cases, the analysis presented hitherto clearly shows the limits of associating the *ex post* evaluation of the concrete reality of a flood-adapted urban park (in Coimbra) with *ex ante* analyses of two proposals in their earliest implementation stage (in Bordeaux and Antwerp). Therefore, given this major difference between the cases, the overall analyses may seem stricter with the Coimbra case than with the other two.

Yet, the construction phase and the final appropriations and uses of the Scheldt Quays and the Brazza neighbourhood will surely bring to the fore in some years other flood-related issues worth to be reflected upon (just as the Parque Verde do Mondego did). For instance, it is now only possible to foresee the behaviour of these two urban projects during floods based on their well-intentioned flood-adapted design, but the actual experience may of course be different (at least regarding floods' sociocultural dimensions), just as the case of

other project contingencies. Shading light on this fact may be important at this point of the thesis to stress the tentative character of the potential research answers raised, which will be the core of the next section.

7.3 Searching for tentative answers

Having examined the three cases individually in Part II and in contrast to each other in the previous section, we can now go back to our research questions more generally related to ‘design and floods’ and try to answer them (these and the research objectives stated in Chapter 3 are recalled below in Table 23). Again, the ‘answers’ here enunciated do not aim to establish the ‘true’ rules for flood-adapted design (in a positivist sense), but to congregate some lessons learnt that may favour the combination of safety and urbanity ambitions in flood-prone urban projects. In this regard, we intended to mark this section with a speculative tone, while making a synthesis of the overall thesis.

Table 23: Summary of the research questions and objectives

Research question	Focus	Objective
What are the critical elements that can make possible the full integration of fluvial floods in the design of urban-regeneration projects?	Background	To grasp baseline conditions, strategies and mechanisms that can actively foster flood adaptation through design in riverine urban-regeneration projects
What are the possible (design) stances towards floods as regards adaptation?	Floods	To verify how fluvial floods are portrayed within design processes and outputs in urban-regeneration projects
What are the special roles (if any) played by the design activity when dealing with the regeneration of flood-prone urban areas?	Spatial design	To characterize spatial design as a flood-adaptation tool
Who are the key stakeholders in the process of designing flood-prone urban projects and which roles are fulfilled by them?	Spatial designers	To recognize which stakeholders and related disciplines have been enablers of an inclusive ‘design and floods’ perspective

Source: elaborated by the author

Concerning the first question, the cases pinpointed some possible background conditions favourable for ‘design and floods’ within urban-regeneration projects, although having in mind that design alone may not be enough to efficiently manage some particularly complex fluvial-flood situations. Being one of the major sociocultural dimensions of risk in general, the first of these factors seems to be ‘high flood-risk awareness’, initially concerning the design commissioners, but finally not restricted to them. Awareness indeed may support the inclusion of floods in an integrated manner into spatial design demands, but it may not be a sufficient condition to foster successful flood adaptation (as seen in the Coimbra case). The research clearly showed the weight of the sociocultural dimensions (namely flood-risk culture) to follow an adaptive path, which may be expressed for instance through the long-lasting relationship nurtured with the river, being it mostly viewed as a source of fear or a bonanza, in the case of port-cities. These sociocultural dimensions can also be well illustrated by the actual experience of past flood events, namely the ensuing damage and mitigation measures then engendered.

Besides ‘high flood-risk awareness’, one needs to duly ‘understand (hybrid) flood processes’ to successfully manage them through design. The comprehensive knowledge of the fluvial-flood situation to be tackled comprises first the understanding of the differences between the diverse flood types (for instance, flash floods do not have the same spatial expression as fluvial floods; therefore the mechanisms to be designed may be quite different in these two situations). Sometimes, it is equally necessary to verify interlinkages between floods from different sources (as it seemed to be the case in the Monastery of Santa Clara-a-Velha in 2016, when the Mondego entered the site due to backflows in the sewage system), since the damage potential is normally higher in these cases. ‘Understanding (hybrid) flood processes’ also entails accurate hydrological modelling to apprehend how the water will flow through the site (including its velocity, extension and depth) in different scenarios – not only in the worst-case one but also during more regular (minor) flood events. Moreover, ‘understanding (hybrid) flood processes’ implies taking into account always evolving flood-related human aspects (such as legislation or land-use prospects), as well as the effects of unconsciously designed flood catalysts (such as the ones derived from the flood-defence paradox).

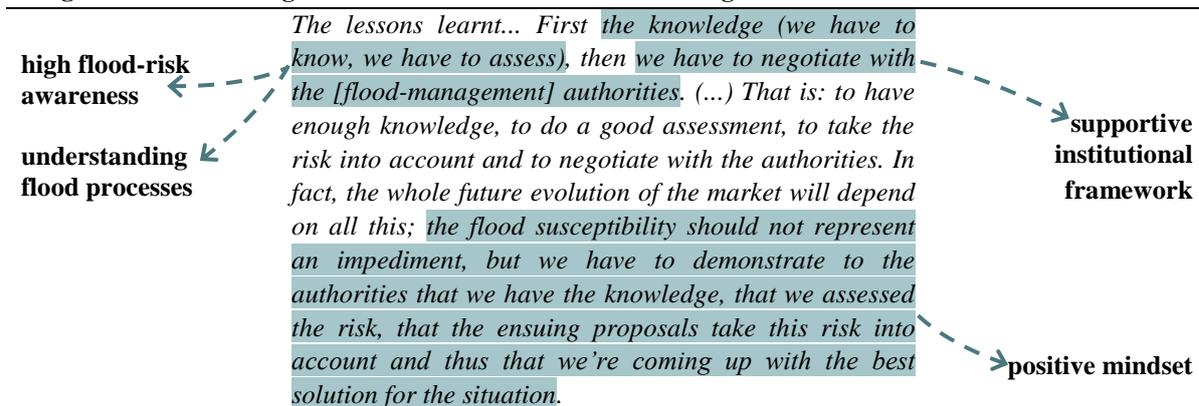
‘High flood-risk awareness’ and ‘understanding (hybrid) flood processes’ may yet not lead to fluvial-flood adaptation through design if a ‘positive mindset’ is not present. Indeed, a ‘positive mindset’ in which floods are not only viewed as a threat but possibly also as a territorial asset seems to be a major mainstay for a proactive approach through design. This condition should ideally be expressed by the promoters of the project (the clients), and embraced as a shared attitude among the stakeholders to actually frame the design’s process and output. In their turn, these three background ingredients of adapted urban projects – ‘high flood-risk awareness’, ‘understanding (hybrid) flood processes’ and ‘positive mindset’ – need to be complemented by a ‘supportive institutional framework’.

Being strongly anchored in the sociocultural dimension, the institutional framework related to floods is not at all static, while it somehow structures and at the same time illustrates the prevalent flood-risk culture. To encourage and allow designing flood risk consciously and collectively, this legal and political institutional framework should be supportive, that is, not purely restrictive but cleverly open to negotiations by the involved stakeholders. This final point was made clearer in an interview, when an informant from the Bordeaux case synthesized the major local lessons learnt regarding urban regeneration and floods using the following key terms: knowing, assessing and negotiating. Indeed, the four background conditions favourable for ‘design and floods’ highlighted here are present in her statement, quoted in Diagram 3.

These conditions are also well aligned with the arguments supported by the CEPRI (see quote in Diagram 4), even if these do not emphasize cities (with their physical structures and their inhabitants’ values and actions) as active co-producers of flood events. Although not present in this particular quote, ‘positive mindset’ and ‘supportive institutional framework’ are likewise important background conditions that underlie the CEPRI’s six technical principles to adapt urban-regeneration initiatives to floods (see p. 84). On the other hand, the condition ‘joint endeavour’ identified within the CEPRI’s quote will be

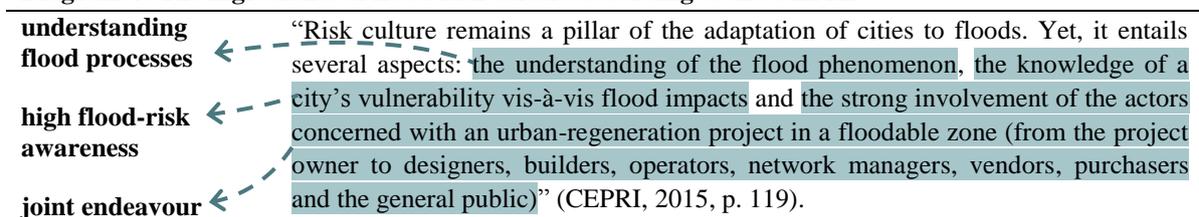
further discussed within the potential answers to our fourth research question, concerning spatial designers and other design stakeholders.

Diagram 3: Some background conditions favourable for ‘design and floods’



Source: elaborated by the author

Diagram 4: The ingredients of flood-risk culture according to the CEPRI



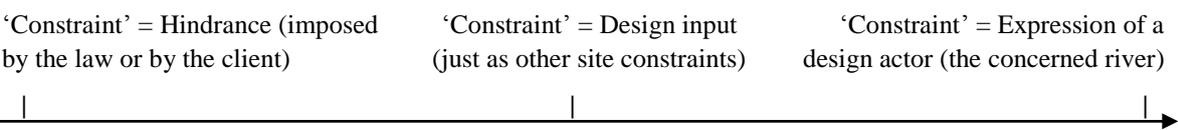
Source: elaborated by the author

Regarding the second question, a proactive stance towards fluvial floods seems to recognize and accept the involved ambiguities in the riverine spaces – such as disruption vs. stability, or preservation vs. change –, as they are actual expressions of the urban land-water interface (see Figure 44, on p. 93). Indeed, these ambiguities should not be refrained through design but showcased as assets of these particular spaces. Therefore, instead of positively valuing either one aspect of these ambiguities or another (then choosing to deal exclusively with the preferred one), these contrasting features should be added up within a design framework. To be more precise, when designing flood-prone urban-regeneration projects, instead of viewing floods as either a technical problem or a territorial asset, both facets should be equally managed; instead of concentrating on floods as either a physical or a sociocultural constraint, both dimensions should be scrutinized.

Moreover, instead of hesitatingly classifying floods as either an environmental issue or a landscape resource, both should be embraced, doing justice to the description of floods as an unintentionally designed “andscape”. Finally, instead of either relegating the issue as a sporadic (and undesirable) event yet to come or refraining any urban use or occupation because of the latent floods, one should bring floods’ temporality together with other site constraints and opportunities (while duly acknowledging its characteristics that may be actually dangerous to be experienced). In fact, all these design factors are not at all static; urban degeneration and regeneration processes are for instance good illustrations of cities’ temporality in practice, which is finally part of their spatial richness.

Based on this understanding of how floods should be viewed and incorporated within urban projects (that is, “how things could be” – the core objective of “research by design” as supported by Foqué (2010, p. 44)), it seems impossible to give a plain answer to our second question: ‘what are the possible (design) stances towards floods as regards adaptation?’ The possible stances actually vary in accordance with the physical and sociocultural particularities of each context, while viewing floods more negatively or positively derives from the combination of a multitude of related objective and subjective factors. Yet, the analysed cases suggest that floods as a design constraint can be perceived quite differently, following a general continuum, from the most negative to the most positive standpoint (see Diagram 5).

Diagram 5: The different understandings of floods as a design constraint



Source: elaborated by the author

On the left-most side of the continuum, ‘constraint’ takes the acceptance of an external hindrance (or encumbrance), to be ‘gotten rid of’ as soon as possible in order to allow the design to concentrate on other aspects perceived as more essential to a given urban project. Several possible reasons could be behind the negative standpoint of doing away with floods as a design subject, all of them having a cultural and/or disciplinary nature. First of all, the lack of knowledge on the issue does not encourage proactive stances; on the other hand, the lack of interest may represent a barrier to the access to knowledge – indeed, for some professional designers, it does not make much sense to invest in understanding such as a “para- or exo-architectonic” concern (Traganou, 2009).

This rationale reveals the importance of a supportive (legal and political) institutional framework in place, in order to ‘impose’ the due consideration of the flood issue. In the middle and right-most side of the continuum, another sense of ‘constraint’ is related to the particularities of the site (just like other limitations and assets), to which constant consideration is given during the design process; floods as a constraint in this sense are really integrated into the design. Moreover, in a more optimistic sense of the term, expressed in the right-most pole of the diagram, the flood constraint is related to understanding the concerned river as a design actor in its own right; within this perspective, one can truly embody an “andscape” stance.

These varying degrees of recognition would finally be revealed within the design processes and outputs of urban-regeneration projects. If within the EU Flood Directive floods are clearly portrayed as a territorial subject (more than a solely technical one), thus making spatial design a timely tool to manage them, the next step towards flood adaptation is perhaps dealing with them as a hybrid, a composite territorial and cultural subject. In fact, a proactive stance towards fluvial floods would comprise two interlinked dimensions: spatial adaptation – which is relatively fast and can for instance be fostered through design –, and sociocultural adaptation – which is usually a more complex and long-term

endeavour (no less important than the former) that ideally should also be tackled through design, as expressed in Hobeica and Hobeica (in press).

As such, the process of designing flood-adapted urban projects potentially involves the reformulation of objective flood parameters (such as water depth or velocity), as well as of subjective aspects related to the prevailing flood-risk culture (namely social perception and representation of flood risk). Yet, as remarked in the tentative answers to our first question, the redefinition and enhancement of flood-risk culture seems to be not only a consequence of well-designed adapted urban projects but also a background condition *per se* that must be fulfilled for these projects to be conceived as such.

Regarding the third question, the adopted stance towards spatial design in flood-adapted urban projects seems to be closely linked to the stance taken towards floods (and thus to the prevailing flood-risk culture), as anticipated in Section 2.6 (namely in Figure 42, on p. 92). Our research suggests that the design activity is in itself apt to be performed as a flood-adaptation tool even if it did not play any remarkable specific role within the three analysed cases, differently from some of the cases presented in Rossano and Hobeica (2014). In fact, when conducted collectively as a process, the design of flood-prone urban areas hardly differs from other design situations that take an evolutionary standpoint, as suggested by Prominski (2006). Yet, the research also suggests that Latour's "five advantages of the concept of 'design'" – modesty, attentiveness to details, intention to produce meaning, sense of improvement and ethical dimension (2009a, p. 3) –, dealt with in Chapter 2 (on pp. 56 and 88), are indeed crucial qualities for pursuing flood adaptation through spatial design.

To effectively reach this goal, it seems that design should be embraced as a process-oriented framework that anticipates contingent scenarios, while not intending to freeze its output, which can only be achieved with great doses of modesty, attentiveness to details and sense of improvement. As a flood-adaptation tool, the design process should not relinquish dealing with transitory states; conversely, the proposed framework should be able to evolve along with (physical and sociocultural) contextual changes, while safety and urbanity keep being equally handled in these varying states. The ensuing design output would thus acknowledge all the site's vicissitudes, as well as time and uncertainty, in an open manner, a condition that may imply for example resorting to temporary or seasonal uses and programmes. Ultimately some space can even be left, when possible, for the rivers themselves to be active co-designers.

As for the intention to produce meaning and the ethical dimension of design, they can strongly manifest themselves when sociocultural adaptation to floods is also closely associated to the task of spatial adaptation. In this regard, spatial design can be a suitable flood-adaptation tool since it can support not only physical and sociocultural adaptations at once, but also breaking barriers regarding urban and flood-management demands that apparently conflict with each other. When reflecting about the lessons learnt in Bordeaux regarding the regeneration of flood-prone areas, an interviewee who is an expert in this subject made a sensible statement that clearly pinpoints the major role design can have as an adaptation tool, in both the territorial and cultural senses:

We must try to find solutions that work as much as possible without human intervention during a flood; things have to work on their own. The water must flow, it must be channelled into the right spots. We must try not to add physical or mechanical protection devices: there shouldn't be things to be closed or moved during a warning, for these are quickly forgotten outside flood episodes, they stop functioning, there's no maintenance, and this is the real danger. The solutions have to be designed in such a way that they work well on their own. The other thing is that the water has to be made visible again in the city; in fact, compared to the past, people have forgotten, they have tried to think that all the water would systematically fit into the pipes and remain behind the dykes... This doesn't work. So the water has to be seen, so that people are aware of the risk; we must learn again to understand and know the risk. [emphasis added].

By considering flood management a spatial-design subject (in the same way as urban mobility, for instance), floods can be brought closer to people in both physical and mental senses. On the other hand, by practicing spatial design as a flood-management tool, the utmost objectives of protecting people and assets and reducing flood damage are obviously kept, while other potentialities linked to the riverscape can also be addressed. As illustrated by the traditional flood-management initiatives, taking a problem-solving design stance may be adequate only if one considers floods a simple (technical) issue to be solved, while when considering floods a hybrid condition, taking only this design stance seems to be insufficient to holistically tackle them.

Conversely, taking a sense-making design stance should not imply disregarding the materiality of floods, since the associated damage potential might actually be high. In sum, 'flexible process and product', 'anticipating contingencies', 'rivers as co-designers' and 'breaking barriers' are broad qualities that tentatively characterize spatial design as a flood-adaptation tool. Yet, spatial design is not a self-referencing tool: the goal of bringing together safety and urbanity (that is, 'design and floods' altogether) must be intentionally pursued by local authorities, territorial players and all stakeholders involved in the regeneration of flood-prone urban areas, including the professional designers themselves. Our research indeed showed that, besides the rivers in question and their peculiar variations, people are a key component of flood-adapted design, which brings us to the fourth research question and its potential answers.

In fact, being one of the most eloquent expressions of floods' sociocultural dimension, flood-risk culture is notably present in all tentative answers to our four research questions. It is not by chance that in Chapter 2 humans were highlighted at the centre of both the flood-risk triangle (in Figure 9, on p. 27) and the three design facets (in Figure 53, on p. 115). Considering that fluvial-flood adaptation through design should be an integrative endeavour in line with the "andscape" standpoint, Figure 282 combines the aforementioned figures in order to emphasize the importance of the human dimension within this commitment. Based on our research results, we cannot say that any particular discipline is more effective than others in duly enabling fluvial-flood adaptation through design; yet the research suggests that the disciplinary segregation as to dealing with floods (caricaturized in Figure 37, on p. 85) increasingly appears to be indeed outdated. Conversely, varying levels of disciplinary involvement with the tasks of supporting the due understanding of hybrid flood processes and of consciously intervening with floods seem more reasonable, as suggested in Diagram 6.

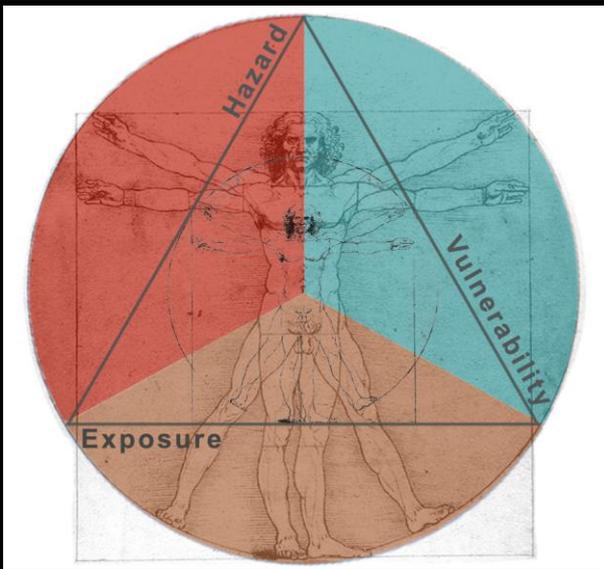
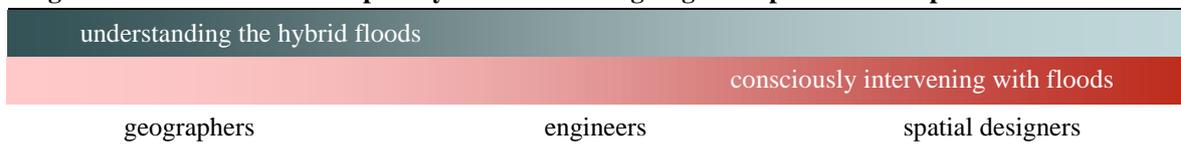


Figure 282: Humans are at the centre of both spatial design and flood risk

Source: elaborated by the author, based on Leonardo da Vinci's Vitruvian Man sketch (ca. 1509) and Crichton (1999, p. 103)

Diagram 6: Non-exclusive disciplinary tasks when designing flood-prone urban spaces



Source: elaborated by the author

Although the involvement of all concerned stakeholders (independently from their professional background) is a key condition for making feasible the regeneration of flood-prone urban areas, as previously stressed in the CEPRI's quote in Diagram 4 (on p. 371), our research suggests that the professional designers can have a particularly encouraging role in these processes, as instigators, negotiators and/or orchestrators. To this end, they should ideally demonstrate, just like the design commissioners, 'high flood-risk awareness', which could derive for instance from past professional experiences with similar background conditions. But familiarity with the issue may not be enough if designers do not show open-mindedness to deal positively with the complexity, the contingencies and the contradictions inherent to the hybrid floods.

Therefore, modesty – one of Latour's "five advantages of the concept of 'design'" (2009a, p. 3) – should be equally understood as a quality needed for designers themselves, in order to allow the necessary professional openness to engage in a process that should be truly a 'joint endeavour', as remarked in the CEPRI's quote in Diagram 4 (although that quote does not also emphasize the rivers themselves as design actors). To be successful, such a 'joint endeavour' should be carried out by an interdisciplinary design team in which each professional expertise adds up in order to holistically face floods through design. From the three roles the professional designers can perform in a 'design and floods' initiative, orchestration seems to be the most comprehensive one, for it ideally carries in itself the other two (instigation and negotiation, which should not be neglected), while recognizing the importance of each member of the (extended) design orchestra (the design team and beyond) for the accomplishment of its task.

7.4 Degrees of fluvial-flood adaptation through design

The three analysed cases have also clearly shown that ‘design and floods’ cannot be a straightforward stance, being completely dependent on the existing human-natural context in which each particular urban project develops. In any case, as we previously expressed elsewhere, “‘design and floods’ remains a search for an acceptable and sustainable compromise between safety and urbanity”, the two major design dimensions of flood-adapted urban projects (Hobeica & Santos, 2016, p. 623). Following this reasoning, we carried out an extrapolation exercise based in particular on the lessons learnt from the three selected cases, whereby we suggest a tentative scale to qualify the different degrees of integration of floods through design, having in mind the resulting design product. The ‘design and floods’ scale comprises three different stages: tolerating, accommodating and welcoming floods (see Figure 283); it does not intend to express various levels of urbanity and safety through design but the intensity of the interactions between these two components.



Figure 283: The ‘design and floods’ scale

The scale is intended to capture the degrees of fluvial-flood adaptation through design and the intensity of the interactions between urbanity and safety
Source: elaborated by the author

The proposed scale contemplates three stages of interaction: from coexistence, on the left, to integration, in the centre, and then to synergy, on the right. In the first stage, ‘tolerating floods’, the goals of urbanity and safety are handled with no clear relationships between them; they just coexist. ‘Tolerating floods’ is well exemplified by the Coimbra case: despite the high level of urbanity attained in the Parque Verde do Mondego, the design finally did not leave much room for experiencing the river’s intrinsic dynamics (now recognized as more anthropically driven), while safety is handled somewhere else (upstream, mostly at the scale of the river basin). The tolerance of the Mondego’s overflows within the park’s area therefore seems more related to a sense of resignation as regards the residual risk than the result of intentional (design) actions. From the experience of this particular urban project, we can tentatively propose that ‘tolerating floods’ may be a consequence of design and floods evolving as independent parallel processes.

The second stage is ‘accommodating floods’; from this point on, we can distinguish visible interactions between safety and urbanity, which are finally bonded to each other. This is for instance best illustrated in the Bordeaux case, through its pragmatic pursuit of hydraulic transparency, which preserves the space needed for the occasional overflows of the Garonne, as imposed by the law. To ‘accommodate floods’, it seems that design and floods have to be handled as simultaneous and interdependent processes; ‘design and floods’ thus constitutes an endeavour *per se*.

Finally, the third stage is ‘welcoming floods’, the most challenging one given existing spatial and cultural restrictions, yet the one in which “andscape” can be exercised at its best. This more intense stage can be expected when safety and urbanity extrapolate their respective precincts to synergistically compose a whole, in which floods take part instead of being excluded. Here design finally acts as a powerful tool to positively tie urban and flood-management requirements. In the Antwerp case, even if a defensive device was the intended design output, the ‘welcoming floods’ perspective could unexpectedly be attained in some urban segments of the quays (namely in the least occupied ones), thanks to the fostered close relationships between the objectives of both urban and flood management.

In any of these stages of adaptation through design, damage and disturbance are not impeded from happening, although they should be kept to a minimum; yet, at the higher end of the scale (that is, when ‘welcoming floods’), an overall benefit is obtained. For instance, when the disruptions brought by the water-level variations are faced in a more positive way, no disturbance in the urban life should take place. Instead, new temporary wet landscapes can emerge, bringing more diversity and dynamism to the urban realm, even if some damage is sporadically endured. Besides showcasing a positive stance as regards floods’ acceptance, ‘welcoming floods’ may reflect designers’ active engagement with both the social and territorial processes involved within the hybrid floods, as well as the provisional results of their continuous learning about dealing more comprehensively with such phenomena.

According to the specificities of each case, ‘tolerating’, ‘accommodating’ and ‘welcoming’ floods can nevertheless coexist in the same urban project (an alternative that perhaps seems even more likely). In any case, ‘welcoming floods’ cannot be directly taken as an attainable approach, since it may be simply unfeasible in some circumstances (as already expressed regarding the ‘living with floods’ mindset – see p. 48), mostly due to some particular flood characteristics. For example, in the *plan guide* for Brazza, at least two factors did not favour reaching a higher level of adaptation. On one hand, the permanent uses planned for the new quarter mean that people will actually live there, so vulnerability to floods in this situation implies much more than potential monetary losses. On the other hand, due to the hydraulic characteristics of the area (namely being a water-transfer site vis-à-vis inner sections of La Bastide), the local capacity of retaining water is particularly restricted.

In any case, the ‘welcoming floods’ stage is probably the most difficult one for spatial designers, since it implies a double design request: anticipating both dry and wet scenarios. Such spatial flexibility, which must be the rule as a means to face uncertain (flood) futures, can only be attainable through a truly interdisciplinary design practice. At the same time, when an urban space welcomes floods, another territory is potentially alleviated from the water burden (in a kind of spatial-equity exercise). In a sense, ‘welcoming floods’ leaves a margin for future interventions and further adaptation (in a kind of generational-equity exercise), without incrementing the flood-risk paradox while promoting inspiring urban environments. Figure 284 combines the ‘welcoming floods’ stage with Figure 282 (on p. 375), highlighting again the importance of the human dimension to actually foster the ‘safety *with* urbanity’ synergy through design.

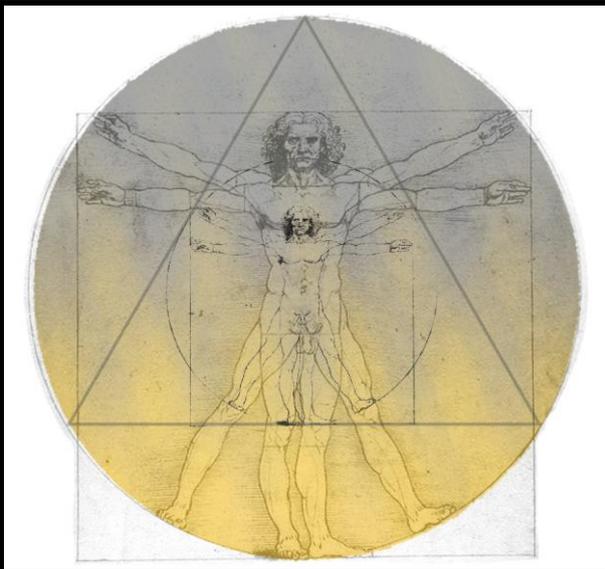


Figure 284: Humans are at the centre of the intended synergy between safety and urbanity

Source: elaborated by the author, based on Leonardo da Vinci's Vitruvian Man sketch (ca. 1509) and Crichton (1999, p. 103)

To further illustrate 'welcoming floods' within one of our studied cases, the premises of the Monastery of Santa Clara-a-Velha can be used as a theme for a hypothetical design exercise, considering the 'unexpected' return of the water into them. In view of this extrapolation, we should start by quoting an excerpt from an interview – including our question, which at the time (2013) was probably perceived as too naive by the interviewee:

Question: If the Monastery is flooded again in the future, are there, for example, any envisaged alternative paths or mobile installations that would allow it to be visited even partially submerged?

Answer: *When there is a flood, nobody even thinks about this. In a flood situation, be it in a hospital or in a heritage building, the premises are closed. When there is a flood, the whole country is focused on the flood, not on the visitors of this Monastery or any other heritage site. Therefore, since we hope these situations to be very very sporadic (it happened in 2001; since then, the only signs of high waters were this year, 2013), what we have to do is to reorganize the space and make it functional again. So the use of the space is compromised; it's a difficult coexistence in times of disaster.*

Even if our question was in a way misleading (a more adequate and correct wording for our question could have been: "When the Monastery is flooded again..."), the answer received anticipated a paradox. Despite being aware about the presence of the water in the site and having prepared the complex to withstand its effects, the involved stakeholders somehow dismissed the (negative but also positive) vicissitudes related to the occurrence of actual flood events, including their duration. As experienced in 2002 (when the archaeological works were still ongoing), the water trapped within the cofferdam could remain present for weeks, not only compromising some of the auxiliary infrastructures and the financial viability of the museum, but also hindering the tourism activity in the city. This was indeed the situation after the two 2016 floods, which left the complex inoperative for almost three months. Yet, the design product could have explored the possibility of 'welcoming floods' (in a kind of contingency plan), and thus making feasible the visits of the Monastery while submerged.

Such an innovative plan could provide a temporary, unexpected and fascinating opportunity to experience entering the flooded church through the upper floor, as it used to

be for centuries. For instance, resorting to movable installations, the former access through the open window in the upper floor could have been kept as more than a memory, to be used when the church's ground floor and the ruins of the cloister are under waters. Such a possibility was even put into practice during the civil works (see Figure 285, and compare it with Figure 143, on p. 200). Through such a flexible design, the use of this alternative entrance would give continuity to history, brought back to life at least in infrequent short periods, and would in a way do justice to the water and its crucial contribution to the archaeological conservation of the heritage across time.



Figure 285: The church's main improvised access, rehabilitated during the civil works

'Welcoming floods' in the premises of the Monastery of Santa Clara-a-Velha: if such an entrance had been kept as an alternative to be used during floods, the church could be still be visited during these events
Source: Costa (2008, p. 37)
(modified by the author)

Of course, some disturbance would be inevitable (as it was the case during the two floods of January and February 2016), but instead of being only blamed, new floodings of the Monastery could be taken as historical opportunities to temporarily live the heritage site in its century-old wet state. Although using a dry scenario, a very similar perspective was embraced by an initiative carried out in 2012 by the management of the institution, as described by an interviewee:

Last year [2012], we came up with an idea (a costless one), which was to recreate the 19th-century episode of an archaeologist who once decided to go on an expedition into the interior of the church: not without fear, he and two other persons took a boat and torches to navigate the dark waters under those arches. (...) So we replicated this scene at night (without water, of course), with a few torches, and it was a success that exceeded our expectations: 600 people participated!

This initiative indicates that 'welcoming floods' in this particular situation (that is, having a contingency access to be used during and rightly after flood events) could indeed have been highly valued by the Monastery's visitors. But since exposing the cofferdam was totally in opposition to the conservation stance then pursued, such contingent opening would probably not have been attuned with the overall design ambitions, even if it could have represented a possibility to unexpectedly play with history and memory, while floods would actually give continuity to the former.

7.5 Chapter summary and main conclusions

This chapter brought together the issues raised in the three studied cases in an aggregate manner as a means to highlight a number of background elements and specific mindsets related to floods and spatial design, as well as some traits of spatial designers, which in combination may favour ‘design and floods’. The major baseline conditions identified and the proposed components of a holistic stance towards floods are synthesized in Figure 286 and Figure 287, respectively. On the other hand, Figure 288 contains some components of a proactive stance towards spatial design, while Figure 289 sums up some expected qualities of spatial designers to adequately perform their roles within ‘design and floods’.

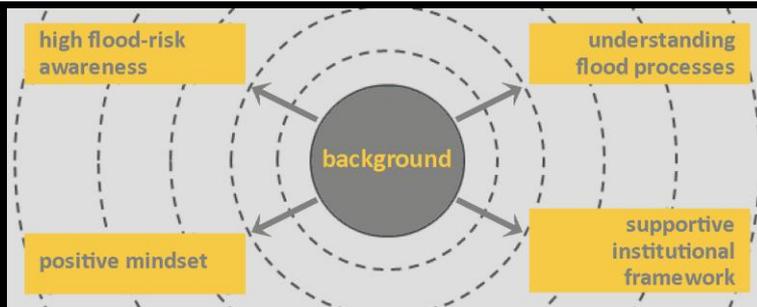


Figure 286: Key favourable background conditions for ‘design and floods’

Source: elaborated by the author

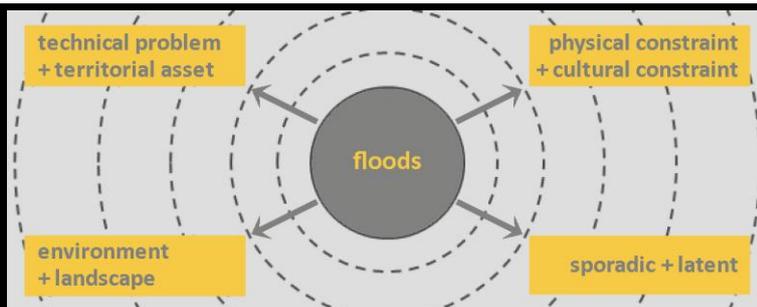


Figure 287: Towards a holistic stance vis-à-vis floods

Source: elaborated by the author

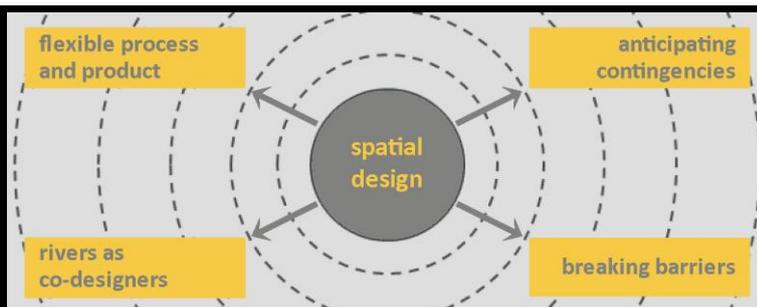


Figure 288: Towards a proactive stance vis-à-vis spatial design

Source: elaborated by the author

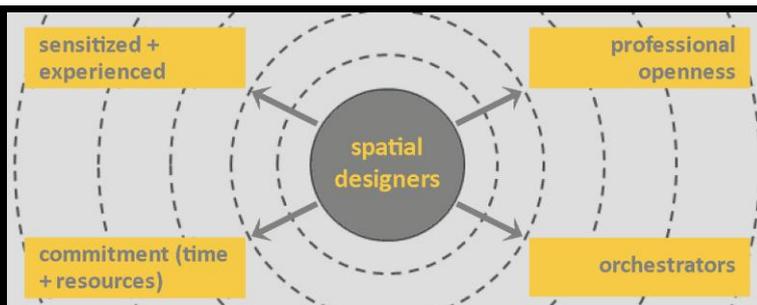


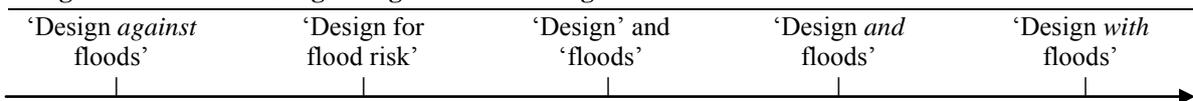
Figure 289: Some qualities of spatial designers to adequately perform ‘design and floods’

Source: elaborated by the author

Although arising from a coupled flood-management and urban-development demand, ‘design and floods’ may not correspond to an actual intertwining of these two processes, which can be perceived and performed as parallel ones, as illustrated in the first of the proposed stages of flood adaptation (‘tolerating floods’). Conversely, in a deeper ‘design and floods’ perspective, experiencing minor and manageable floods may be taken as a mechanism for preserving and nurturing the much needed flood-risk culture. When closer interlinkages between urbanity and safety are explicitly required for example by the design commissioners ever since the project brief, ‘design and floods’ may indeed extrapolate the problem-solving approach to reach a more thorough adaptive stance that can enrich the urban realm while also leading to safe flood events.

Moreover, when the design task is performed as a dynamic endeavour that consciously integrates flood processes themselves as a compositional element, ‘design and floods’ eventually evolves into a more intense ‘design *with* floods’, in which these two processes somehow transcend themselves to form one comprehensive whole, in line with the synergy between safety and urbanity in the ‘welcoming floods’ stage. Just as ‘welcoming floods’ is proposed as the most intense stage within a continuum, ‘design *with* floods’ could also be compared with other forms of dialogue between ‘design’ and ‘floods’, as illustrated in Diagram 7.

Diagram 7: The increasing dialogue between design and floods



Source: elaborated by the author

Keeping the “andscape” perspective (that is, taking into account the dynamic relationships between living and non-living organisms and their settings), design itself is faced as a process in ‘design *with* floods’, while hybrid flood processes are taken as an element of design. Moreover, while river dynamics are not exactly prevented, their occurrence in relationship with the human (urban) environment is somehow anticipated. At the same time, ‘design *with* floods’ reminds us of the continuity of the adaptation challenge, in a parallel with the arguments of Pelling (2011, p. 163), when suggesting “adapting *with*” climate change instead of “adapting *to*” it (as discussed in Section 2.6, on p. 91). To exemplify the pertinence of such analogy, some of Pelling’s arguments could be paraphrased as follows (2011, pp. 164-165):

What are the consequences of moving from seeing [flood] risk as an external threat to [urban] development to accepting that it is both a product and driver of [urban] development? (...) Living with [floods] means accepting future hazards cannot be planned out, or even necessarily predicted. Rather than seeking ever more precise technological guidance and solutions (...) we need to learn how to live with the fuzziness of [floods]. Indeed what need to be made visible are not only the physical forcing mechanisms but also the human processes driving [floods] and the distribution of [their] impacts.²⁶⁷

²⁶⁷ Original quote (Pelling, 2011, pp. 164-165): “What are the consequences of moving from seeing climate change risk as an external threat to development to accepting that it is both a product and driver of development? (...) Living with climate change means accepting future hazards cannot be planned out, or even necessarily predicted. Rather than seeking ever more precise technological guidance and solutions the

‘Design *with* floods’ as a means to ultimately ‘welcoming them’ may at first sight seem a utopian goal, but this does not need to be negatively understood as intrinsically unattainable. We adhere to the positive sense of utopia presented by Secchi and Viganò (2009, p. 9), departing from Thomas More’s seminal book *Utopia*:

Utopia is not synonymous with evasion from reality. (...) On the contrary, starting from a critical view of the current world, (...) Utopia is a great leap of the imagination to envision a world that is better than the present one. A plan has always a utopian dimension and takes a kind of critical distance from existing situations in exploring and probing a possible future. [italics in the original]

This standpoint is closely aligned with the ideas put forward by the sociologist Ruth Levitas (2013, p. 122), for whom, in its broadest sense,

utopia may be defined as the expression of a desire for a better way of living, which may take many forms (...). These forms are socially constructed: imagining an alternative society in the future is one manifestation; so too is an idealized representation of the present. (...) Utopia is always a form of counterfactual thinking, although not always self-consciously so. What is abandoned in this definition is the pejorative connotation of utopia, as impossible and unrealistic.

Following these two arguments, all major spatial-design endeavours are intrinsically utopian, since it is through a “great leap” of creativity that design accomplishes its ameliorative intentions. And ‘welcoming floods’ should be regarded exactly in this sense: a provocative image to encourage thinking and designing (*with* floods) differently, towards the envisioning of future urban scenarios in which people prevent damage from fluvial floods without eliminating them *per se*, but rehabilitating them as complex and inevitable human-natural processes. The exercise considering the premises of the Monastery of Santa Clara-a-Velha, presented on p. 379, had the intention to illustrate how ‘welcoming floods’ could be concretely pursued while it still seems a utopian image.

In any case, even if one takes into account the pejorative connotation of utopia, it seems quite reasonable to argue that embracing floods through design is as utopian as the idea of human defence against floods (as stressed in Section 2.4). It is precisely through the positive sense of utopia that ‘design *with* floods’ should be considered, since it goes in the opposite direction of the flood-defence paradox. In fact, instead of feeding the chimera that floods can be fully eliminated and are thus a past and solved issue, one can positively wait for their return, in a safer mode, whenever they happen.

Moreover, the idea of ‘design *with* floods’ as a means to possibly ‘welcoming them’ has the power of framing differently an issue that is often viewed only through the negative prism. Perhaps it is worth mentioning an account made in this regard by one of the interviewed designers, an expert in designing flood-prone territories:

urgency of climate change adaptation suggests we need to learn how to live with the fuzziness of climate change. Indeed what need to be made visible are not only the physical forcing mechanisms but also the human processes driving anthropocentric climate change and the distribution of its impacts.”

I think that people in general like to think in terms of progress, they don't like to think in terms of danger, and that's a problem we have as designers, when we talk about flood risk, is that nobody wants to hear about flood risk, I think, in general. It's nice if you talk about it if it's in Jakarta, but they don't want to hear that the place where you live is actually exposed to flood (or to anything else). And I think, in my experience in flood-prone areas, that the people generally have a vague idea, but the fact that they are exposed to more danger doesn't mean that they are more aware of it; it means that they are ready to pay to be protected from it. And I think that's a bit the trouble we have: it is extremely interesting and important to talk about floods, but it is very difficult because a lot of people don't want to hear of it, they just want you to take care of it, that's it.

This quote perfectly illustrates the double challenge involved in the regeneration of flood-prone urban areas: to merge spatial and sociocultural adaptation to floods into a single design process (see Figure 290).

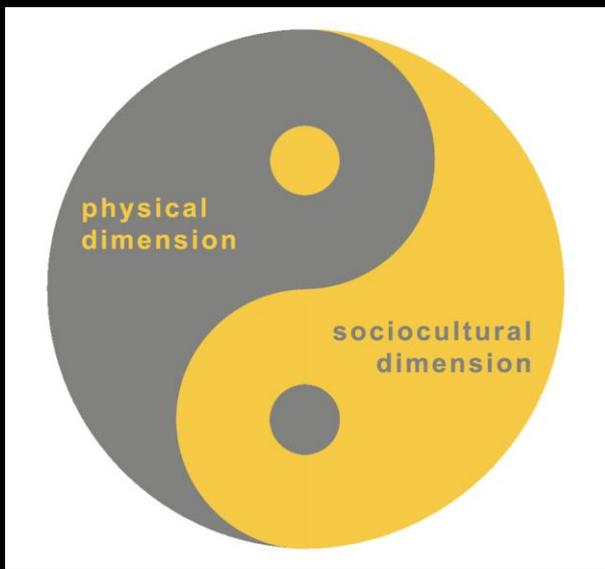


Figure 290: The yin and yang dimensions of flood-risk adaptation

Perhaps a more useful (and dynamic) conceptualization of flood risk for the design practice?

Source: elaborated by the author

As heralded by the socio-hydrology proponents, it is definitely in the interactions between floods' physical and sociocultural dimensions that 'design *with* floods' finds its niche to welcome contingencies without necessarily being a stressful experience. Another quote from the same interviewee brings a worthy question to the conclusion of this chapter:

Variations are more stressful [in the urban setting] because the whole system can collapse, and they don't call for a healing process, which you have in the countryside, where people collectively will clean the streets or get the stones out of the river, or clean the woods. So I think it's a double problem: one, you're not prepared to the stress of a destruction; and two, you don't know what to do after (and during) the destruction. This is something that somehow would be interesting to wonder how you can bring this back.

'Design *with* floods' may be a path in the search for possible answers to this question. Present-day European cities do not need to wait for harmful flood disasters to have the opportunity to safely reinvent themselves and enhance urban life.

8 Conclusions and implications

This chapter constitutes the most challenging part of the research, especially considering the constructivism paradigm, which is the delineation and aggregation of its conclusions, as well as their possible contributions and implications in terms of theory and practice. Given that knowledge is in this framework considered always provisional and its production ongoing, in order to write this final chapter we should however assume that some timely lessons about fluvial-flood adaptation through design based on the three analysed cases were (at least partially) extracted. In any case, the major argument or the actual thesis raised throughout this study is quite clear at this stage: just like floods themselves, ‘design *with* floods’ – that is, fluvial-flood adaptation through design – has indeed two crucial dimensions (physical and sociocultural), and the players involved in either flood management or urban regeneration (designers in particular) should be aware of and concomitantly deal with both.

In this regard, when it comes to floodable urban-regeneration projects, the design task needs to extrapolate the strict spatial realm – that is, the reduction of the physical vulnerability of the built environment to floods while providing inspiring urban solutions – to reach the underlying mentalities, hence associated to the vulnerability in a wider sense. This double engagement constitutes after all a reasoning parallel to Langenbach’s insight on flood-defence systems (2007), presented on p. 13.

Accordingly, the two aspects enunciated in Section 3.1 – the ‘how to’ and ‘how come’ questions related to fluvial-flood adaptation through design – complement each other and cannot be dissociated. But while ‘how to’ adapt to floods through design is much more straightforward and frequently highlighted in the relevant literature (as stressed in Section 2.5), ‘how come’ seems to be the most pressing contemporary question. Indeed, the well-documented ‘how to’ is generally perceived as necessary and sufficient, but the analysed cases pinpointed that in reality this appears as a rather biased perception, since the means related to ‘how to’ adapt to fluvial floods ultimately have to be weighted against all other project demands, thus representing an increased process complexity, notably in terms of concerned actors, timeframes and decision-making. The adjustment of this perception is part of the required cultural transformation underlying flood adaptation, since the involved parameters are of a social nature, being hence totally related to the ‘how come’ question.

Actually, the research results stressed that the physical (spatial) adaptation to fluvial floods can only be duly pursued if a supportive flood-risk culture is in place, which accepts the paradigm of ‘living with floods’ and can thus encourage effective adaptation through design. For instance, the major questions raised in Terrin (2014), presented on p. 77 and in Table 2 (on p. 98), can only be partially understood if approached solely through the ‘how to’ prism, since their essence concerns much more than the simple matching of the best flood-adaptation solution to a given urban situation. On the other hand, when using design

as a flood-adaptation tool and presenting it as a timely method to address floods within urban-regeneration initiatives, Bonnet's accounts of the French workshop on risk-susceptible changing territories (Bonnet, 2016), introduced on p. 101, indeed touch upon the 'how come' question in several instances.

Our research has shown that, like in the management of risks in general, people are a central dimension for the integration of floods into urban-regeneration projects, while the rivers themselves are likewise key actors, since not all of them propitiate the conditions needed to design for safely 'living with floods'. Therefore, when feasible in concrete terms, reframing floods as an opportunity is also needed to open a window for the reconversion of some non-territories into liveable ones, which is only possible through a proactive flood-risk culture. Acting as a catalyst for the involved stakeholders (including spatial designers), this critical ingredient can appropriately promote the understanding of the fluvial-flood phenomenon and the existing urban vulnerabilities, in order to support higher degrees of flood adaptation.

In theoretical terms, the formulated conclusions could contribute to the broadening of the Urban Flood Management framework, introduced at the end of the literature review (see p. 87), into an Urban Flood Design and Management one, which would clearly acknowledge the hybridity (or the underlying "andscape") condition of floods. This enlarged framework would thus reveal humankind's true role within fluvial floods, which may be not always negative, in terms of aggravating a given flood-prone situation, as it is usually attributed. And to do justice to Kandinsky's claim geared towards inclusiveness, we bring here two statements about the Mondego that apparently conflict with each other (see Figure 291 and Figure 292), which in fact should be taken as both valid and complementary (stability *and* transience are innate traits of all rivers).

A thorough exercise of unveiling potential positive effects of an "andscape" perspective in riverine settings – a condition intrinsically associated to an adaptive track – may indeed illuminate spatial design's tasks related to floods (that is, 'design *with* floods'). Necessarily interdisciplinary (or even transdisciplinary, one may coherently argue), this exercise comprises at least two major complementary stages: the formulation of scenarios and an ensuing synthesis. Intertwining spatial and temporal scales, the envisaged scenarios should favour an "andscape" stance, which demands the blurring of barriers with respect to human and natural processes to eventually generate safe and sensible river spaces. Moreover, the involved dynamics (both river fluctuations and the ever-changing sociocultural aspirations) should be mirrored by the design process itself, which should be carried out in a way that allows the evolvment of the design product.

At the same time, the scenarios should not only focus on the worst (flooding) case, but also on the range of alternatives from which it is possible to benefit from optimizations and trade-offs, as in the sense of adaptation advocated by the UNFCCC (see p. 45). In this regard, designers at large should be aware that not only are they arranging and defining spatial settings for current (normal) day-to-day situations, but they are also designing floods in general in the longer term, particularly the ones associated to the residual risk (having a low probability and a high damage potential). Therefore, 'design *with* floods' can

ideally be seen as a means to future-proof riverine cities vis-à-vis the uncertain climate-change prospects.



Figure 291: One of the two ‘either-or’ states of the Mondego: stability

The graffiti affirms: “Water always finds and maintains its level”

Source: author’s archives
(19 November 2017)



Figure 292: One of the two ‘either-or’ states of the Mondego: transience

The graffiti affirms: “This is a river, never the same”

Source: author’s archives
(19 November 2017)

As for the synthesis, ‘design *with* floods’ requires an inclusive point of view that, going beyond the assessment of floods as a technical issue, also explores the aesthetic, sensorial, symbolic and ecological roles they may play in the urban settings. This task with a very open scope calls for the active involvement of stakeholders with different backgrounds. Such a wider participation in the design process may promote the exchange of invaluable inputs and facilitate structuring consensual territorial visions beyond problem-solving; as a result of these exchanges, some solutions and arrangements not previously thought of can actually emerge.

This collaborative approach can not only act as a powerful sensitization tool (hence bringing floods closer to people’s daily lives) but also increase the players’ sense of project ownership, which in its turn can favour the construction of a more positive perception of floods, as already anticipated in Rossano and Hobeica (2014). To orchestrate the negotiations needed to ‘design *with* floods’, designers have to develop both hard and soft skills; that is, besides their creative and prospective abilities, human and project management capabilities, such as openness, perseverance and diplomacy, are required, somehow characterizing the roles of instigator, negotiator and orchestrator revealed in the three analysed cases.

When facing flood-prone urban-regeneration projects, spatial designers need to be, as always, inquisitive and creative generalist professionals, but also develop a higher degree of humility to admit not knowing everything and thus the need to closely collaborate with other professional domains. Moreover, they need to demonstrate generosity, that is, the capacity to share the design practice (and the associated accountability) with other people and processes, including the rivers themselves. In his conference in the framework of the “2015 Álvaro Siza Lectures”, Moura (2015) has precisely highlighted that the ideal image of architects comfortably working in isolation in their practices has gradually become outdated, given the programming and technological complexities of present-day architectural interventions (the design process and product for the Antwerp quays are particularly illuminating in this regard).

This trend brings an interesting issue to the fore: in fact, the designers’ task of reframing mentalities does not concern solely the commissioners and other stakeholders involved in the design; adapting urban spaces to floods also means the sociocultural adaptation of professional designers themselves to truly account for more dynamic environments and processes. Yet, several barriers seem to exist in this regard, as already anticipated in Section 2.5. For instance, when dealing with floods’ unstable conditions, the urban project has to anticipate potential scenarios but not to freeze the future, in the sense of restraining the inherent mutability of the spatial setting. The ensuing openness needed in the design proposal is not particularly cherished by architects, as expressed by Portas (2011), quoted on p. 60, although some laudable exceptions do exist (see Rocha’s quote in footnote 65, on p. 64). At the same time, contingencies cannot be omitted, as argued by Till (2009), but should be faced as an innate attribute of ‘design *with* floods’.

Likewise, as argued by the architect Jorge Figueira (2017) in a recent debate about the place of architecture among social sciences, architects are presently faced with the dilemma of choosing between “agoraphobia” and “claustrophobia”. While the former is associated to the professional fear of the dissolution of the architecture discipline (as presented in Figure 19, on p. 57) or of the ‘open design’ suggested by Portas (2011), the latter is related to the fright of the closure of the architectural practice in and for itself, exemplified in Rossi’s ideals (1966). If architects (and designers in general) have to opt for one of these two opposite poles, this research has leant towards claustrophobia, although advocating integration and avoiding such bipolarities – often needed to facilitate the understanding of complex issues, but necessarily artificial, as stressed by Latour (1993).

This inclination is notably based on the fact that the agora was spatially and conceptually the core of the city when it emerged as a complex democratic sociocultural phenomenon. Indeed, epitomizing all urban public spaces and the possibility of unusual encounters, the agora has been the locus in which the richness, beauty and tolerance developed in “the human invention *par excellence*” (Lévi-Strauss, 1955, p. 127) fortunately unfold, as attested for example by the longstanding work of the architect-urbanist Jan Gehl (Gehl & Gemzøe, 2000). Moreover, only the agora has the power to foster the envisioning of buildings and other wider spatial relationships as debatable “matters of concerns”, and not as mute “matters of facts” (Latour, 2009a). As discussed in Section 2.5 (on p. 58), the

quoted authors who refer to the enlargement of the architectural sphere of action – Vidler (2010), Sarkis (2014), Heynen (2016) and Kullmann (2016) – do not seem to be worried about the mischaracterization of their respective professions, but rather they acknowledge the fine-tuning (adaptation!) of an ancestral practice to our fast-changing contemporary world. A parallel can be made, for instance, with the adjustments needed in architecture as a standalone discipline when it had to integrate its practical know-how into the academic realm, as aforementioned (see p. 109), according to the accounts of Krüger (2001) and Foqué (2010).

Consequently, in order to effectively ‘design *with* floods’, designers do not need to perceive the exchanges with other domains as a dissolution of the architecture discipline, for interdisciplinary interactions are a crucial condition to go beyond strict problem-solving approaches towards providing riverine spaces that are both safe and liveable. Hence, ‘design *with* floods’ necessarily encompasses not only the acceptance of a double design request (as illustrated in Figure 41, on p. 91), but also welcoming the others (people and disciplines) and the unforeseen. Looking backwards, if we had to rename this thesis, an alternative, bolder, title to the chosen *Design with floods: turning threats into opportunities for/in urban projects* would be *Welcoming floods through design*, as a means to highlight the positive stance needed to embrace the involved contingencies. Such designation would more explicitly reflect the necessarily collaborative mode of dealing with floods, in which all the concerned stakeholders act consciously as ‘flood designers’.

Although deliberately designing fluvial floods is definitely not a mainstream idea, the increasing sensitization as regards the issue suggests that time has now come for the positive incorporation of floods and the gradual improvement of urban-regeneration projects accordingly. Indeed, the flood issue seems to be trailing the same path as other environmental concerns that are today taken for granted, which also required decades to be duly internalized into planning and design practices (as highlighted in a quote on p. 340). One of the first steps in this direction would be the full recognition of floods as a legitimate design issue by the design community, a move that duly fits into the present enlargement of the architectural sphere of action. Floods could quite straightforwardly be included among some of the crucial topics that constitute architecture’s new and multifarious “front” (Aravena, 2016), as showcased in the last Biennale Architettura (the 15th International Architecture Exhibition), in Venice in 2016 (see Figure 293).

Similarly to quality of life and sustainability, floods require a positive mindset and a high degree of openness to be pursued through design (although the term ‘battle’ may not be the best one in this context, since it may easily be associated to defence and hard-infrastructure solutions). Moreover, differently from other issues such as segregation, inequalities and pollution, fluvial floods should not be just negatively associated to evils to be eradicated, but taken as an inevitable amalgamation of sociocultural and natural dynamics (in a truly “andscape” perspective). Fortunately, many of these interactions can to a certain degree be anticipated (the emerging socio-hydrology domain is a promising endeavour in this sense) and thus better and more cautiously designed.

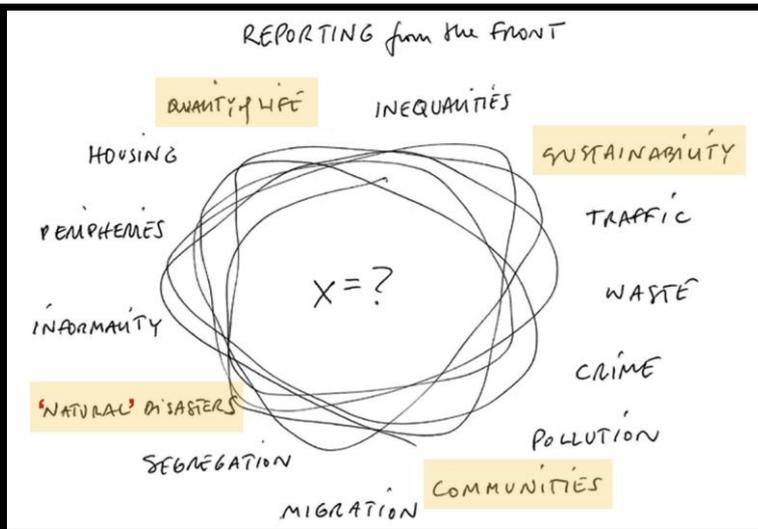


Figure 293: “Battles” to be addressed by architecture, theme of the 2016 Architecture Biennale Scheme elaborated by the architect Alejandro Aravena, curator of the exhibition (the topics in which floods could be included were highlighted by the author)
 Source: Aravena (2016, p. 22)
 (modified by the author)

Sharing the same spirit with the Biennale Architettura 2016, the first World Design Summit, held in Montréal in October 2017, had the general aim of unleashing the power of design to start consciously shaping our living world of the future. Congregating architects, graphic designers, industrial designers, interior designers, landscape architects and urbanists, the event addressed 6 key thematic areas (“Design for earth”, “Design for participation”, “Design for transformation”, “Design for beauty”, “Design for sale?” and “Design for extremes”), embracing 108 questions that are transversal to all the disciplines of those professionals (WDSO, 2017). As a genuinely complex design subject of our present society, floods could be included in any of these thematic areas, and similarly to key focused issues such as degrowth or spatial justice they require a collaborative stance from the involved stakeholders (designers, clients, contractors, final users etc.) in order to be properly dealt with.

In this regard, among the possible implications of the research, one is related to the present training of architects and urbanists. In fact, since the issues discussed here are still generally perceived as “para- or exo-architectonic concerns” (Traganou, 2009), not all spatial designers are interested in or prepared to face the challenges of designing with floods. Indeed, the levels of interest, sensitization, knowledge and experience vary widely among the several design professionals we met in the course of this research, which may indicate that there is still a long path to be trailed for them to be better equipped with the hard and soft skills needed to perform this enlarged design task. The reinforcement of the notion of territory (taken as meaningful spaces with use), coupled with the understanding that any spatial intervention occurs within a river basin (as recalled by Alday and Jover (2009), quoted on p. 75), could be a timely incentive in this sense. The close disciplinary intertwining between geography and design is particularly illustrated in the proper epigraphs chosen for the three parts of this thesis, which intended to highlight the bonanza that riverine urban spaces represent, especially when floods are viewed not only through negative lenses.

In a way, this research has only provided a sample of the broad range of new research possibilities offered in the intersection of these two disciplines. It indeed left us with two complementary aspirations for the future: from the theoretical point of view, we would be

interested for instance in exploring the full use of the Actor-Network Theory (Latour & Yaneva, 2008; Yaneva, 2009; 2012) to scrutinize flood-prone urban-regeneration projects, for this method appears as a powerful means to further investigate the ‘how come’ question related to fluvial-flood adaptation. From the more practical point of view, we would also be eager to collectively carry out ‘design *with* floods’ in a concrete situation, including through the resort to other, more practice-oriented, research methods, such as the ‘research by design’ approach (Till, 2001; Fabian & Viganò, 2010). This aspect can be related to another issue that would also be interesting to focus through ‘research by design’: to what extent can the design-adaptation role be instigated in contexts with more informal urbanization processes, as the ones currently found in the cities of the developing world (especially that in these contexts architects and urbanists have a very important role, beyond the conventional ‘product-oriented’ one)?

At the same time, since the followed constructivist standpoint implies that the conclusions and lessons learnt are necessarily tentative (as they evolve with the phenomenon under study), the research has left several open questions as regards designing *with* floods. In this sense, questions seem to be better drivers to advance knowledge than final answers. For example, based on the experience of the three studied cities, we could wonder whether there is any relationship between the historical defensive strategies to face major riverine floods and the current incidence of pluvial (urban) floods. In fact, one hypothesis would be that the former has been unconsciously designing the latter, by impeding the inherent drainage of old minor watercourses into the main river. Such a theme would not only articulate geography and spatial design but also involve other perspectives – those of history and sociology for instance –, paralleling in a way the stances of archaeogeographical and socio-hydrology studies (Lavigne, 2010; 2012; Di Baldassarre *et al.*, 2017).

The three analysed cases raised as well new internal conjectures worth to be further researched, such as: what if the project of the Parque Verde do Mondego would be conceived today, with climate change as an additional (or a stronger) design input? Although generally evolving in the same context, how do the various concurrent floodable urban projects of Bordeaux’s right bank differ in terms of design problems and responses? Without necessarily having to undergo a destructive focusing event, what could currently spur the implementation of the master plan for the Scheldt Quays? At the same time, we now wonder how the analyses of flood-prone urban projects could be enriched if carried out collectively in a more formal interdisciplinary mode; in other words, what would be the questions, concepts and methods potentially brought by geographers, engineers, hydrologists, sociologists and other disciplines that could support a better understanding of ‘design *with* floods’? And how could spatial designers benefit from this transversal knowledge to better perform their roles to promote higher degrees of flood adaptation, and to achieve safer, more liveable and meaningful urban places?

The present research could clearly be further elaborated from now on and investigate in more depth social, economic, cultural and political issues related to ‘living with floods’ and ‘design *with* floods’. There is indeed still a lot to be learnt in order to better live with the hybrid floods and to consciously and successfully design *with* them.

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Appendixes

Appendix A: Main characteristics of the potential cases initially screened

Main characteristics of the context of the screened urban-regeneration projects (as of July 2012)

Country *	City	Total pop. (000)	River	City-river configuration **		Flood characteristics		Last important flood event		Existing flood-defence structures		Spatial-planning documentation (local or regional)	
				Position of the city in the river basin	Position of the river within the city	Flood type	Exposed population (000)	Date ***	Associated damage toll ****	Type	Date of construction	Any reference to floods?	Major conditions imposed
PT	Coimbra	143	Mondego	in the middle catchment	central / asymmetric	riverine	9	1948, 2001	?	dams, dikes	1970-80s	article 64 of the revision of the PDM (2009) deals with the “zones prone to floods”	specific rules for the occupation of floodable areas
	Lisbon	540 (AML 2.9 M)	Trancão and Tagus	estuarine	tangent	riverine + flash floods	?	1967	> 600 deaths	dams, controlled-flood areas	?	PROTAML; the revision of the PDM (2010) mentions the vulnerability to floods (in fact, this relates to the definition of the flood susceptible areas)	the need to elaborate specific hydrological studies for any project having more than 75 ha
	Almada	2.9 M (AML)	Tagus			flash floods	?	?	?				
	Seixal			riverine	?	?	?	PROTAML	?				
	Barreiro			?	?	?	?						
FR	Paris / Vitry-sur-Seine	12 M (Île-de-France)	Seine	in the middle catchment	central / tangent	riverine	~ 900	1910	5 deaths; > 200,000 affected people; economic losses of 1,000 M €	dikes, floodwall, controlled-flood areas, dams	1950s, 1990s	Plan de Prévention du Risque Inondation (PPRI); Schéma Directeur de la Région Île-de-France (SDRIF)	control and adaptation of new urbanizations in floodable areas (particularly the ones related to urban regeneration), in order to reduce the vulnerability
	Paris / Ivry-sur-Seine												
	Paris / Saint-Ouen												
	Bordeaux	1.1 M	Garonne	estuarine	central / asymmetric	riverine with tidal influence	?	1930, 1981, 1999	?	dikes	?	Plan de Prévention du Risque Inondation; Schéma de Cohérence Territoriale de l’Aire Métropolitaine Bordelaise	buildability is generally defined in relationship to flood risk (certain areas can develop if the previous hydraulic conditions are maintained)
BE	Antwerp	1.25 M	Scheldt	estuarine	central / asymmetric	riverine with tidal influence + storm surge	?	1953, 1976, 2013	?	dikes, floodwall, controlled-flood areas	1978	yes (at a regional scale)	?? (probably only in Flemish...)
UK	London	13.7 M	Thames, Lea	in the middle catchment	central	riverine with tidal influence + storm surge	> 1 M	1953	300 deaths; 32,000 evacuated people; 24,000 flooded houses	movable barriers, dikes, controlled-flood areas	1970-80s	Planning Policy Statement 25 (Development and Flood Risk); The Flood and Water Management Act 2010	Three strategies are proposed: avoidance, resistance, resilience, while new developments should incorporate SUDS to deal with pluvial floods
	Glasgow	2.5 M	Clyde	in the middle catchment	central	riverine with tidal influence + storm surge + flash floods	> 12,000 buildings	1994	3 deaths; 700 flooded houses; economic losses of 100 M £	dikes, controlled-flood areas, movable barriers	?	Scottish Planning Policy 7 (Planning and Flooding); Planning Advice Note 69 (Planning and Building Standards Advice on Flooding)	flood-risk assessment is required for all new developments (while the use of movable barriers is forbidden)
ES	Zaragoza	650	Ebro	in the middle catchment	central / asymmetric	riverine	100	1961, 2007, 2003	no deaths, but economic losses	dikes, controlled-flood areas	1960s, 1980s	a section of the Plan General de Ordenación Urbana (2007) deals with the protection of watercourses	definition of compatible uses
DE	Hamburg	1.8 M	Elba	estuarine	central / asymmetric	riverine with tidal influence + storm surge	180	1962, 1976, 1981, 1999	300 deaths; 6,000 homeless people	dikes, controlled-flood areas	> 1963		
	Frankfurt	2.3 M	Main	in the middle catchment	central / asymmetric	riverine	?	?	?	?	?	?? (probably only in German...)	?? (probably only in German...)
	Mainz	200	Rhine	in the middle catchment	tangent	riverine	60	?	?	dikes, movable barriers	?		

Source: elaborated by the author

* cases from the Netherlands were not considered

** based on the RiProCity methodology (Baptista e Silva & Pinto, 2010)

*** centennial flood or other

**** related to the latest centennial (or the latest important) flood event

Main characteristics of the screened urban-regeneration projects (as of July 2012)

Country	City	Characterization of the flood-prone urban-regeneration project							Main references available	Does this case seem feasible?
		Name	Designers	Flood susceptibility	Area	Localization within the city	Major urban uses	Major adaptation measures		
PT	Coimbra	Parque Verde do Mondego	Camilo Cortesão & Mercês Vieira; Gonçalo Byrne; José Laranjeira; PROAP	in the 1-in-100-year flood zone	80 ha (?)	central	urban park	land grading to safeguard the Monastery of Santa Clara-a-Velha	Programa Polis (2001); Cunha (2002); Paiva (2003); Marques <i>et al.</i> (2005); CESUR (2007); Saraiva (2010)	+/- (urban project?)
	Lisbon	Parque das Nações	Luís Vassalo Rosa	low?	330 ha	peripheral	mixed + urban park	? use of the floodplain of the Trancão River as an urban green zone	Machado (2006)	-- (low risk, flash flood most important)
	Almada	Frente Ribeirinha de Almada Nascente (Margueira)	Richard Rogers Partnership; Santa-Rita Arquitectos; WS Atkins	low	115 / 88 ha	central	mixed	Praça Lisnave: the levels of the project should not increase the flood risk Cova da Piedade: basements located at a deep level should be avoided; new constructions should be elevated; only parking spaces below the basement level	ATKINS <i>et al.</i> (2003, 2009a, 2009b); Grupo de Trabalho (2009)	-- (low risk, only flash flood is relevant)
	Seixal	Siderurgia Nacional	?	low?	536 ha	peripheral	mixed + industrial	?	Grupo de Trabalho (2009)	- (few data up to now, low risk)
	Barreiro	Quimiparque	RISCO	low	290 ha	central	mixed	?	Grupo de Trabalho (2009)	-- (low risk)
FR	Paris / Vitry-sur-Seine	Les Ardoines	SEURA, SAFEGE, Polyprogramme, Philippe Raguin, SCB Économie	in the 1-in-100-year flood zone	320 ha	peripheral	mixed + industrial	definition of different platforms according to flood levels, which define the permitted land use	Beucher (2007); EPA-ORSA (2009); Brun (2010); Brun and Adisson (2011a, 2011b); Moulin (2012)	++
	Paris / Ivry-sur-Seine	Ivry-Confluences	Bruno Fortier, Dusapin & Leclercq, Valode & Pistre	in the 1-in-100-year flood zone	145 ha	peripheral	mixed + industrial	definition of propagation axis and flood-expansion zones	Ville d'Ivry (2010); Carputi (2011)	+/- (few data up to now)
	Paris / Saint-Ouen	Les Docks	Makan Rafatdjou; Reichen & Robert; Olga Tarraso, Hélène Saudecerre	in the 1-in-100-year flood zone	100 ha	peripheral	mixed	SUDS (ditches and filtration basins)	Streiff (2007)	+/- (few data up to now)
	Bordeaux	Bastide Brazza Nord	KCAP, Mutabilis, INGEROP, OASIIS, BMA	in the 1-in-100-year flood zone	90 ha	peripheral	mixed	promotion of hydraulic transparency (floodable alleys, floodable undercrofts) and dry accesses (for emergency and evacuation)	Ville de Bordeaux (2007)	+
BE	Antwerp	Masterplan Scheldekaaien	PROAP, WIT, D-RECTA, IDROESSE	high?	2,3 ha	central	urban park + flood defence	urban park that acts as a flood-defensive infrastructure	Van de Put (2007); Nunes (2008, 2011)	+/- (urban project?; language)
UK	London	Stratford City / East Village / Athletes Village	Fletcher Priest, Arup, West 8	medium	73/27 ha	peripheral	mixed	elevation of all the site (landfill)	?	- (few data up to now)
	Glasgow	South Dalmarnock (Clyde Gateway Masterplan)	Glasgow City Council, Sheppard Robson, Grontmij Group Ltd, Whitelaw Turkington	?	110 ha	peripheral	mixed	SUDS (e.g.: green corridors)	Werritty (2006)	+
ES	Zaragoza	Parque del Agua (Parque Luis Buñuel)	Iñaki Alday, Margarita Jover, Christine Dalnoky	in the 1-in-100-year flood zone	120 ha	intermediate	urban park	acceptance of the river's seasonal overflows was one of the starting points of the design	Alday and Jover (2008)	+/- (urban project?)
	Hamburg	HafenCity	Hamburgplan, KCAP, ASTOC	in the 1-in-100-year flood zone	155 ha	central	mixed	elevation of all buildings, streets, parks and bridges; provision of emergency accesses; floodable public spaces	Hafencity Hamburg (2006, 2009)	+/- (language)
DE	Frankfurt	Westhafen	Seifert Architects, Ulla Schuch	medium?	13 ha	central	mixed	mentioned in Brun and Adisson (2011a) as an example of an adapted flood-prone intervention	?	+/- (language)
	Mainz	Zollhafen (Customs Harbour)	Carl Fingerhuth; the municipal department of urban planning	in the 1-in-100-year flood zone	22 ha	central	mixed	"Project developer's guide" + "Flood-risk management guide"; elevation of buildings; emergency accesses; sensitization of the dwellers through public spaces	Barroca and Serre (2012)	+/- (language)

Source: elaborated by the author

Appendix B: The initial case-study protocol (Coimbra)



Universidades de Coimbra (IIIUC / CES), de Lisboa e de Aveiro
Programa Doutoral em Território, Risco e Políticas Públicas

Título da tese: Projetos urbanos ribeirinhos e inundabilidade: constrangimentos e oportunidades*

Por Liliane Hobeica
maio de 2013

Protocolo do estudo de caso

Caso-piloto: Programa Polis Coimbra

O protocolo do estudo de caso é um instrumento interno de trabalho que, além de conter uma visão geral da investigação, expõe os mecanismos e procedimentos previstos para sua operacionalização (Yin, 2009). Funciona, na prática, como um guia (ou uma agenda) para a realização das tarefas, com o qual se pretende aumentar a fiabilidade do estudo de caso, já que ajuda a manter o foco do trabalho e, ao mesmo tempo, antecipa problemas potencialmente a encontrar no campo. Coloca-se, assim, como uma peça essencial num estudo de caso múltiplo, prezando pela sua integridade global (mesmo que cada caso individual tenha seu próprio protocolo, adequado às suas particularidades). Não sendo um instrumento estático, o protocolo vai sendo atualizado e ajustado à medida que as tarefas de campo são realizadas (Yin, 2009); segundo Huberman e Miles (1994, p. 431), tais ajustes potenciais normalmente decorrem de um melhor entendimento do objeto em estudo, o que vem a reforçar a validade interna da investigação. De modo a permitir uma comparação entre a presente versão (iniciada em setembro de 2012) e a versão final do protocolo (no momento da conclusão do estudo), as alterações serão registradas numa tabela para este fim.

O estudo do caso do Programa Polis Coimbra funcionará como um estudo-piloto; testará, então, os procedimentos previstos neste protocolo, o que será fundamental para a elaboração dos protocolos dos dois casos seguintes.

Contextualização do estudo de caso

O presente estudo busca explorar uma possível conciliação entre a ocupação urbana de zonas ribeirinhas e o risco de inundação, considerando a seguinte **questão de investigação**: como projeto urbano ribeirinho e condição de inundabilidade se têm articulado (ou como se podem articular)? Têm-se como **objeto de estudo** projetos urbanos ribeirinhos localizados em zona inundável por transbordamento de leito que apresentam um enfoque (mais ou menos explícito) de adaptação ao risco de inundação. O **objetivo geral** da investigação é identificar, nesses projetos adaptados, como foi possível integrar preocupações para com o risco de inundação; ‘como’, aqui, diz respeito tanto ao processo que efetivamente permitiu a conjugação da condição de inundabilidade com outros condicionantes de projeto, quanto aos meios (técnicos) da arquitetura e do urbanismo utilizados para efetivar a adaptação (não se trata, portanto, de um mero inventário das medidas técnicas empregadas). Ou seja, trata-se de identificar os mecanismos (ou procedimentos) processuais e projetuais que possibilitaram a consideração da inundabilidade enquanto um elemento-chave nos projetos urbanos em estudo. A questão de investigação e o objetivo geral desdobram-se nas **questões específicas** e nos **objetivos específicos** indicados na tabela 1 a seguir.

Optou-se, enquanto método de investigação, pelo estudo de caso, método em geral considerado adequado quando são reunidas as seguintes condições: a questão da investigação é do tipo ‘como’ ou ‘por quê’, e o foco do estudo é um evento ou fenômeno contemporâneo em seu contexto particular e sobre o qual não há controle (Yin, 2009). Também, este é considerado o método mais apropriado para investigação em arquitetura e urbanismo (Foqué, 2010), pois através dele pode-se conseguir uma ‘visão de todo’ do objeto em

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estudo, ao serem enfocadas, conjuntamente, “as relações complexas entre contexto, produto e processo que governam todos os processos projetuais” (p. 174). Para ilustrar a diversidade de situações e argumentos encontrada em projetos urbanos ribeirinhos em zona inundável, e utilizando um enquadramento das ciências do risco, pretende-se estudar três casos bem distintos, cada um deles numa tipologia diferente em termos de ênfase na atuação sobre uma componente particular do risco (*hazard*, exposição e vulnerabilidade):

- 1) o conjunto de projetos no âmbito do Programa Polis Coimbra (englobando o Parque Verde do Mondego), ilustrando uma atuação mais centrada na contenção da exposição (MAOT & CMC, 2001);
- 2) o Scheldekaaien (*master plan* da Frente Ribeirinha de Antuérpia, Bélgica), uma infraestrutura ao mesmo tempo de defesa contra inundações e de reforço da identidade urbana (Nunes, 2008); e
- 3) o *plan guide* Brazza Nord, em Bordeaux (França), centrado na promoção da transparência hidráulica e na redução da vulnerabilidade (CUB, 2011).

Notar que esta classificação dos projetos urbanos a estudar em termos da ênfase numa dada componente do risco foi feita *a priori* (antes da coleta de dados efetiva para a investigação) e de maneira apenas indicativa, não se constituindo numa classificação rigorosa ou estanque. De fato, nota-se alguma incidência de preocupações para com as três componentes clássicas do risco no conjunto de mecanismos desencadeados em cada um deles face à condição de inundabilidade.

Questões específicas	Objetivos específicos
1: Quais os condicionantes que favorecem (ou favoreceriam) a incorporação do risco de inundação em projetos urbanos ribeirinhos?	1) Identificar os constrangimentos (contextuais e físicos) do projeto urbano em questão (no sentido de conhecer tanto os pontos fortes do sítio, quanto as outras prioridades com as quais o tratamento das inundações eventualmente esteve em competição), e o modo como a inundação foi percebida.
2: Como os projetos urbanos ribeirinhos têm abordado as inundações por transbordamento de leito em termos de prevenção, mitigação, adaptação, preparação?	2) Identificar como as diferentes componentes da gestão do risco de inundação – prevenção (evitamento de danos), mitigação (minimização dos danos), adaptação (ajuste ao risco), preparação (previsão, alerta, emergência etc.) – foram tratadas (não só na escala do projeto urbano, mas também na escala mais alargada de seu contexto envolvente).
3: Como enfatizar o papel das inundações por transbordamento de leito num dado projeto urbano ribeirinho, quando se está face a um conjunto de interesses conflitantes?	3) Inventariar as alternativas técnicas empregadas (ou propostas) para fazer face à condição de inundabilidade, do ponto de vista macro (urbanístico) e eventualmente micro (edificação).
4: Como soluções inovadoras face às inundações podem ser (ou têm sido) favorecidas em projetos urbanos adaptados?	4) Verificar se inovações projetuais foram incitadas pelo fato da condição de inundabilidade geralmente repercutir-se em maiores restrições à ocupação urbana.
	5) Tentar identificar que mecanismos foram facilitadores de uma ótica inclusiva na abordagem da condição de inundabilidade.

Tabela 1: Relação entre as questões específicas e os objetivos específicos

Procedimentos da coleta de dados

Esta seção identifica, particularmente, a informação que se busca adquirir no campo (referente à adaptação de projetos urbanos à condição de inundabilidade, em termos de processo, contexto e produto), os dados a coletar, os instrumentos a utilizar na coleta e as fontes a consultar. Para o caso em Coimbra, estima-se que a coleta de dados e uma análise preliminar sejam feitas até o final de janeiro de 2013 (para os outros dois casos: até o final de setembro 2013). Em relação aos outros dois casos, a situação em Coimbra é duplamente peculiar, pois, além dos planos estarem parcialmente executados, o caso engloba diversos projetos em área inundável (em escalas diferentes e mais ou menos independentes) que se agruparam em torno do Programa Polis, listados abaixo e indicados na Figura 1.

- 1) o Plano de Pormenor do Parque Verde do Mondego (PPPVM) (de 1999 e de 2004, em nova versão), elaborado por MVCC Arquitectos e pela PROAP – Estudos e Projectos de Arquitectura Paisagista;

– o Parque Verde do Mondego (projeto de execução), elaborado por MVCC e PROAP (1ª, 2ª e 3ª etapas: 1.1, 1.2 e 1.3), e por NPK – Architectos Paisagistas Associados (4ª e 5ª etapas). Incluem-se aqui as seguintes edificações implantadas na área do Parque (com projetos arquitetônicos específicos):

- a) o módulo de restaurantes (“as Docas”) e
- b) o Pavilhão Centro de Portugal, na margem direita; e
- c) na margem esquerda: três edifícios de apoio à Praça da Canção (balneário, com sanitários e apoio aos espetáculos, e dois módulos de apoio ao parque e ao recinto de espetáculos);
- d) o conjunto do Clube Náutico (composto por três módulos para instalações ligadas ao desporto náutico), e o módulo de apoio à área de merendas;
- e) o complexo de piscinas; e
- f) o Exploratório Ciência Viva.

2) o Plano de Pormenor do eixo Portagem – avenida João das Regras (PPEPJR) (de 2004), elaborado por Gonçalo Byrne Arquitectos;

– a Entrada Poente do Parque Verde do Mondego (projeto de execução) (2.1), elaborado por Gonçalo Byrne Arquitectos e PROAP;

3) o projeto de valorização do Mosteiro de Santa Clara-a-Velha, elaborado pelo Atelier 15.



Figura 1: Identificação dos planos e projetos agrupados em torno do Programa Polis

Fonte: com base em CMC (2010) e MAOT e CMC (2001)

Os dados a coletar serão, em grande maioria, de natureza qualitativa, sob a forma de documentos, entrevistas e observações (ainda que, para fins de caracterização do projeto em estudo, se possa recorrer a dados quantitativos). Com o recurso a estes três tipos de evidências, procurar-se-á favorecer a triangulação das fontes de informação, processo que contribui para validar as interpretações posteriores.

Os **dados documentais** incluirão publicações ou documentos de diversas naturezas: planos, relatórios, regulamentos, legislação, (eventualmente) artigos na mídia, páginas web específicas, assim como cartografia, fotografia e desenhos (plantas arquitetônicas). Os editais dos concursos, os memoriais descritivos, os regulamentos, os relatórios e as peças desenhadas, ligados aos planos e projetos em questão, são provavelmente os principais documentos da investigação, e deverão ser coletados junto à Câmara Municipal

de Coimbra (CMC) ou aos próprios projetistas. Também serão coletadas informações sobre os projetos em estudo disponíveis nas páginas web dos projetistas e outros documentos institucionais (da CMC ou do Programa Polis, por exemplo) que se mostrem pertinentes sobretudo para a caracterização do contexto físico e sociopolítico, tais como: documentos administrativos (propostas, relatórios de progresso etc.); agenda e atas de encontros; avaliações e pareceres feitos por terceiros (particularmente os das duas comissões técnicas de acompanhamento dos planos de pormenor); compêndios de estatísticas. Artigos científicos que mencionem dados relevantes para o estudo de caso (como Cunha (2003) ou Tavares e Cunha (2008)), podem constituir fontes documentais secundárias. Documentos relevantes e de acesso condicionado (não disponíveis para livres e repetidas consultas) serão, sempre que possível, fotocopiados ou digitalizados, para permitir eventuais reconsultas posteriores. Alguns dos principais documentos a consultar (já identificados), assim como os locais onde potencialmente podem ser encontrados, encontram-se listados na tabela 2 (em cinzento, documentos já coletados e parcial ou totalmente tratados):

Documento	Localização
– Cartografia do município e da zona em estudo	– online, através da plataforma SIG municipal (http://sig.cm-coimbra.pt)
– o Plano Diretor Municipal, incluindo o regulamento e os mapas que o acompanham (versão original de 1994, e as subsequentes alterações)	– online, no site web da CMC
– o Plano estratégico do Programa Polis (2001)	– Biblioteca Geral da UC; CMC (Divisão de Planeamento Urbano e espólio CoimbraPolis)
– “Boletim Informativo” da CoimbraPolis (2002-2005)	– Biblioteca Geral da UC (cinco números disponíveis)
– o edital do concurso público para contratação do PPPVM (programa e caderno de encargos) (1995)	– CMC? (requerimento à CMC datado de 15/07/2013)
– o “Estudo de impacte hidráulico do edifício do Clube Náutico, na Margem Esquerda” (mencionado no Plano Estratégico do Programa Polis) Não realizado: tratava-se do estudo do impacto do antigo clube náutico, que acabou por ser demolido, o que tornou esse estudo desnecessário (informação acedida em entrevista em 3 julho de 2013).	– CMC? (espólio CoimbraPolis?)
– o “Estudo urbanístico do Parque Temático Ciência, Cultura e Lazer”, na margem esquerda (mencionado como “em curso”, no Plano Estratégico do Programa Polis)	– RISCO
– o Plano de Pormenor do Parque Verde do Mondego (relatório, regulamento e peças desenhadas) (1999)	– CMC (requerimento à CMC datado de 15/07/2013)
– o Plano de Pormenor do Parque Verde do Mondego (relatório, regulamento e peças desenhadas) (2004)	– CMC (Divisão de Ordenamento e Estratégia)
– os projetos de execução das diferentes etapas do Parque Verde do Mondego (englobando as diversas edificações executadas; inclui memória descritiva e peças desenhadas)	– espólio CoimbraPolis na CMC
– o edital do concurso público para contratação do PPEPJR (programa e caderno de encargos) (2001?)	– espólio CoimbraPolis na CMC?
– o Plano de Pormenor do eixo Portagem/Avenida João das Regras – PPEPJR (inclui a Entrada Poente do Parque Verde do Mondego) (2004)	– CMC (Divisão de Planeamento Urbano)
– o projeto de execução da Entrada Poente do Parque Verde do Mondego (inclui memória descritiva e peças desenhadas) (2004)	– CMC (espólio CoimbraPolis)
– o relatório do “Estudo hidráulico e hidrológico do rio Mondego na zona de intervenção do programa Polis em Coimbra” (elaborado pelo DEC-FCTUC) (2002)	– CMC (Divisão de Ordenamento e Estratégia)
– o “Relatório Final do Grupo de Trabalho para a análise das cheias no Baixo-Mondego no Inverno de 2000/2001”, (elaborado pelo DEC-FCTUC) (2001)	– DEC-FCTUC?
– atas e relatórios produzidos pelas duas comissões de acompanhamento dos planos de pormenor	– espólio CoimbraPolis na CMC?
– atas de reuniões camarárias em que os projetos em análise foram mencionados ou discutidos (entre 1995 e 2011)	– online, no site web da CMC
– o edital do concurso público para a revalorização do Mosteiro de Santa Clara-a-Velha (programa e caderno de encargos) (2001)	– Centro de Documentação do MSCV?

Documento	Localização
– o projeto para a revalorização do Mosteiro de Santa Clara-a-Velha (inclui memória descritiva e peças desenhadas) (2001-2008)	– projetistas (Atelier 15)

Tabela 2: Relação preliminar de documentos a consultar

Pretendia-se iniciar a etapa de coleta e tratamento de documentos com aqueles de conteúdo mais abrangentes (em particular, relativos ao contexto), e depois partir para documentos específicos (os planos e projetos em si). As atas da CMC (relativas ao período entre 1995 e 2011), fundamentais para o estabelecimento de uma cronologia dos planos e projetos em torno do Polis, foram triadas a partir das seguintes palavras-chave: Parque Verde do Mondego, Programa Polis, Sociedade CoimbraPolis, Mosteiro de Santa Clara-a-Velha, Plano de Pormenor do eixo Portagem – avenida João das Regras (só serão, contudo, listadas nas referências bibliográficas apenas as atas efetivamente citadas na tese). Uma questão que deveria ser equacionada à partida dizia respeito à localização dos documentos elaborados pela Sociedade CoimbraPolis, agência gestora do programa que foi extinta em 2009. De fato, não se sabia quem havia retido o acervo do material então produzido: a CMC ou a Sociedade Parque EXPO (entidade gestora da CoimbraPolis que, entretanto, também está atualmente em processo de liquidação).

Inicialmente, fomos informados por um funcionário municipal que esse acervo encontra-se “pulverizado” na CMC; no entanto, em seguida, outro funcionário municipal informou-nos que a CMC é a “fiel depositária” do espólio do Programa Polis em Coimbra, cujo conteúdo se encontra no Departamento de Obras. Posteriormente, neste Departamento, as duas informações anteriores foram, de algum modo, reafirmadas: parte do material está, de fato, dispersa nos serviços que respondem pelas atividades relacionadas (por exemplo, no caso de obras ainda em curso ou de serviços de manutenção); parte está num depósito específico, porém ainda sem qualquer catalogação. Devido a esta condição, o acesso ao material é bastante condicionado (listagens dos documentos pretendidos foram sendo submetidas ao serviço responsável pela gestão deste acervo previamente às idas ao depósito, mas apenas poucos deles foram acedidos – eventualmente por não serem facilmente localizáveis), de modo que não tem sido possível uma ‘imersão’ desejada na documentação existente. Ao mesmo tempo, a funcionária municipal a cargo deste acervo ressaltou que algum material do espólio do Programa Polis Coimbra (como estudos preliminares) pode ter ficado arquivado na Parque EXPO, em Lisboa.

As **entrevistas**, em formato semiestruturado, serão realizadas com pessoas-chave que estiveram envolvidas no processo de elaboração (e/ou de concretização) dos planos e projetos, seja por parte da contratante (CMC, CoimbraPolis), seja por parte dos projetistas, com o intuito principal de cobrir aspectos não abordados ou pouco esclarecidos nos documentos consultados. De fato, a análise documental em curso já nos permite concluir que não é possível acompanhar o desenrolar do processo apenas a partir dos dados formalmente registrados nos documentos; as atas das reuniões camarárias, por exemplo, não acompanharam sequencialmente os acontecimentos, nem relataram explícita e devidamente os conteúdos em si das discussões que os geraram, restringindo-se, muitas vezes, a uma exposição somente das conclusões. Assim, as entrevistas permitirão estabelecer, de forma sintética, uma cronologia do processo (com a identificação dos agentes envolvidos, das decisões tomadas e dos mecanismos utilizados), e também explorar uma leitura mais focada na interação entre a inundabilidade e os projetos elaborados.

As entrevistas serão antecedidas por um contato inicial para verificar interesse e disponibilidade dos potenciais informantes em colaborar com a investigação; nessa altura, ser-lhes-ão fornecidas uma carta de apresentação institucional da investigadora (elaborada por um dos orientadores) e uma breve apresentação da investigação (numa página A4, elaborada pela investigadora). Para que sejam efetivamente direcionados às pessoas em questão a entrevistar, os guíões de entrevista serão elaborados à medida que as entrevistas forem efetivamente marcadas (alguns deles figurarão como apêndice na tese), e deverão incluir questões relativas tanto ao produto final, quanto ao contexto e ao processo que os suportaram. Quando devidamente autorizado, as entrevistas serão gravadas em formato digital para posterior transcrição (integral ou apenas de seus trechos mais relevantes, nos casos em que isso for mais pertinente). O texto resultante será encaminhado ao entrevistado para validação da informação (na impossibilidade de gravação, seguirão as notas registradas durante a entrevista). Algumas das instituições e pessoas potenciais a contactar já identificadas são indicadas na tabela 3 (em cinzento, aquelas já contactadas ou já entrevistadas):

Categoria	Instituição	Pessoa-chave
Contratante	CMC / DMAT / DPT / Divisão de Planeamento Urbano	– Eng. Fernando Rebelo (atual chefe da Divisão)
	CMC / DMAT / DPT / Divisão de Ordenamento e Estratégia	– Arq. Paisagista Rui Campino
	CMC / DMAT / Departamento de Obras	– Eng. Ulisses Correia (atual chefe do Departamento)
	CMC / Serviço de Proteção Civil	– Eng. Serra Constantino (atual chefe do Serviço); Enga. Joana Lopes
	CMC / Gabinete de Planeamento e Controlo	– Sra. Rosa Silva (ex-funcionária da Parque EXPO)
	Sociedade CoimbraPolis	– Eng. João Rebelo (representante da CMC na Sociedade CoimbraPolis)
	Sociedade CoimbraPolis /Sociedade Parque EXPO	– Arq. Paisagista José Filipe Gameiro Fernandes (representante da Parque EXPO na Sociedade CoimbraPolis)
Projetistas / consultores	– MVCC Arquitectos	– Arq. Camilo Cortesão
	– Gonçalo Byrne Arquitectos	– Arq. Gonçalo Byrne
	– PROAP – Estudos e Projectos de Arquitectura Paisagista	– Arq. Paisagistas João Nunes e Carlos Ribas
	– Atelier 15	– Arq. Alexandre Alves Costa
	– S&F (projeto Exploratório Ciência Viva)	– Arq. José Fernando Oliveira
	– NPK – Arquitectos Paisagistas Associados	– Arq. Paisagistas Leonor Cheis, José Veludo e José Lousan; Arq. Paulo Albuquerque
	– DCT-FCTUC	– Prof. Alfeu Marques; Prof. Nuno Eduardo Simões

Tabela 3: Relação preliminar de pessoas/instituições a entrevistar (os contatos dos projetistas estão listados no Apêndice 1)

As **observações** focar-se-ão particularmente no contexto geográfico e no produto em si, contemplando uma descrição detalhada do espaço projetado e de sua envolvente (seja antes da intervenção, nos trechos ainda em fase de projeto, seja *a posteriori*, nos trechos já concretizados). As observações (apoiadas por fotografias, desenhos, esquemas gráficos etc.) serão úteis para uma caracterização das edificações realizadas dentro do perímetro inundável, especialmente no tocante a sua localização e à existência de alguma particularidade em termos de desenho adaptado (ou seja, da presença de indícios visíveis de adaptação ao risco, como materiais construtivos empregados, nível de implantação, cuidados com a drenagem etc.). Na envolvente, serão de particular interesse os eventuais marcos de eventos anteriores de inundações. Tal como as entrevistas, as observações terão um caráter semiestruturado, com uma definição preliminar de um roteiro a seguir, mas que comporta a flexibilidade necessária para adequação do percurso em função do que se encontrar de fato no terreno. Serão realizadas sessões de observação sistemática, as quais são antecedidas por uma preparação específica (mesmo em termos de adequação temporal: dia da semana, horário, condição do tempo etc.); contudo, as impressões tidas em visitas anteriores ao local (ou seja, em observações ocasionais) também serão registradas e levadas em conta. A preparação às visitas de campo inclui o levantamento ou a revisão de informações que possam apoiar sua realização (por exemplo, a identificação de locais e/ou questões a serem cobertos) e a elaboração de mapas auxiliares; prevê-se percorrer a pé todo o perímetro da área sob intervenção e as duas margens do rio, assim como visitar as edificações de acesso público. Após cada sessão de observação, serão registrados o percurso efetivamente percorrido e as notas da visita de campo (descrição e eventualmente algumas análises preliminares).

Intenciona-se iniciar a coleta de dados por uma pesquisa documental preliminar, cobrindo aspectos mais gerais (em especial, sobre os contextos físico e institucional), seguida por visitas de campo preliminares e contatos prévios com colaboradores da CMC. Após esta fase, seguir-se-á uma pesquisa documental mais específica (relativa ao processo e aos projetos, contando já com o acesso a documentos mais restrito), o que dará as bases para uma elaboração mais apurada dos guiões de entrevista. Também partindo do geral para o específico, intenciona-se realizar entrevistas primeiramente com alguns colaboradores-chave da CMC e em seguida com os projetistas. Sendo o Polis Coimbra um estudo de caso com caráter de piloto e pelo relativo fácil acesso às pessoas envolvidas (pelo menos em comparação aos outros dois casos, Bordeaux e Antuérpia),

prevê-se que, ao longo do levantamento de dados, alguns dos entrevistados sejam recontactados para complementar informação. A coleta de dados será registrada num ‘diário de campo’ informal, sendo que, para promover a manutenção do foco do estudo, no início do diário estarão destacados as questões gerais e os objetivos da investigação. O plano inicial de execução desses trabalhos é apresentado na tabela 4:

mês semana	out. 12		nov. 12				dez. 12				jan. 13			
	3 ^a	4 ^a	1 ^a	2 ^a	3 ^a	4 ^a	1 ^a	2 ^a	3 ^a	4 ^a	1 ^a	2 ^a	3 ^a	4 ^a
Documentos														
Visitas														
Entrevistas														

Tabela 4: Plano preliminar de coleta de dados

Idealmente, este protocolo para o estudo de caso Programa Polis Coimbra (iniciado em setembro de 2012) estaria finalizado (ainda que numa versão obviamente sujeita a ajustes) antes do início do levantamento de dados propriamente dito (em meados de outubro de 2012, na previsão inicial); contudo, percebeu-se que uma elaboração ‘abstrata’ do protocolo (sem as contribuições do campo) poderia torná-lo pouco operacional. Assim, concretamente, grande parte deste protocolo acabou sendo elaborada ao mesmo tempo em que já se procedia à coleta de dados; também, devido a vicissitudes próprias do trabalho de campo (acesso a documentos e pessoas, adequação com agendas de terceiros), a estimativa inicial de realização da coleta mostrou-se irrealista. Isso, contudo, não significa que o tempo a dedicar aos outros dois casos será comprometido, pois este primeiro caso já tinha, à partida, um claro papel de aprendizagem, além de que os casos de Bordeaux e Antuérpia são ambos ‘projetos únicos’ (e em pleno processo de elaboração), o que podem favorecer uma coleta de dados menos complexa. Mesmo assim, com vistas a não comprometer o calendário global da investigação, e embora este estudo com caráter piloto ainda esteja em curso, a coleta do segundo caso (o projeto urbano de Bordeaux) já foi iniciada (o que tem sido, de alguma forma, produtivo, pois alguns cruzamentos entre ambos já vão enriquecendo as primeiras análises). Ressalta-se **ainda** que a elaboração do protocolo concomitantemente à coleta de dados tem duas consequências principais: por um lado, é notável alguma incongruência no uso dos tempos verbais nesse documento (haja vista o tempo decorrido entre o início e o fim de sua elaboração e os diferentes estágios das tarefas aqui descritas); por outro lado, tal como sugerido por Yin (2009) para aumentar a fiabilidade e a validade do estudo, havia sido prevista a revisão (por pares) deste protocolo antes de sua implementação, o que não se mostrou praticável.

Questões do estudo de caso

As questões do estudo de caso decorrem das questões específicas da investigação (indicadas na tabela 1), contudo são mais precisas ao focar cada caso individualmente. Postas para o investigador, essas ‘novas’ questões funcionam como lembretes que devem acompanhar a coleta de dados, justificando o porquê de cada uma delas (não sendo necessariamente as mesmas perguntas que serão feitas nas entrevistas) (Yin, 2009). As questões todas giram em torno da consideração, nos planos e projetos elaborados (integralmente e também suas subpartes), da condição de inundabilidade, assim como das estratégias de adaptação efetivamente propostas para este fim. Parte-se do princípio que os planos e projetos em estudo são um produto, ou seja, dependem fundamentalmente do contexto mais global e do processo que os envolveram e os possibilitaram. Para o Programa Polis Coimbra, seguem abaixo exemplos das questões consideradas à partida (listagem não exaustiva):

- Para além da inundabilidade, quais os outros constrangimentos que também deveriam ser respondidos por este grupo de projetos em particular?
- Qual a relevância dada às inundações (ou à condição de inundabilidade) frente a outros constrangimentos geográficos (e/ou constrangimentos institucionais ou de outra ordem) existentes?
- Quais os condicionantes que efetivamente favoreceram (ou desfavoreceram) a incorporação da condição de inundabilidade neste grupo de projetos?
- Há alguma relação (incompatibilidade) entre a imagem que se queria obter para o local (um projeto piloto que imprimisse um padrão de qualidade urbana para eventuais replicações) e a condição de inundabilidade?
- A história secular do Mosteiro de Santa Clara-a-Velha submerso teve alguma repercussão especial nos planos e projetos em questão?
- O quão relevante foi a cheia de 2001 para os processos de elaboração desses planos e projetos? Com que repercussões?
- A inundabilidade foi tida como uma questão meramente técnica ou mais que isso? Isto é uma condição explicitada nos planos e projetos em questão?

- Como as inundações foram percebidas (pelos diferentes agentes envolvidos: contratante, projetista, agências governamentais relacionadas etc.): fatalidade, incapacidade de gestão, empecilho, oportunidade? (Nesse sentido, no Plano Estratégico do Polis Coimbra há uma referência interessante, de que o Parque Verde do Mondego “corresponde ao antigo leito de cheia do rio” (MAOT & CMC, 2001, p. 25), como se a zona tivesse perdido essa condição com o aproveitamento hidráulico realizado nos anos 1980.)
- Que componente da gestão do risco de inundação foi privilegiada na abordagem presente? Com que recursos?
- Como a abordagem dada ao risco de inundação neste grupo de projetos se relaciona com a abordagem dada numa escala mais alargada (da bacia hidrográfica, por exemplo)?
- As duas margens foram abordadas da mesma forma (ou a margem esquerda, por ser em grande parte abrangida pela REN, teve um tratamento diferenciado, mais ou menos restritivo)?
- Quais condições eventualmente teriam encorajado uma maior atenção para com a inundabilidade do local?
- Havia requisitos relativos à inundabilidade nos programas e cadernos de encargos dos concursos para estes planos e projetos?
- O quão relevante foi a questão da inundabilidade no âmbito mais amplo do Programa Polis, já que ambicionava “a requalificação urbana e ambiental” nas cidades ribeirinhas onde interveio?
- Há alguma solução inovadora face às inundações a mencionar neste grupo de projetos em particular, em termos seja de desenho (urbano e/ou arquitetônico), seja de técnica construtiva?
- Alguns dos projetos em estudo (na margem esquerda) foram premiados pelo município pela qualidade do espaço resultante; houve algum reconhecimento, nesses prêmios, da consideração da inundabilidade nesses projetos?
- O quanto as ‘regras’ definidas à partida (pelos programas, cadernos de encargos, PDM, legislações pertinentes, fontes de financiamento etc.) encorajaram, fomentaram ou restringiram a proposição de inovações projetuais ligadas à condição de inundabilidade?

Procedimentos da análise e interpretação dos dados

Como o método escolhido foi o estudo de caso múltiplo (composto de três casos individuais), os procedimentos de análise e de interpretação dos dados serão os mesmos para todos os casos a analisar. **Notar que a própria coleta de dados já é entendida como uma tarefa analítica, pois são feitas escolhas e delimitações ('data reduction')** sobre o que e como coletar, tendo sido separada no protocolo apenas para que fosse mais ressaltada. Os três tipos de dados mencionados (de natureza qualitativa) serão utilizados para caracterizar o caso em estudo, de modo a permitir interpretações centradas no método analítico em múltiplas camadas denominadas PCP (Foque, 2010). Este método, especialmente concebido para a produção de conhecimento em arquitetura, tem como enfoque o **Produto**, o **Contexto**, o **Processo** e, por fim, a relação entre essas três esferas (que, de fato, não são necessariamente autônomas, mas muito intrincadas).

A esfera do **Contexto** corresponde à situação pré-projeto, **que abrange componentes tanto estáticas quanto dinâmicas:** a área alvo de intervenção e sua envolvente geográfica e sociopolítica (institucional), em diferentes escalas. Trata-se de uma esfera, em grande parte, ‘externa’ ao projeto em si e, portanto, pouco controlável pelos projetistas; sua apreensão será principalmente baseada na análise documental. A esfera do **Processo**, por sua vez, diz respeito ao encadeamento dinâmico entre as situações pré- e pós-projeto, abrangendo a identificação de fatos marcantes, de alternativas que se colocaram e de decisões cruciais nas diferentes etapas. Situa-se, assim, na interface entre o contexto global e o produto final e é, até certo ponto, controlável pelos projetistas; este domínio será reconstituído nomeadamente através de análise documental e entrevistas. Por fim, o **Produto** é a esfera ‘interna’ ao projeto, resultante ou síntese das interações entre contexto e processo, sendo aqui maior a influência por parte dos projetistas. Esta esfera abarca aspectos funcionais, construtivos, formais e ambientais, como também aspectos imagéticos, sensoriais, culturais (por exemplo, cultura urbana ribeirinha e memória do risco) e suas articulações. Todos os tipos de dados coletados embasarão o entendimento do produto. **Notar que a ideia de ‘controle dos projetistas’ aqui empregada diz respeito ao grau de influência que esses podem exercer ao longo do processo e das decisões, não significando necessariamente que a elaboração de um projeto urbano seja (ou deva ser) uma atividade individualista ou autoritária.** De modo geral, são muitos os atores institucionais envolvidos, de modo que a tomada de decisão é naturalmente muito complexa. Mesmo na esfera do produto projetual em si mesmo, ainda que grande parte delas recaia sobre os projetistas (pelo menos em termos da formalização das ideias), as decisões nunca são exclusivas suas.

Como previsto, a análise tem sido feita desde o início da coleta de dados e engloba 1) a síntese dos dados, 2) o agrupamento e a exposição organizada da informação aferida, e 3) a interpretação dessa informação a fim de formular conclusões (Huberman e Miles, 1994, p. 429). A análise inicial diz respeito a cada caso individualmente, sendo realizada com recurso a técnicas sugeridas por Huberman e Miles (1994), devidamente ajustadas para o contexto de nossa investigação:

- a construção de uma cronologia do projeto urbano em questão;
- a codificação dos dados coletados (sejam eles obtidos via documentos, entrevistas ou observações), para a identificação de temas recorrentes e de conceitos-chave. Esta análise de conteúdo, realizada com apoio de um software de análise de dados qualitativa, não se baseia apenas nas categorias predefinidas que são ligadas ao PCP, mas segue também uma abordagem mais indutiva (especialmente no caso das entrevistas);
- o agrupamento posterior das novas categorias identificadas em torno de conceitos mais amplos (alguns dos quais já estão definidos à partida – como, por exemplo, as diferentes componentes do risco);
- tabulações preliminares dos dados já tratados para permitir sua visualização de forma concisa e acessível, que permita identificar relações entre eles. Será elaborada uma nova grelha de análise (mais detalhada que a inicial, que permitiu a definição dos três casos a estudar), agregando e classificando tanto os dados factuais coletados quanto as interpretações resultantes da codificação e/ou de reflexões mais abrangentes;
- a concepção de quadros e esquemas gráficos, relacionando informações emergidas dos dados e conceitos extraídos da revisão da literatura; e por fim,
- tabulações mais elaboradas, desta vez para tentar encontrar, a partir das interpretações realizadas, respostas potenciais às perguntas da investigação.

Apesar de ainda não detalhado, prevê-se a realização de uma análise morfológica do projeto em relação à condição de inundabilidade, a partir das plantas coletadas.

Uma fase posterior de análise englobará todos os casos em conjunto: as novas grelhas de análise individuais de cada caso serão articuladas numa única grelha com os dados tratados dos três casos. Esta matriz (já em preparação com dados dos casos de Coimbra e Bordeaux) permite uma leitura comparativa dos três estudos que sustentará uma síntese agregada, ainda que o propósito do estudo não seja valorar o caso mais ou menos exemplar, mas sim ressaltar principais semelhanças (que podem eventualmente ser válidas em outros casos similares) e diferenças, apresentando, assim, alguns dos posicionamentos possíveis na proposição de projetos urbanos em contextos inundáveis. Esta fase agregada será também útil para alimentar as análises individuais, num processo iterativo; no entanto, seu conteúdo não fará parte do relatório de cada caso em particular, mas de um capítulo específico da tese.

Perfil do relatório do estudo de caso

Prevê-se que cada estudo de caso venha a resultar, enquanto produto final, num capítulo específico para a tese (entretanto, em etapas intermediárias, os estudos de caso podem gerar pelo menos um artigo mais sucinto); os relatórios de cada um dos casos (todos com uma mesma estrutura) darão a base para estes capítulos e eventuais artigos. As partes mais genéricas referentes aos pressupostos de partida, à revisão bibliográfica e ao método não farão parte dos relatórios individuais, já que estes conteúdos serão integrados em capítulos apropriados da tese, nos quais serão abordados de maneira mais aprofundada. A mesma ressalva vale para a parte referente à análise conjunta dos três casos.

O início da redação dos relatórios (a meio caminho da análise) deve ser precedido por releituras da literatura relevante; esses documentos devem já conter a maior parte das ilustrações que serão, ao final, utilizadas na tese. De acordo com Yin (2009), o relatório de estudo de caso não deve ser confundido com a documentação ou a base de dados que permitiu o estudo, mas já ser um resultado, uma conclusão sobre o caso; esse autor ressalta também que o relatório do estudo de caso não segue necessariamente o formato convencional dos artigos científicos: exposição de questões e/ou hipóteses, descrição dos procedimentos da pesquisa e da coleta de dados, apresentação dos dados, discussão e conclusão. Pretende-se aqui delinear as linhas-guia para a redação destes relatórios individuais, incluindo um roteiro indicativo de suas partes e conteúdos, alinhado com a estratégia analítica definida acima:

Parte 1: breve apresentação do projeto em estudo, com uma justificativa da ênfase na componente do risco de inundação identificada (no caso de Coimbra, atuação mais centrada na contenção da exposição);

Parte 2: contextualização (‘enquadramento estático’, tipo ‘fotografia’), referindo a cidade, o rio (a bacia hidrográfica), o risco de inundação; fazendo referência também ao país na Europa (mas a diretiva europeia da

gestão das inundações, por conformar um contexto comum aos três casos, será provavelmente tratada, na tese, num capítulo anterior aos deles).

Parte 3: cronologia (‘enquadramento dinâmico’, tipo ‘filme’), desde o PDM (de 1994), os trabalhos arqueológicos no Mosteiro de Santa Clara-a-Velha (iniciados em 1995), o concurso do Parque Verde do Mondego (primeira versão em 1995/1996), o Programa Polis (iniciado em 2001), a cheia de 2001 etc.

Parte 4: os planos e projetos analisados, enquanto síntese do contexto e dos processos em causa. Deve contemplar (não apenas de maneira descritiva, mas também interpretativa): um breve enquadramento do caso enquanto um projeto urbano (numa relação com o contexto urbano envolvente); uma apresentação das potencialidades e dos constrangimentos (ou desafios) do sítio sob intervenção; uma apreciação de como esses foram vertidos na proposta; uma leitura formal, por exemplo, da ocupação e dos usos propostos (porte), do traçado (disposição) e da volumetria dos elementos construídos propostos; particularidades ligadas à consideração da condição de inundabilidade.

Parte 5: considerações e conclusões parciais, em especial, relacionando o conteúdo da parte anterior com as questões da investigação. As limitações do estudo decorrentes do caso sendo analisado em si mesmo (e não do plano previsto no protocolo) deverão ser aqui explicitadas.

Referências bibliográficas; aqui poderá existir também uma seção com a lista de documentos consultados, mas não referidos no relatório.

Apêndices, em especial, os guiões de entrevistas, eventuais grelhas de análise não abrangidas no corpo do relatório e as notas de visitas de campo.

Anexos, contemplando cartografia relevante e elementos originais dos planos e projetos.

Prevê-se o envio de versões preliminares do relatório deste caso para alguns dos entrevistados (e outros eventuais revisores voluntários), para verificar a necessidade ou de coletar mais algum dado (caso haja omissões) ou de rever alguma interpretação (ou ainda, para levantar interpretações alternativas), o que certamente contribuirá na escrita final do capítulo da tese correspondente. Notar que estes capítulos que resultarão dos relatórios dos estudos de caso poderão seguir, no final, outro formato (em termos de ordenamento das ideias, ilustrações, dimensão etc.), se isso for considerado pertinente.

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Atualizações no protocolo (a partir de maio de 2013):

Data	Alteração	Motivo
ago/13	Marcadadas em destacado ao longo do texto	Ajustes ou complementos ao texto; evoluções na parte relativa aos procedimentos de análise
set/13	Texto da tabela com os categorias analíticas	Evolução no processo de análise / afinamento dos conceitos empregados

Apêndice 1: Contatos dos projetistas
(em cinzento, projetistas já contactados)

Projetista	Projeto	Pessoas-chave
MVCC Arquitectos	– PPPVM – PVM (1ª, 2ª e 3ª etapas) – Docas – Clube Náutico – edifícios de apoio à Praça da Canção	Arq. Camilo Cortesão
Gonçalo Byrne Arquitectos	– PPEPJR – Entrada Poente do PVM	Arq.s Gonçalo Byrne e José Manuel Laranjeira
PROAP – Estudos e Projectos de Arquitectura Paisagista	– PPPVM – PVM (1ª, 2ª e 3ª etapas) – Entrada Poente do PVM	Arq.s Pais. João Nunes, Carlos Ribas e Joana Barreto
Atelier 15	– Valorização do Mosteiro de Santa Clara-a-Velha	Arq.s Alexandre Alves Costa, Sergio Fernandez e Luís Urbano
Sítios & Formas, Projeto e Consultoria	– Exploratório Ciência Viva	Arq. José Oliveira
NPK – Arquitectos Paisagistas Associados	– PVM (4ª e 5ª etapas)	Arq.s Pais. Leonor Cheis, José Veludo, José Lousan
Arquiteto Paulo Albuquerque	– Complexo de piscinas (junto com a NPK)	

Endereço	Página web & e-mail	Telefones
Av. da Boavista, 209 Porto	www.mvcc.pt mvcc@mvcc.pt	226 061 400
Rua da Escola Politécnica, 285 Lisboa	www.byrnearqu.com geral@byrnearqu.com	213 804 190
Rua Dom Luis I, 19, 6º Lisboa (2a-6a 10-18)	www.proap.pt proap@proap.pt	213 951 724
Rua 15 de Novembro, 61 Porto	atelier15@gmail.com	?
Av. Emídio Navarro, 81, 3º D Coimbra	www.sitioseformas.com info@sitioseformas.com	239 854 160
Rua Passos Manuel, 101, 4º E Lisboa	www.npk.pt npk@npk.pt; npkapa@mail.telepac.pt	213 582 842 /44
Rua Chagas 17, 1º E Lisboa	paa.lida@gmail.com pa.lida@oninet.pt, pa.arq@oninet.pt	213 259 648

Appendix C: List of interviewees, by city

Name, background and role (when the interview was carried out)	Date	Duration
Coimbra		
Mr. José Oliveira, architect-urbanist, head of Sítios e Formas	16/01/2013	60'
Mr. Rui Campino, landscape architect, officer at the planning and strategy division, CMC	23/01/2013	44'
Mr. Fernando Rebelo, engineer-urbanist, head of the urban-planning division, CMC	25/01/2013	78'
Mr. Camilo Cortesão, architect-urbanist, head of MVCC	01/03/2013	47'
Mr. Sergio Fernandez, architect, head of Atelier 15	07/03/ 2013	49'
Mr. João Rebelo, engineer, former CMC councillor and director of the Sociedade Coimbra Polis	20/05/2013 and 03/07/2013	55' 104'
Mr. Artur Côrte-Real, archaeologist, director of cultural services at the DRCC (former director of the MSCV)	08/07/2013	91'
Mr. Jorge Carvalho, engineer-urbanist, former advisor at the CMC-APOT	29/08/2013	43'
Mr. José Filipe Gameiro Fernandes, landscape architect, former coordinator of the Coimbra Polis Programme, Parque Expo	10/03/2014	71'
Antwerp		
Ms. Paola Viganò, architect-urbanist, head of Studio Secchi-Viganò	03/10/2013	32'
Mr. Bruno de Meulder, architect-urbanist, partner of WIT Architecten	05/10/2013	32'
Mr. Iñaki Zoilo, architect-urbanist, partner of PROAP	10/03/2014	91'
Ms. Reinhilde Vanhooydonck, engineer, Scheldt Quays project manager at W&Z	11/05/2016	106'
Mr. Philippe Teughels, architect-urbanist, Scheldt Quays project manager at AG VESPA	11/05/2016 and 13/07/2016	126' 12'
Mr. Kristiaan Borret, architect-urbanist, Antwerp's former <i>stadtbouwmeester</i>	13/05/2016	49'
Bordeaux		
Mr. Frédéric Rossano, landscape architect, former project manager of the Bastide Brazza Nord project at KCAP	04/10/2013	110'
Ms. Anastasia Elrouss, architect-urbanist, partner of YTAA	27/12/2013	78'
Mr. David Luque, architect-urbanist, project leader of the Bastide Brazza Nord project at KCAP	27/02/2014	106'
Ms. Carine Dunogier, engineer, head of the infrastructure department at Ingérop's Bordeaux agency	12/03/2014 and 23/07/2015	98' 110'
Ms. Flore Scheurer, geographer-urbanist, Bastide Brazza project manager at Ville de Bordeaux	22/07/2015	139'
Ms. Catherine Delaloy, architect-urbanist, head of planning at Bordeaux Métropole's urbanism directorate	22/07/2015	90'
Mr. Michel Desvigne, landscape architect, head of Michel Desvigne Paysagiste	27/07/2015	60'

Source: elaborated by the author

Appendix D: Example of an interview schedule

Interview schedule – Atelier YTAA

Architect-urbanist Anastasia Elrouss

Partner in the consortium of the Bastide Brazza Nord AMO phase

- Could you please briefly introduce yourself and the office Youssef Tohmé Architects & Associates, mentioning its main activities today?
- There's only one closed question, to which we'd like you to simply answer with a number, from zero to ten: how do you assess the importance conferred to floods in the master plan for Bastide Brazza Nord?
- No more numbers; could you please tell us how YTAA got involved in this plan?
- Do you know what criteria were used to select the consortium led by YTAA for this phase?
- Could you please describe the Bastide Brazza site?
- What are its main geographical strengths and constraints?
- Are there other non-geographical strengths and constraints to be mentioned?
- Could you briefly describe the current master plan for Bordeaux Brazza?
- What would you consider to be the main challenges faced by this master plan?
- What are the roles of the consortium partners: YTAA's office (leader; urbanism and architecture); Michel Desvigne (landscape) and INGÉROP (engineering)?
- Are there other players involved?
- How is the disciplinary expertise of each of the partners being brought together in the design process?
- How does the current master plan relate to the previous studies made for Bastide Brazza? For example, the "trame verte"/ "plan-guide", by Michel Desvigne and Bruno Fortier (2004), the preliminary study by Agence AUC (2010), and the pre-operational study by KCAP (2012). Is it possible to identify any kind of continuity between them?
- How has this process developed?
- What are the envisioned relationships between the master plan for Brazza and the other plans being elaborated for Bastide (Parc aux Angéliques, Bastide Niel...)?
- Brazza is supposed to be part of an *éco-quartier* initiative (*arc du développement durable / Éco-cité Plaine de Garonne*), intended to be a pilot intervention to guide future ones. This means that a great importance should be given to environmental aspects. In your point of view, how were these issues included in the specifications (*cahier des charges*) by the Municipality of Bordeaux?
- What are the major environmental commitments of the current master plan?
- It's noticeable that, in Bordeaux, there is a great political will to reincorporate the whole Plaine de Garonne (Brazza included) into the urban fabric. In your opinion, to what extent has the municipality been interested in having Brazza as a flood-related neighbourhood?
- Was this aspect to be reinforced in the master plan as an environmental differentiation aspect (or to be minimized, in the sense of hiding it)?
- The CUB (Communauté Urbaine de Bordeaux) had contracted a particular study on floods for the Garonne plain, prepared by EGIS Eau (2011), which included the Brazza area. Using CUB's words, this study was intended to support "the conciliation between the urbanization needed in this zone and its vulnerability to floods". Do you think this conciliation is an important issue for both CUB and Ville de Bordeaux? (I mean, in your opinion, did they share the same stance about how to deal with this sometimes conflicting combination: floods and urbanization?)
- How are floods being dealt with in the current master plan?
- Up to now, do you think this topic could have been more explored? Or will it be more explored in the near future, as the implementation phase goes on?

- In terms of urban design properly, what are the mechanisms proposed by the master plan to cope with floods (e.g. urban morphology, green public spaces etc.)?
- And regarding the design of individual buildings? Did the master plan specify rules to be applied to them, when in a flood-prone area? If yes, what rules?
- Is there any rule regarding, for example, restriction of uses in some buildings in areas with higher intensity of risk – I mean, buildings supposed to be used by vulnerable populations (children, the elderly...), or more sensitive buildings linked, for example, to the supply of basic services, like energy etc.?
- What is the main flood study being used as a reference for the development of the area?
- “*Urbanisme en liberté*” has been used to synthesize the development strategy to be pursued in Brazza, in a flexible and pragmatic approach. How does this strategy relate to the ways to deal with floods within the master plan?
- What aspects of KCAP’s previous master plan were maintained in the current master plan?
- What are the main differences between the current master plan and the previous one by KCAP?
- In the previous planning stage, INGÉROP had done some 3-D simulations/scenarios regarding urban design and floods. Are these scenarios still being used to feed the master-plan proposal?
- In the desirable image for Brazza, it is noticeable that there are some hesitations between urban density (*centre ville*) and greening (*ville verte*) (or hesitations regarding the difficult balance to be established between them). Do you think these hesitations can have some impact on the relevance and consideration of floods within this development?
- The experience of minor and regular flood events is sometimes considered a means to keep the salience of flood risk. So risk culture could be fostered by keeping the flood-proneness condition visible in people’s daily urban routine (through the presence of, for example, floodable public spaces, emergency accesses or visible marks of past flood events). Was this sensitization aspect also relevant in the current Brazza master plan? If yes, how is it planned to be reached?
- Had your office (or one of your partners in the planning consortium) previously worked on urban design projects in flood-prone zones?
- If yes, could you please give us some examples of this kind of projects? What were the main lessons learnt with them? To what extent could such lessons be applied to the Brazza case?
- Is it possible to identify any influence of other European riverine urban projects on this master plan for Bastide Brazza?
- Many architects believe that the more restrictions you have, the more you need to be creative to deal with them (and the more interesting the project is). Do you think that there is any innovative solution in the master plan of Brazza thanks to the fact that it is located in a flood-prone area?
- What information would you add now to further explain us the __ you gave to the importance conferred to floods in this particular project (our second question)?

Appendix E: Original quotes from interviews in either Portuguese or French

page	original quote
135	<i>“c’est un fleuve très violent, très chargé en boue, en terre, en débris”</i>
154	<i>“os níveis de urbanidade”</i>
158	<i>“o Programa Polis, que era no fundo uma estratégia para as cidades médias portuguesas, [visava] aplicar os conceitos daquilo que era a nossa experiência na ‘Expo 98’, na zona de intervenção, e levá-la para outras cidades do país”</i>
158	<i>“um rio, duas margens, uma cidade”</i>
158	<i>“o grande risco é perder o concurso”</i>
158	<i>“criar uma frente de rio, que é, no fundo, o objetivo da grande maioria das cidades de um país civilizado, hoje em dia: ter umas zonas de lazer, urbanas, com estas condições muito boas da água”</i>
162	<i>“tínhamos a perceção de que aquela frente até a Portela, se fosse assumida toda como verde público, poderia ser excessiva, com dificuldade de utilização e tratamento. Lembro-me que no plano estava incluída a ideia de que alguns equipamentos (sei lá, minigolfes, piscinas ou similares) podiam ser privados, mas integrados no conjunto de Parque, sendo certo que se considerou indispensável garantir percurso público ao longo de toda a margem e atravessamentos variados.”</i>
162	<i>“proposta de Plano de Pormenor”</i>
167	<i>“quando o Programa Polis foi feito, todas as situações estavam mais do que estudadas. Portanto, nós não andámos a estudar o problema das cheias: as cheias do Cacém estavam estudadas, as cheias de Viseu estavam estudadas, as cheias de Coimbra estavam estudadas (neste caso por acaso estavam mal estudadas, mas estavam estudadas). O que nós fizemos foi fazer com os estudos que havia, não fomos estudar outra vez; porque senão eram quatro anos para fazer estudos e quatro anos para fazer planos.”</i>
169	<i>“uma espécie de piscina ou caixa onde o conjunto monumental é mantido a seco”</i>
169	<i>“memória da ameaça provável”</i>
170	<i>“as pessoas iriam viver o rio com menos intensidade”</i>
173	<i>“coisas do plano foram muito condicionadas”</i>
173	<i>“fundamentalistas da cheia”</i>
174	<i>“a própria cheia [de 2001] foi o próprio estudo”</i>
175	<i>“o facto de aquilo estar em leito de cheia impediu boa parte das formas de ocupação que se pretendiam fazer”</i>
175	<i>“erro humano, pura e simplesmente”</i>
177	<i>“Como os projetos já estavam a ter isso em conta, depois o plano, por sua vez, não sentiu a necessidade de reforçar isso. Não estou a dizer que está bem, se calhar é um erro; não estou a dizer que isto está bem. Devia estar, se calhar; mas como estava tudo a ser feito ao mesmo tempo, provavelmente passou essa questão dos planos terem isso referenciado, ficou logo nos projetos.”</i>
178	<i>“os promotores (a conjugação de interessados públicos ou privados) não apareceram”</i>
178	<i>“fundamentalmente o que houve foi uma grande delimitação de área onde as coisas não puderam ser feitas”</i>
178	<i>“se um parque urbano de vez em quando tiver água, nesses dias não se vai lá ou vai-se com galochas; não vejo nisso qualquer problema ”</i>
182	<i>“Isto é o rio; o rio, que é azul, é parque.”</i>

page	original quote
184	<i>“As Docas, por exemplo, subiram 30 ou 40 cm relativamente ao que estava no projeto. É evidente que era muito mais bonito como estava, 30 cm na relação com a água é uma grande diferença, elas estavam rigorosamente na continuidade da água e fomos obrigados a fazer um degrau, pôr aquilo um bocado mais acima (...) realmente a probabilidade de entrar água 30 cm acima é muitíssimo mais baixa do que 30 cm abaixo; portanto, percebe-se, faz algum sentido.”</i>
185	<i>“os restaurantes que estão lá feitos têm um nível de cota estudado de maneira que a água possa, por exemplo, andar pelas explanadas; é normal o nível de cheia, num ano normal, chegar às explanadas, está feito para isso. O próprio parque está feito para que se houver inundações, o próprio parque funcionar como amortecedor desse nível d’água.”</i>
187	<i>“As Docas têm uns aparelhinhos quaisquer, umas pequenas eclusas, umas comportas para pôr nas portas se aquilo subir mais...”</i>
187	<i>“Fundamentalmente, acho que o que têm é um termo de responsabilidade de quem ocupa o espaço a dizer que não vai culpar a natureza por estragar uma máquina de fazer batatas fritas quando a água subir.”</i>
188	<i>“eu lembro-me de, a certa altura, ter que perder algum tempo para tentar convencer algumas boas almas que não era preciso pôr uma grade ao longo do rio para que as pessoas não se atirassem ao rio. (...) havia aí gente que achava que, já que agora tinha gente, tinha que se fazer um gradeamento (aliás, era mais bonito até fazermos um gradeamento ao longo da costa toda para as pessoas não caírem ao mar). O bom senso é uma coisa que custa muito a adquirir, demora muito tempo; e normalmente as pessoas não têm isto.”</i>
193	<i>“as coisas voltaram para trás; por exemplo, a piscina, que estava prevista e que agora acabou por ser feita já (...), teve que ser recuada, quando, na ideia inicial do projeto original, a piscina era muito próxima da água (mas também era muito mais interessante).”</i>
194	<i>“apesar de o Exploratório estar sobre o leito inundável (aliás, de acordo com o previsto no Plano de Pormenor), a cota de utilização é a cota 21; e essa foi uma das medidas tomadas para salvarguardar dos efeitos de cheias.”</i>
196	<i>“O Centro de Interpretação está pousado em pilotis não por razões de arquitetura moderna; está pousado em pilotis porque se admite que haja de 100 em 100 anos uma inundações que possa chegar até o pavimento. E portanto, todo o material que pode sofrer com inundações foi levado para cima.”</i>
196	<i>“Não é certo que aquilo que se fez seja absolutamente eficaz.”</i>
196	<i>“em cima de um monte de pedras (...) estava bem visível que tínhamos que nos prevenir”</i>
196	<i>“o próprio edifício contemporâneo é um edifício que conta a história do sítio (...). Ao estar elevado, mesmo sendo um edifício contemporâneo, retrata preocupações que é fugir da água ainda hoje (...). Portanto, aquele edifício marca a contemporaneidade, mas a contemporaneidade de uma história de um território que é um território inundável. Quem olhar para aquele espaço vê que não foram só as freiras que tiveram esse cuidado de fugir da água, mas também a contemporaneidade; daí que toda a harmonia das soluções passa exatamente por todos esses conceitos.”</i>
196	<i>“o terreno está sempre cheio d’água”</i>
198	<i>“as pessoas (...) que forem ver o edifício [a ruína da igreja] sem antes ver o filme visita-o com uma sensação completamente diferente, e aquele filme tem exatamente esse objetivo, de criar sensações.”</i>
198	<i>“mas talvez minorizado por parte dos patrimonialistas”</i>
198	<i>“memória da ameaça provável”</i>
199	<i>“funcionou ao contrário”</i>
199	<i>“havia uma série de dispositivos de drenagem da encosta que garantiam que não acontecesse aquilo que aconteceu (e que depois não voltou a acontecer; é possível que tenham feito alguma coisa)”</i>
200	<i>“continua a prever-se (ou admitir-se) que possa haver mais inundações”</i>

page	original quote
201	“Este sítio não é um sítio seco; apesar de estar seco hoje, é um sítio com água: basta desligarmos um botão (e isso transmitimos muitas vezes às pessoas), e a água começa a subir. Portanto, essa sensação de que estamos na iminência de ter água novamente é tão simples como um botão: se desligarmos um botão, demora dois dias mas depois fica cheio d’água outra vez.”
203	“em uma situação normal, [o canal] estaria sempre com água um pouco estagnada (ficava ali o lixo, as folhas secas etc.); essa bombagem do Mosteiro de Santa Clara-a-Velha descarrega nesse canal e garante a sua limpeza.”
204	“‘O homem vence a natureza?’ (...) ‘Será que com as essas coisas todas (barragens etc.) conseguimos vencer a natureza?’ Bom, o que é um facto é que não. A ruína está preparada, o edifício está em pilotis, é um edifício palafítico, portanto o que nós não queremos é que a água chegue às coleções; já a igreja, enfim, a sua história é conviver com a água, poderá haver algum prejuízo mas são assim prejuízos menores.”
204	“a água permitiu que aquele sítio ficasse congelado”
205	“o Parque Verde do Mondego é uma excelente oportunidade, e uma oportunidade rara, porque, de facto, é um parque que foi oferecido à cidade pelas cheias do rio Mondego. Ou seja, o facto do rio durante toda a vida ter sido um rio não domado (...) fez com que a margem do rio não tivesse sido ocupada. Portanto, tinha ocupações agrícolas, mas não teve nem ocupações industriais nem urbanas como é normal na maioria das cidades (...) Como a agricultura foi sendo decaída (era uma coisa mais ou menos abandonada), de facto, foi relativamente simples (ao contrário de outras cidades onde é preciso demolir fábricas desocupadas ou outras coisas), foi muito fácil criar uma frente de rio”
207	“Isso é muito bom para a biodiversidade porque esses locais que não se pode usar, enchem-se de ratazanas (que é um bicho que não tem o problema do risco, portanto, vai para lá). Esta gestão também tem estes problemas, não é? É perigoso, não se usa; então, transforma-se numa pequena selva urbana, que é bom (tem ervas daninhas, bichos da selva, cães abandonados e lixo). Acho que é melhor um sítio que de vez em quando é preciso dizer ‘não vá’...”
209	“Sabe que o papel do projetista é tentar fazer o que não lhe deixam, portanto. É verdade, é pressionar um bocadinho mais, senão estávamos sempre a fazer o mesmo que os patos-bravos (fazem exatamente o que a lei permite para que não os incomodem). Nós temos que fazer um bocadinho mais, temos que ir um bocadinho contra isso e tentar fazer coisas que não sejam consensuais, porque o consenso não vale a pena.”
213	“o facto é que o rio está com pouca água, ao contrário do que parece; e se houver uma cheia... de facto é fácil transbordar um copo que está cheio de areia com poucas gotas d’água, e isso é o que ali eventualmente poderá acontecer.”
213	“[haver água no terraço das Docas] é uma contingência dali, e isso está no contrato, isso até está nos próprios contratos com eles; eu lembro-me de isso ter sido discutido, e eles, ao princípio, eles sabiam muito bem que a água podia lá chegar.”
214	“nós sabemos que (...) de vez em quando vai ser preciso investir para repor a situação [das Docas]; de X em X tempo, vão acontecer estas condições naturais [i.e. cheias] que de certa forma estragam, degradam a situação que lá está, e vai ser preciso intervir. (...) e pode-se dizer que nunca dormimos descansados, porque estes fenómenos que aconteciam de 100 em 100 anos, depois passaram a acontecer de 50 em 50, e agora está a acontecer de 10 em 10. Não se sabe se daqui a 20 anos não acontece de 2 em 2, não é? As condições climáticas que nós estávamos habituados, as médias e as estatísticas estão todos os dias a serem postas em causa, pelas alterações climáticas. Isso preocupa-nos, é um facto.”
302	“pendant longtemps dans la Métropole il n’y avait que des ingénieurs (il n’y avait pas d’urbanistes, il n’y avait pas d’autres compétences, vous n’aviez que des ingénieurs) et essentiellement sur les problématiques de gestion de l’eau.”
308	“[le site] est coincé et fracturé : coincé derrière des zones de logement, des industries qui vont rester, derrière les coteaux, derrière des voies ferrées ; enclavé, avec un fort passé, et qui est aujourd’hui raccordé. Et donc aujourd’hui il a à nouveau un avenir. (...) Et puis il n’y a pas d’habitants (ça c’est très bizarre), pas d’habitants, finalement peu d’emplois, c’est sous-occupé, c’est très vide, c’est assez mort, assez vide ; c’est désaffecté, en fait, c’est comme une friche énorme, voilà.”

page	original quote
309	<i>“Brazza n’est qu’un petit territoire (...), c’est un petit sujet par rapport à l’immensité du territoire et le nombre de secteurs de projets sur lesquels nous devons intégrer le risque inondation”</i>
309	<i>“À Brazza, ce n’est pas très compliqué ; pourquoi ? Il n’y a pas de digues, c’est un territoire non protégé ; quand on est derrière une digue, le risque c’est que la digue casse : au moment où elle casse, ça fait rentrer l’eau d’un seul coup, très vite très fort, et ça c’est très dangereux. À Brazza, si ça déborde, c’est parce que l’eau grignote sur la berge, monte, monte et monte, et se déverse lentement dans le territoire, et finalement elle se répartit ; donc il n’y a pas de vitesses très fortes, même avec des hauteurs importantes.”</i>
309	<i>“On parle d’inondations qui, chaque année, ont une chance sur cent d’arriver ; ce n’est pas une inondation qui va arriver deux fois par an, c’est une chance sur cent chaque année. Donc on parle vraiment de choses qui ne sont pas courantes (ou même de très grosses inondations) (...). Donc on gère un risque qui a une faible probabilité d’arriver ; donc inonder les parkings ce n’est pas très grave (même s’il y a quelques dégâts), le but c’est que les gens ne meurent pas, le but c’est maîtriser le risque pour les êtres humains, voilà.”</i>
311	<i>“une connaissance de ce territoire avec une autre approche [de l’urbanisme plus contextualisé], qui mêle géographie et histoire”</i>
311	<i>“de façon plus claire et de façon plus pédagogique”</i>
311	<i>“pour qu’il y ait cette conscience”</i>
315	<i>“c’est vraiment l’hyper-centre de l’agglomération”</i>
317	<i>“[le risque d’inondation n’a] pas été suffisamment pris en compte au moment du plan guide, et il a fallu refaire beaucoup beaucoup de choses. Donc dans l’idée, ce que la maîtrise d’ouvrage voulait c’est que ça soit bien pris en compte dès le départ à Brazza, pour qu’on ne mette pas par terre le projet après, qu’on ne casse pas le projet parce qu’on a oublié l’inondation.”</i>
317	<i>“c’est ça la nouveauté : c’est qu’en fait le quartier a toujours fait avec l’eau, mais pas de façon aussi importante que ce qu’on connaît maintenant avec le réchauffement climatique. ”</i>
327	<i>“Alors, je pense que dans le vocabulaire de la maîtrise d’ouvrage, à partir du moment où c’est résolu, on en parle peu, et pour eux [Ville de Bordeaux] c’est considéré un peu comme résolu ; donc je ne suis pas sûre qu’ils en parlent beaucoup (maîtrise d’ouvrage). Ils considèrent que c’est technique, que c’est résolu, donc voilà.”</i>
327	<i>“je pense que pour nous c’était déjà quelque chose d’acquis, ce n’était pas une nouveauté... Ça veut dire qu’au début (le premier), cette question-là a été traitée comme importante parce qu’on était en plein dedans ; elle revenait, elle ressortait de façon importante, donc on l’a mise de façon importante. Et puis on a vu qu’il y avait des réponses possibles urbaines, avec l’eau, donc c’est devenu pas problématique, c’était une donnée d’entrée comme d’autres (...)”</i>
327	<i>“une équipe qui va être capable de travailler avec nous dans l’état d’esprit qu’on attend ; dans le contexte qu’on a, comme c’est de l’urbanisme négocié, ça veut dire une équipe (et un architecte-urbaniste) qui soit capable de s’adapter (...). Voilà, on est dans la négociation, donc il faut trouver des équipes qui soient capables de négocier, et qui soient capables d’accepter les propositions (...). On est dans des contextes mouvants aujourd’hui, et donc on ne peut plus dire ‘on sait faire’ ; en fait on ne sait pas faire, on n’en sait rien, donc il faut savoir faire avec ‘on ne sait pas’, et tout le monde ne sait pas faire avec ‘on ne sait pas’.”</i>
328	<i>“à chaque fois ce qu’on dit c’est : ‘reprenez les bonnes idées et ce qu’on a validé de l’autre [plan guide], et on vous autorise à réinterroger le reste”</i>
329	<i>“en fait on est en ville sous un couvert d’arbres”</i>
331	<i>“c’est lié à la volonté de faire rentrer le paysage de la Garonne, avec la notion des lanières, la notion des peupleraies, et les pilotis qui s’intègrent avec le végétal qui passe en dessous”</i>
334	<i>“un compromis entre les fonctions, les usages et l’inondation ; (...) entre inondation et usage, c’est les deux qui sont en balance, c’est un équilibre entre les deux ”</i>
334	<i>“il faut que l’eau se voie”</i>

page	original quote
335	<i>“je veux que l'eau soit visible, voilà, je veux que les gens sachent qu'ils habitent dans un quartier d'une certaine façon... que les gens doivent se demander par exemple : 'Pourquoi on est sur pilotis ?' Et à un moment, on puisse leur dire pourquoi : 'Parce que c'est inondable.' 'Ah, donc c'est inondable ! Ah, je peux avoir de l'eau dans le quartier ; d'accord, OK.' Et le jour où ils ont de l'eau, ils savent, ils ne sont pas pris de court, ils savent qu'il y a de l'eau, voilà. Moi je veux aussi rendre visible les choses, et pas rendre invisible, gérer techniquement et puis le jour où ça arrive on se demande pourquoi, on a oublié qu'il y avait de l'eau, qu'il pouvait y avoir de l'eau. Donc ça c'est vraiment la ligne de conduite”</i>
335	<i>“le but c'était de trouver quelque chose de très simple que tous les promoteurs privés pourraient faire, on n'a rien fait de compliqué.”</i>
336	<i>“une trame qui est très aérée” ; “une très grande souplesse (d'enlever, de remettre, de rajouter, d'adjoindre, de dissocier...)” “c'est un des grands atouts de ce projet”</i>
336	<i>“On aurait pu construire plus ; mais justement, si on avait construit plus, on aurait été plus gêné par rapport au risque inondation. Le plan masse est vraiment calé sur le risque inondation (...), c'est adapté au site et ça permet à un moment donné cette adaptation et cette évolution, puisque demain on ne sait pas, nous, l'urbaniste, on ne sait pas lire dans la boule de cristal (...). La ville c'est ça : c'est un mouvement perpétuel, et nous on doit rendre possible ce mouvement (on ne doit pas l'empêcher) ; donc c'est à nous aussi de trouver dans nos règles, dans nos projets urbains, la souplesse.”</i>
337	<i>“il faudrait savoir maintenant comment on le réalise et dans quelle ordre, parce que si je commence à mettre tous les cailloux, sans enlever ceux qui sont déjà là, je vais avoir un problème. Aujourd'hui on a déjà des cailloux (ce sont des bâtiments existants qui un jour vont être démolis), et si je commence par faire tous les nouveaux bâtiments avec une emprise au sol et que je ne démolis pas les bâtiments qui sont déjà là, j'ai mis plus de cailloux dans ma bassine.”</i>
337	<i>“On ne peut pas être souple sur l'inondation, parce qu'en fait, à chaque fois qu'on veut prouver quelque chose, il faut passer par des choses très lourdes, très mathématiques (des modèles, des analyses, des démonstrations auprès des services de l'État, des dossiers réglementaires), ça ne peut pas être souple l'inondation ; parce qu'en fait, l'inondation ne s'arrête pas à la parcelle, elle va chez le voisin, elle va loin, donc ce n'est pas sur ça qu'on peut être souple. Du coup, on ne peut pas faire ce qu'on veut. Non, ce n'est pas souple sur l'inondation.”</i>
339	<i>“L'environnement, au moins ce dont on s'occupe sur le projet de Brazza, c'est prendre en compte le territoire comme il est aujourd'hui : est-ce que, par exemple, il y a des plantes intéressantes à sauvegarder ? Comment est la pollution ? Est-ce qu'il y a des problèmes liés au bruit ? Est-ce qu'il y a des problèmes liés à l'inondation ?”</i>
340	<i>“je pense que c'est en train de changer. C'est-à-dire que je pense que, il y a 15 ans, on était mauvais en environnement, et ça a changé (maintenant, dans les dossiers, c'est assez bien traité). Je pense que maintenant c'est l'heure de l'inondation ; je pense que c'est la chose sur laquelle les projets vont s'améliorer maintenant. Je pense aussi que la difficulté en inondation c'est qu'il y a peu de gens qui savent traiter de l'inondation, et que c'est difficile à comprendre ; ce n'est pas facile d'accès, pour comprendre les phénomènes (il y a beaucoup de réglementations, beaucoup de modélisations, c'est comme quand on parle des problématiques acoustiques ou air, c'est compliqué aussi, c'est un peu la même chose). Tout de suite, on dit : 'Ah là là ! Il va falloir faire un modèle, ça va être cher...' ; les gens évitent, parce que c'est cher. Donc je n'espère qu'une chose, c'est que ça va être de mieux en mieux fait.”</i>
341	<i>“Nous on dit 'il y a une troisième voie : je peux, sous conditions', en toute connaissance de cause et en croisant les enjeux ; l'enjeu et le niveau de risque, parce qu'il y a des territoires où il y a un petit risque et d'autres où il y a un grand risque, donc ce n'est pas du tout la même approche. (...) Donc à chaque fois le croisement des enjeux va nous ouvrir des champs de possibles. Et en fonction de l'enjeu urbain, eh bien on va essayer de travailler en bonne intelligence (...)”</i>

page	original quote
341	<p>“Si on n’intègre pas l’inondation au départ dans le plan guide, on ne peut pas le faire fonctionner par rapport à l’inondation. Donc c’est à faire en même temps ; on ne peut pas dire : ‘Je fais un plan guide, et puis après je vais voir comment je fais pour l’inondation’ (ça ne marche pas). Et si on le fait avec, on peut faire quelque chose de bien ; c’est faisable, on peut arriver à... Enfin, les êtres humains ont toujours vécu en zone inondable, il faut juste apprendre à le faire, réapprendre à le faire ; on a juste oublié, mais en vrai on savait faire. Donc je pense qu’il faut faire tout de suite avec...”</p>
342	<p>“est-ce que la norme permet de faire de bons projets ? Est-ce que la norme empêche les bons projets ? Est-ce que la norme permet de réfléchir ? Est-ce que la norme empêche de réfléchir ?”</p>
342	<p>“tout le monde [Ville de Bordeaux et Métropole] est d’accord sur le fait que, de toute façon, comme tout est inondable partout sur le bord de la Garonne, il vaut mieux construire en zone inondable dans la partie déjà urbanisée que d’aller construire en zone inondable dans les parties non urbanisées ; il vaut mieux gérer ça en ville que de le gérer à la campagne (l’urbanisation). Donc tout le monde est d’accord sur le fait qu’il vaut mieux densifier la plaine rive droite dans Bordeaux que de continuer à étaler l’agglomération bordelaise jusqu’au bassin d’Arcachon.”</p>
344	<p>“Question : Tu disais : ‘il faut que l’eau se voie’ ; à ton avis, est-ce que la sensibilisation est un aspect souhaité dans le plan guide de Brazza ? Réponse : Non ; ce n’est pas souhaité. Ça c’est ma volonté personnelle [rires]. Je pense qu’en fait Brazza n’est que le début...”</p>
344	<p>“L’objectif c’est : il y a la Garonne, il y a un réchauffement climatique, c’est factuel, c’est comme ça, donc ça peut être inondable, donc on fait avec l’eau. L’objectif c’est : on fait avec l’eau.”</p>
345	<p>“notre travail à nous c’est de faire en sorte que les projets qui se réfléchissent soient la meilleure réponse aux territoires, c’est-à-dire qu’il faut commencer par investiguer les territoires, et faire les diagnostics et faire des études. Ça coûte de l’argent, ça prend beaucoup de temps (des fois on a des élus qui trouvent qu’on met beaucoup de temps à réfléchir), mais l’urbaniste, une fois qu’il commence à travailler, il faut qu’il sache exactement sur quel territoire il travaille, et après il fait un projet qui est la bonne réponse à ça (sinon on a un projet qui peut être joli mais qui n’est pas la bonne réponse). Et la question inondation, c’est exactement ça : bien connaître le risque, bien l’avoir expertisé sur le territoire, et après, une fois que je sais exactement comment fonctionne mon territoire d’un point de vue hydraulique et à quels risques il est exposé, là on peut faire travailler un urbaniste, et pas dans l’autre sens (et ça, ça vaut pour la pollution, ça vaut pour plein de sujets). Donc la Métropole met beaucoup d’argent dans les études avant de faire, de proposer, des projets urbains ; je pense que c’est la bonne façon de faire.”</p>
345	<p>“la Ville n’a pas cherché à faire un projet qui traite la question d’inondation, elle a pris la contrainte et elle a essayé de faire avec (le mieux possible, mais avec).”</p>
345	<p>“Mais dans tous les cas, depuis le début, depuis 2009, on prend en compte la question de l’eau, mais les réponses sont très différentes : elles peuvent être parfois très techniques, et d’autres fois beaucoup plus naturelles, on va dire (plus d’adaptation au contexte qu’une gestion technique) ; voilà, on a des choses très différentes. Par contre, comme on n’est pas effectivement habitué à travailler avec l’eau de façon prégnante comme d’autres pays, du coup on expérimente, finalement. On n’a pas une réponse commune, on n’a pas une position où on se dit ‘ah, avec ce problème-là, c’est cette solution-là.’ (...) on a dit aux urbanistes : ‘on a le problème de l’eau, vous faites avec l’eau’, et chacun a proposé des réponses différentes.”</p>
346	<p>“En fait, ils n’étaient pas intéressés... Je ne pense pas qu’ils étaient intéressés par le fait de l’associer... Je ne pense pas que c’était la question posée, je pense que c’est une obligation, au départ c’est une obligation. Comment dire?... Comment faire d’une contrainte une force, on est toujours dans cette question-là ; ce n’est pas par plaisir qu’ils font ça, ils n’ont pas le choix. ”</p>
347	<p>“le plan guide a très bien intégré la problématique de l’inondation tout de suite ; je ne suis pas sûre que si [Ingérop] n’avait pas été là ça serait le cas.”</p>

page	original quote
347	<i>“ce qui est important c’est de pouvoir avoir des gens dans les équipes des plans guides qui sont capables de comprendre et d’expliquer les phénomènes, pour que ça soit bien intégré tout de suite. (...) puis surtout, quand un architecte regarde la parcelle, il ne peut pas connaître ça [les dynamiques territoriales de l’eau]. Une parcelle qui est prise comme ça au hasard dans le territoire, il ne peut pas comprendre d’où vient l’eau, comment elle arrive et ce qu’il faudrait faire pour que ça marche bien. Donc ce qu’il y a c’est que c’est toujours pareil : l’urbanisme c’est l’histoire d’équipes pluridisciplinaires. Si on est en zone inondable, il faut des gens qui comprennent l’inondation. (...) à Bordeaux, il faut faire avec des spécialistes de l’inondation, sinon on ne fait pas de bons projets.”</i>
355	<i>“Il faut une contrainte légale, je suis persuadée. Moi, je ne pourrais pas faire mon travail correctement sur ce sujet [l’adaptation aux inondations] si je n’avais pas l’appui de la loi... Je pourrais faire à quelques endroits avec des partenaires, par exemple, mais pas de manière générale (pas de manière exhaustive, pas de manière complète), ça ne serait pas possible, je suis sûre.”</i>
361	<i>“Brazza est une illustration de ce qu’on peut faire sur un territoire confronté à un risque inondation qui est un risque relativement faible.”</i>
361	<i>“na fase inicial do planeamento estratégico [do Programa Polis Coimbra], [a propensão do sítio às cheias] esteve em conta, mas as propostas que foram colocadas na mesa não a tiveram, até porque não havia o estudo [hidráulico] concluído. Depois desse estudo concluído, portanto, isso tem uma preponderância essencial, eu diria máxima (estamos a falar mesmo do máximo), a partir desse momento.”</i>
361	<i>“oito, por uma razão muito simples: o parque verde urbano de Coimbra, para mim, o Parque Verde é isto [uma grande faixa com o rio em seu centro], não é isto [duas faixas paralelas de um lado e do outro do rio], percebe? Isto [o rio] é parque. Isto é o rio; o rio, que é azul, é parque.”</i>
361	<i>“se eu fosse demasiado cuidadoso diria dez, começo pela higiene e a segurança. Eu nunca começo por aí. Quer dizer, acho que o projeto, a questão essencial é a qualidade do espaço que seja vivido por quem vai usar; essa, eu dou dez. O resto são condicionantes que se vão ter que cumprir, melhor ou pior, para que essa qualidade do espaço seja completada por conforto, segurança e outras coisas assim. No caso concreto da cheia do Mondego (que houve uma nos últimos 15 anos [entrevista concedida em 2013] e foi por engano), não me parece que isso tenha que condicionar muito a maneira como nós trabalhamos. Não penso que seja uma coisa que vá condicionar o projeto de forma significativa, a não ser na justa medida em que a interpretação (do meu ponto de vista, um pouco abusiva) desse fenómeno leve a ideias excessivas de restrição. Portanto, o problema é mais como contornar certas limitações, do que como cumprir certas normas de boa conduta.”</i>
362	<i>“Ce n’est pas à la base du projet... enfin, c’est quand même une contrainte forte.”</i>
362	<i>“Je dirais qu’en fait ça a été pris dès le début, et ça c’est très positif ; et ce qui a été très positif c’est que la Ville (le maître d’ouvrage) comme le reste de l’équipe ont dit : ‘OK ; on fait avec l’inondation comme elle est.’ Ils n’ont pas essayé de contourner, ils n’ont pas essayé de dire : ‘Ah ! On va faire un peu comme ci, on va faire comme ça...’ L’équipe a dit : ‘OK, c’est inondable, c’est comme ça.’ Et ça, ça se voit dans toutes les typologies des bâtis, il y a plusieurs types de solutions qui ont été trouvées... C’est assez simple à expliquer comment c’est pris en compte aussi, je trouve que le huit c’est aussi parce que le projet reste faisable, c’est-à-dire qu’on n’a rien fait de compliqué, et je pense que ça a une chance d’être fait pour de vrai. En fait, c’est réaliste, on arrive à une solution réaliste, faisable, et intégrée dans le plan guide ; le huit c’est parce que c’est faisable, c’est partagé, et c’est intégré dans le plan guide. Ce n’est pas quelque chose qui est rajouté par-dessus.”</i>
364	<i>“é evidente que os projetos são exatamente interessantes porque têm evolução”</i>
371	<i>“Les leçons apprises... Il y a la connaissance (il faut connaître, il faut expertiser), et ensuite il faut négocier avec l’État. (...) Bien connaître, bien expertiser, bien prendre en compte et négocier avec les services de l’État ; parce que, c’est tout le sens du marché qu’on va lancer, ce n’est pas parce qu’il y a risque inondation qu’on ne peut pas faire, mais il faut démontrer aux services de l’État qu’on connaît, qu’on a expertisé, et que les propositions qu’on fait tiennent compte de ce risque et qu’on a juste la réponse à la situation.”</i>

page	original quote
374	<p>“Il faut essayer de faire des choses qui fonctionnent au maximum sans l'intervention de l'être humain lors de l'inondation ; il faut que ça marche tout seul. Il faut que ça coule, que ça aille aux bons endroits. Il faut essayer de ne pas mettre des choses mécaniques, des choses physiques pour protéger : il ne faut pas avoir à fermer des choses, il ne faut pas avoir à bouger des choses, en cas d'alerte ; parce que ça, pendant le temps où il n'y a pas d'inondation, les gens oublient, ça ne fonctionne plus, ce n'est pas entretenu, et c'est là que c'est dangereux. Il faut que ça marche parce que c'est configuré comme il le faut. Ensuite, l'autre chose c'est : je pense que l'eau doit à nouveau se voir en ville ; parce qu'en fait, ce qui se passe par rapport à ce qu'on faisait avant, c'est qu'on a oublié, c'est qu'on a essayé de penser que toute l'eau irait dans les tuyaux, qu'elle resterait derrière les digues... Ça ne marche pas. Donc, en fait, il faut que l'eau se voie, pour que les gens aient conscience du risque, il faut réapprendre à comprendre et à connaître le risque.”</p>
378	<p>“Questão: No caso, existe alguma alternativa, por exemplo de percursos ou instalações móveis, que pudessem manter a frequência do monumento mesmo com água?” “Resposta: <i>Quando há cheia, nem sequer se pensa nisso. Numa situação de cheia, seja num hospital seja num espaço patrimonial, os sítios são encerrados. O que acontece é, se houver uma cheia, o país está preocupado com a cheia, não está preocupado com os visitantes que vêm a Santa Clara ou a um outro património. Aí, como esperamos que sejam situações muito muito esporádicas (aconteceu em 2001; estamos em 2103, nunca houve qualquer sinal de cheia a não ser este ano), o que temos que fazer é reorganizar o espaço, e pô-lo novamente a funcionar; portanto é uma questão de convivência difícil, em momentos de tragédia, a utilização do espaço.”</i></p>
379	<p>“O ano passado [2012], arranjámos uma ideia, que não custa nada, que foi recriar o episódio do século XIX de um arqueólogo que resolveu um dia ir fazer uma expedição ao interior da igreja, e que, com algum medo, com mais duas pessoas arranjou um barco e tochas e anda a navegar debaixo daqueles arcos, aquela água e tudo escuro. (...) Então nós retratámos isso à noite (sem água, naturalmente), com umas tochas, e foi uma adesão: 600 pessoas (já nem tínhamos capacidade)!”</p>

Source: elaborated by the author

Appendix F: Summary of the main characteristics of the studied cases

Summary of the characteristics of the cities in which the selected urban-regeneration projects are located (as of July 2014)

		Coimbra	Antwerp	Bordeaux
City characterization	Total population	city: 110,000 (2011) municipality: 143,000 (2011)	municipality: 512,000 (2013) metropolitan region: 1.19 M (2008)	municipality: 240,000 (2010) CUB: 720,000 (2010) [extended urban area: 1.1 M]
	Area	city: 33 km ² municipality: 320 km ²	municipality: 205 km ² (2013) metropolitan region: 1,450 km ²	municipality: 49 km ² CUB: 552 km ²
	Density	city: 3,333 inhabitants/km ² municipality: 347 inhabitants/km ²	municipality: 2,308 inhabitants/km ² (2013)	municipality: 4,845 inhabitants/km ² CUB: 1,304 inhabitants/km ²
	Topography	hilly + (flood) plain	(flood) plain	(flood) plain
River characterization	Name	Mondego	Scheldt	Garonne
	Navigability	no (only in the remote past)	yes (port city)	yes (port city)
	Mean width of the riverbed in the city	180 m	450 m	500 m
	Tidal variation in the city	n.a.	~ 5 m	~ 5 m
	Water quality	good; water sports	?	?
	Number of river crossings	7 bridges	5 tunnels	5 bridges
	Dangerousness	none	high; undercurrents	high; undercurrents
Flood-risk characterization	Major flood type	riverine + pluvial	riverine (with tidal influences) / storm surge + pluvial	riverine (with tidal influences) / storm surge + pluvial
	Rate of (fluvial) flood rise (pace)	slow	slow	slow
	Duration	short: a few days	short: few hours (less than a day)	short: few hours (less than a day)
	1/100-year flood discharge (m ³ /s)	1,200	??	??
	Exposed population	around 9,000	?	?
	Date of last important flood event	1948, 2001	1953, 1976, 2013	1930, 1981, 1999
	Existing flood-defence structures	dams, dikes	dikes, floodwall, controlled-flood areas	dikes
	Date of construction	1970-80s	1978 (floodwall)	?
Planning background	Main planning documents (regulatory and vision statement)	PDM (1994)	Spatial Structure Plan for Antwerp (2006)	PLU (2006), SCOT (2012) Juppé's <i>projet urbain</i> (1996, 2009, 2013)
	Main principles defined	four major concepts, one of which being 'centring the city on the river' (1990)	seven city images (2006), one of which being the 'Water city'	"redonnons à Bordeaux une unité autour de son fleuve, avec le projet des deux rives", "full moon" (2009)
	Main slogan/motto adopted	"one river, two riverbanks, one city" (Coimbra Polis, 2000s)	n.a.	"l'arc du développement durable"
	Any reference to floods in the spatial-planning documentation (local or regional)?	article 64 of the revision of the PDM (2009) deals with the "zones prone to floods"	yes (at a regional scale)	Plan de Prévention du Risque Inondation Schéma de Cohérence Territoriale de l'Aire Métropolitaine Bordelaise
	Major conditions imposed	specific rules for the occupation of floodable areas	?	certain areas can develop if the previous hydraulic conditions are maintained

Source: elaborated by the author

Summary of the characteristics of the selected urban-regeneration projects (as of July 2014)

	Coimbra	Antwerp	Bordeaux
Flood-prone urban-regeneration project	Coimbra Polis Programme	Master Plan Scheldekaaien	Plan Guide Bastide Brazza Nord
Subprojects (if any)	Parque Verde do Mondego (PVM), West Entrance of the PVM, revamping of the Monastery of Santa Clara-a-Velha	Droogdokken park, St Andries and Zuid project (not to be analysed)	n.a
Dates	1995-2006 (project); 1999-2010s (implementation)	2006-2010 (project); implementation ongoing	2010-2014 (project); implementation ongoing
Clients	Municipality of Coimbra, Sociedade Coimbra Polis, IGESPAR	Municipality of Antwerp, W&Z (Waterwegen en Zeekanaal nv)	Municipality of Bordeaux (+ Bordeaux Métropole)
Designers	MVCC/PROAP + GBA/PROAP + Atelier 15 + NPK	PROAP/WIT/D-RECTA/IDROESSE	AUC, then KCAP/Mutabilis/Ingérop/OASIIS/BMA, then YTAA/MDP/Ingérop
Main stakeholders (besides clients and designers)	the Portuguese government (through CCRDC and Sociedade Coimbra Polis), ParqueEXPO	the Flemish government (through W&Z), the port authority, the inhabitants	the land owners
Main contracting procedure	open planning competition (five participants)	restricted planning competition (five participants)	bidding
Scope of the design	two master plans + several detailed projects (at least five)	a master plan + several detailed projects	a <i>plan guide</i> (equivalent to a more detailed master plan)
Area	PVM (1999): 132 ha (expected), of which ~ 80 ha as part of Polis	linear intervention: ~7 km x ~100 m (~ 2.3 ha)	initially: 67 ha; finally: 53 ha
Location within the city	central	central	peripheral (city); central (metropolitan area)
Location as regards the river	on both riverbanks	on the right bank (the traditional one)	on the right bank (the secondary one)
Flood susceptibility	in the 1-in-100-year flood zone	medium (but high value of exposed items)	mostly in the 1-in-100-year flood zone
Previous urban occupation	no	yes	yes
Previous land use	underexploited agricultural fields (mainly orange groves) + disorganized car parks + temporary uses (fairs and festivals)	port zone (mostly discontinued) + disorganized car parks (still today) + temporary uses (fairs and festivals)	declining industrial zone
Major leverage of the urban project	new 'stable' riverine landscape (derived from the regulation works) + Polis Programme (at the national level)	updating of the Sigma Plan	intention to reintegrate the right bank into the urban fabric + the construction of a new urban bridge
Major programme	a regional (urban) park along both riverbanks (linear site)	flood protection + upgrading of the quays (as a public space) (linear site)	a mixed-use neighbourhood (site not linear)
Does it include real-estate development?	no (only sporadic occupation)	no (only sporadic occupation)	yes (real-estate intervention)
Major contextual and physical constraints (besides floods)	informal car parks near the river; low connectivity to the urban fabric; absence of a vast open space to hold big events	underused area transformed into a parking area; informal appropriation by people; update of the flood-risk plan; quay wall in need of restoration; spatial isolation (low connectivity to the urban fabric)	industrial pollution; spatial isolation (low connectivity to the urban fabric); area with a declining urban image
Major potentials (besides floods)	location and size of the area; culture of temporary use already in place	location and size of the area; culture of temporary use already in place	location and size of the area; improved accessibility
Major objectives	to increase the quantity/quality of green area per inhabitant; to reinforce the city centre	to update the flood-protection structures; to stabilize the historical quay wall; to refurbish the public space	to reconvert a (monofunctional) industrial area into an actual (vibrant) part of the city + to refrain urban sprawl
Major conflicts to be dealt with through design	no real conflict	flood protection and urban regeneration (access to the river); quays as an urban barrier being informally appropriated (public open space)	flood protection and urban development + desired urban image for the new neighbourhood (green or urban?)
Stage of the design process in which floods appear as an important issue	only after the 2001 flood event (the issue was not even mentioned in the competition brief)	since the beginning (floods among the major leverages of the project)	since the beginning (the issue was duly mentioned in the competition brief)
Major approach (vertical vs. horizontal) towards floods	horizontal spread (yet, these variations were not really integrated)	vertical containment (although with hybrid solutions of quay-wall rehabilitation, dyke and urban promenade)	horizontal spread (no quay wall in place; promotion of hydraulic transparency)
Public involvement/participation within the process	the two best proposals of the competition (1996) were presented to the public; more intense participation in the case of the monastery	a formal participation process was promoted (this was also useful to minimize potential conflicts and foster ownership)	a formal participation platform was organized (<i>Rencontres de La Bastide</i>), but meetings were scattered; nowadays, Atelier Brazza as a platform for stakeholders, but not really open to the public
Design style (blueprint or process-oriented design?)	despite being designated a master plan, the plan was mostly done as a final design (blueprint), only part of it was left open for future developments	design as an evolving process; several specific project areas were identified, two of which being presently further developed	mixed style: in the first plan, the proposal was developed more as a blueprint ("Dutch style"); in the current version, the plan is more open to evolving situations
Acknowledgement of river processes	partially	yes	yes
Importance given to the three riverine-space design components, according to Prominski <i>et al.</i> (2012)	ecology: + ; flood protection: +/- ; amenity: ++	ecology: +/- ; flood protection: ++ ; amenity: ++	ecology: + ; flood protection: + ; amenity: ++
Intention to conciliate safety and river experience (closeness) at the city level	+/- (but floods not included among such experiences)	++	+ (but the riverbank itself is not integrated in the area under study)
Scope of the notion of safety used within the design	the riverine park itself	the city segments bordering the riverbanks (including the inner city)	the new neighbourhood
Implementation	public (municipality and central government, via a dedicated quango)	public led (two governmental agencies, from different levels: the municipal urban-planning agency and the regional watercourses agency)	although the design process has been carried out by the municipality, private entities are in charge of the implementation

Source: elaborated by the author