

A photograph of an elderly woman walking through a flooded city street. She is wearing a dark coat and holding a black umbrella. She is carrying a large plaid shopping bag and a pair of black shoes. The street is filled with water, and a white car is visible in the background. The overall scene is in a blue-tinted color palette.

**(How) do flood-prone cities  
build resilience?**  
**Towards a learning sensitive  
analytical framework**

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**Irene Bianchi**



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Dipartimento Architettura e Studi Urbani

Doctoral Programme in Urban Planning, Design and Policy  
Department of Architecture and Urban Studies  
Politecnico di Milano

# (How) do flood-prone cities build resilience? Towards a learning sensitive analytical framework

Doctoral Dissertation of

**Irene Bianchi**

Supervisor: Prof. Grazia Concilio

Doctoral Programme Coordinator: Prof. Luca Gaeta

*Doctoral Examination Committee:*

Prof. Marcela Brugnach (B3C - Basque Centre for Climate Change,  
Ikerbasque - Foundation for Science)

Prof. Yuri Kazepov (Universität Wien)

Prof. Paola Pucci (Politecnico di Milano)

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**(How) do flood-prone cities build resilience?  
Towards a learning sensitive analytical framework**

Irene Bianchi

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Urban resilience is almost unanimously identified as an inherently positive guiding principle in the risk reduction policy field. Limited attention, however, is paid to how the resilience of a place is built in practice by actors embedded in complex, polycentric governance structures. Also, literature related to risk and urban studies does not clearly frame the learning dimension of resilience-building processes, mostly failing to discuss how capacities for reflection, collaboration, and action develop in the face of wicked, risk-related problems.

This research takes a social process perspective approach to flood risk reduction. It focuses on post-flood reorganisation attempts developed within selected vulnerable urban contexts, recurrently affected by more or less disruptive flood events. The research looks at institution-led risk reduction policies and practices to explore the nexus between learning processes, learning outcomes, and institutional action. It investigates whether learning dynamics emerge and how they affect institutional practices and their risk mitigation and preparedness results. Also, the research identifies political, organisational, relational and discursive dynamics that shape spaces for reflection and action. The study uncovers some of the mechanisms through which risk-reduction processes succeed or fail to enhance a place's inherent and adaptive resilience and produce "learning loops" that feedback in policy actions.

The study draws on empirical materials collected and analysed through different qualitative methods, including semi-structured interviews, longitudinal media analysis, review of policy and planning documents, thematic content analysis, and problem frame analysis. Additionally, it proposes a learning sensitive analytical framework to deconstruct resilience-building processes. This tool is developed through methodological bricolage, i.e. putting together materials discussed in an interdisciplinary literature review and the results of post-event reorganisation processes analysed in two flood-prone cities, i.e. Kingston upon Hull and Leeds (UK). Selected contributions from social and organisational learning theories and interpretative policy analysis complement those insights. The framework is tested by analysing reorganisation attempts carried out to face the "eternal flooding" of the Seveso Torrent, which has affected the Northern neighbourhoods of Milan for decades, with over 100 events recorded after 1976. Findings are further interpreted with the support of a triple loop-learning model (Argyris and Schön 1978 and following modifications), which explicitly connects reflection to changes into action strategies, governing variables and systems structures and processes.

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Results from the Milanese case show relevant changes in how institutional actors at different levels conceive, frame and address flood risk. In line with European and national regulations, policymakers' approach acknowledges the need to pursue flood mitigation and enhance preparedness, thus overcoming – at least in its declared intentions – old-school defence-dominated approaches. Furthermore, local public officials show a higher degree of attention to the Seveso and its recurrent flooding. Nevertheless, the analysis highlights the existence of a reflective and operational deadlock. (Reflective) action is mainly hampered by path-dependency, defined by local actors as the impossibility to amend “historical mistakes” in decision-making and the irreversible outcomes they generated. A critical role is also paid by spatial, discursive, and governance fragmentation patterns, which contributed to institutional inaction and widened the gap between political rhetoric and the translation of high-level objectives into actions on the ground. The analysis shows that, despite the successful implementation of some of the measures analysed, the reorganisation process as a whole did not succeed in developing reflective actions grounded in social or organisational learning processes.

The study contributes to disentangle the learning-resilience nexus and the role of learning in making risk-reduction strategies and actions. It provides a theoretical background and methodological insights for exploring the interplay of risk-reduction policies, framing and knowledge dynamics and broader relational, discursive and regulatory factors. In particular, it argues that resilience-building requires learning processes to take place and their outcomes to be situated into action at different scales and in various policy arenas. Furthermore, it examines how learning dynamics can be captured and framed, thus providing insights into the field of policy analysis. The proposed framework represents a valuable base for investigating reflective and operative dynamics occurring along policy-making processes developed to tackle risk in contexts characterised by high levels of complexity, uncertainty, and political pressure.





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AdBPo	PoAutorità di Bacino Distrettuale del Fiume Po (River Po District Basin Authority)
AIPO	Agenzia Interregionale per il Fiume Po (Interregional Agency for the Po River)
ARPA	Agenzia Regionale per la Protezione Ambientale (Regional Agency for Environmental Protection)
ATO	Ambito Territoriale Ottimale (Local water board authority)
CAS	Complex Adaptive Systems
CCA	Climate Change Adaptation
CSNO	Canale Scolmatore di Nord Ovest
DEFRA	Department for Environment Food and Rural Affairs
DRR	Disaster Risk Reduction
EA	Environmental Agency
ERSAF	Ente Regionale per i Servizi all'Agricoltura e alle Foreste (Regional Body for Agriculture and Forest Services)
ERYC	East Riding of Yorkshire Council
FAS	Flood Alleviation Schemes
FDSD	Foundation for Democracy and Sustainable Development
FRM	Flood Risk Management
FRMP	Flood Risk Management Plan
HCC	Hull City Council
HRO	High Reliability Organisations
IFM	Integrated Flood Management
IWM	Integrated Water Management
LEP	Leeds City Region Enterprise Partnership
LLAs	Learning and Action Alliances
LLC	Leeds City Council

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MM Metropolitan Milanese

NIMBY Not In My Back Yard

RAFAS River Aire Flood Alleviation Scheme

PAI Piano di Assetto Idraulico (Hydraulic Plan)

PGRA Piano Gestione Rischio Alluvioni (= FRMP)

PGT Piano di Governo del Territorio (Urban Plan)

SESS Social-Ecological Systems

YHLAA Yorkshire and Humber Learning and Action Alliance

WYCA West Yorkshire Combined Authority

UNISDR (now UNDRR) United Nation Office for Disaster Risk Reduction





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*Guardala come arriva guarda com'è com'è  
Guardala come arriva guarda che è lei che è lei*

*Acqua di spilli fitti dal cielo e dai soffitti  
Acqua per fotografie per cercare i complici da maledire*

*Acqua che stringe i fianchi tonnara di passanti*

*Âtru da camallâ  
Â nu n'â â nu n'â*

*Altro da mettersi in spalla  
Non ne ha non ne ha*

*F. De Andrè, 1996*

---





# 1

(How) do flood-prone cities learn?  
Introductory notes and a  
research overview

## ABSTRACT

*This introductory chapter provides a short overview of research contents, approach and structure. Its sections define and frame the research questions, and indicate expected research outcomes and contributions.*

### 1.1 Exploring post-flood reorganisation processes: Why a learning perspective?

Global exposure to natural hazard has doubled over the last forty years (Pesaresi et al. 2017: 66) and climate change is expected to further increase the frequency and magnitude of extreme weather events in the next decades (IPCC 2014). Those events impact in particular fragile social-territorial systems, where increased exposure to hazard intertwines with place-based vulnerability patterns, rooted in social and institutional sources (Tierney 2014, Wisner et al. 2003[1994], Quarantelli 2005[1998]). Structural and organisational vulnerability factors can be related e.g. to historical paths of socio-spatial transformations, to the emergence of specific crisis, or to the characteristics of urban and risk governance networks (see e.g. Cutter et al. 2008, Pelling 2003).

In risk-prone contexts, institutional action at multiple scales is ideally needed to address uncertainty (as theorised by Christensen 1985) and to “strategically navigate” (see Hillier 2011) the system affected in “finding viable paths into the future, negotiating unknown terrain and unprecedented complexity while retaining integrity and relevance” (Hames 2007: 228–29, in Hillier 2011). Contributions from the field of (disaster) risk reduction emphasise the role of institutional actors in offering a vision and in providing direction setting to achieve it (Berke and Campanella 2006); in mediating different interests (see e.g. Olshansky and Chang 2009); and in facilitating interactions among different “ways of knowing” (Bawden 2010). Literature referring to more or less “specified” resilience frameworks<sup>1</sup> and related contributions on adaptive governance highlight that institutional action needs to define policy options and governance arrangements to enhance the capacity of social-territorial systems

<sup>1</sup> Resilience frameworks have widely been used to discuss dynamics related to the capacity of social-spatial systems to deal with more or less abrupt shocks and to reorganise after disturbances (see Chapter 2).

themselves to “cope with, adapt to, and shape change” (Folke 2006: 254). From a more operative perspective, policy discourses underpinned by international guidelines on disaster management adopt a similar approach, stating that actors embedded into more or less formal risk governance networks are required to support risk reduction through mitigation and preparedness (see the Sendai Framework 2015-2030, UNISDR 2015).

*But under which conditions and through which mechanisms does institutional action contribute to the shaping of “inherent” and “adaptive” resilience?*

The thesis takes a social process perspective approach to flood risk reduction. Assuming that extreme events are drivers of change, which can open “windows of opportunity” (Birkmann et al. 2008) that provide cities, organisations and communities with the chance to transform and reorganise (see e.g. Adger et al. 2005, Perry and Quarantelli 2005: 341), the research investigates institution-led processes that aim to support risk reduction within selected vulnerable urban contexts. Those processes are observed to explore the mechanisms through which flood-prone cities react to a shock and attempt to reorganise in the face of risk. Through the development and testing of an analytical framework, the research seeks to better understand pathways through which risk-reduction oriented strategies and measures emerge, develop and are translated into actions on the ground. Accordingly, it looks for contextual political, organisational, relational and discursive factors that affect decision-making processes and their outcomes in terms of risk reduction. Also, the thesis adopts a learning sensitive lens, and it strives to reveal the role and meaning that learning dynamics take along the evolution of institutional-attempts to support flood risk mitigation and preparedness.

My personal interest on the learning dimension of risk reduction originated from some naïve questions, that came to my mind when looking at the news about flood events affecting the same Italian cities again and again: *how is it possible that these flood events occur so often in the same places and keep causing such serious damages? Can these cities ‘learn’ something from their own experience? Or from some other sources?* These first, roughly formulated questions have been

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2 Following Cutter et al. 2008, inherent and adaptive resilience refer respectively to the capacity of a system to function well during non-crisis periods and to its capacity to handle risk.

substantiated and refined through a thematic review of literature on resilience and risk (Chapter 2). The review discusses how learning is defined and framed in the scientific and policy debate on resilience and risk reduction.

The review showed that literature on disaster resilience and risk reduction generally recognises the existence of a ‘learning dimension’ and agrees in emphasising the relevance of learning processes for resilience building. On the one hand, extreme events are viewed as “focusing events” (Birkland 1997, in Choularton 2001: 67), which bring attention to themselves and to their causes. In this view, they can trigger reflection and potentially become “learning opportunities”, i.e. “unplanned learning experiments, offering the chance to test not only human endurance, organizational performance and social behaviour, but also ideas about organizations and policies” (Lanzara 1983: 71). On the other hand, learning is identified as a mechanism for resilience building, which is itself conceptualised as “a process of learning at all levels” (O’Brien et al. 2010: 5046). In this view, learning is intrinsically connected not only to knowledge acquisition, but also to (adaptive and coping) capacity building and, ultimately, to action. The emphasis is on social learning (see Reed et al. 2010 for a definition), which is grounded into relational practices of knowledge co-production and that emerge within actor’s networks through interaction. In turn, actors’ capacity to support risk-reduction oriented reorganisation processes is brought back to their capacity to engage into iterative and reflexive learning processes based on critical reflection (Argyris and Schön 1978), and to situate learning outcomes in the practice of dealing with specific situations.

A learning sensitive lens is adopted to detect those mechanisms through which capacities are (eventually) developed in flood-prone contexts, and to critically discuss structural, procedural and emergent constraints affecting the space (institutional) actors have to make sense of the problem, reflect, learn and situate learning into action.

## **1.2 Setting the context: Research assumptions and problems**

Research assumptions refer to resilience building processes, whose nexus with learning is investigated throughout the thesis. It is assumed that resilience building is “situational” (Cutter et al. 2008), “accumulated” (Satterthwaite 2013) and built through practice. Also, processes affecting the resilience of a socio-spatial system are “socially contingent” (Brown 2014: 109) and

place-specific. This implies that resilience cannot be imported, nor transferred from one context to the other. Rather, it can be co-produced agents embedded in more or less formally defined multi-scalar relational networks. Actors at multiple levels contribute to shape the resilience of a place or of a community through their behaviours, decisions and practices. At the same time, in line with Giddens (1984), their capacity to act individually and collectively is constrained by a system's structural configurations (e.g. physical vulnerability patterns, social capital structures, norms and values) and organisational procedures. For what concerns the role of learning, this situated and incremental understanding implies that resilience and risk reduction cannot be achieved through the reproduction and transmission of an "objective" knowledge, but that they requires reflection and knowledge to be created, shared and "performed", i.e. "localised, embedded, and invested in practice" (Weber and Khademian 2008: 339).

*(i) Conceptualising reorganisation processes and resilience building dynamics*

The conceptualisation of post-flood reorganisation processes in terms of resilience building reflects the same tensions and shortcomings discussed by the resilience debate itself (see Chapter 2). First, doubts are raised about the explanatory potential of the "resilience" concept. Since it has been used "with many different intentions and with a very wide extension" (Brand and Jax 2007: 9), the term is accused of undergoing a "gradual sprawl and a simplification in both its meaning and its application" (Chelleri et al. 2015: 181). In risk management, the simplified use of the concept has for long led to view post-event reorganisation processes as linear paths aimed at going back to normalcy (e.g. Haas et al. 1977. See Olshansky 2017 for an overview). Even if the literature on (disaster) risk management overcame this paradigm and adopted a "forward-looking", dynamic and evolutionary understanding of resilience (Pickett et al. 2004: 373, Kulig et al. 2013: 762), a shared conceptualisation of resilience building processes is still missing. Given also the nonlinear nature of systems behaviours, the interconnections among systems components that interact in non-simple ways (Simon 1962: 468), the multiplicity and heterogeneity of actors involved and the role uncertainty and ambiguity (see Renn and Klinke 2013, Brugnach and Ingram 2012), resilience building in the context of disaster risk reduction is often conceived as "a 'black box' whose inner mechanisms constitute a mystery" (Alford and Head 2017: 400).

Second, the concept of resilience as applied to social systems - including social-territorial systems - has been accused of being “politically ambiguous” (Davoudi, in Davoudi et al. 2012) or even “conservative” (MacKinnon and Derickson 2013). The lack of a clear normative reference has often supported the understanding of resilience as a value-free concept, opening up to politically instrumental use of the term and putting into question – again – its explanatory potential. This last issue encompasses a double dimension:

- **Resilience for whom?** – Despite the increasing importance attributed to the social dimension of risk resilience (e.g. in terms of people-centred approaches aimed at satisfying the need of vulnerable social groups or of disaster-affected people), political issues related to equity and to the enhancement of socio-political capabilities of the involved actors are rarely considered as priorities in the resilience debate (Vale 2014, Vale and Campanella 2005).
- **Resilience by whom?** – Literature does not clearly frame the role of agency in resilience building processes. Questions related to the role of different agents and to the mechanisms through which resilience is (pro-) actively built are still mostly unexplored. Also, urban and community resilience frameworks pay limited attention to the interactions between structural constraints and individual/collective agency.

Third –as mentioned above– despite the growing acknowledgement of the role of iterative learning for resilience building, contributions dealing with social and organizational learning in post-event contexts are still fragmented and very heterogeneous in terms of underlying assumptions, disciplinary perspectives, application fields and intended scopes. Paraphrasing Armitage et al., who referred to learning models in environmental management, it can be argued that while “the value of learning as a normative goal and process is recognized, yet vague notions of learning are often encouraged in the absence of careful examination of the factors that determine if, who, how, when and what type of learning actually occurs” (2008: 87).

*(ii) Reducing risk through policy processes*

Research gaps in resilience literature resonate with bottlenecks identified by critical contributions discussing the evolution of policy approaches, discourses and practices.

First, risk-related issues are often defined in narrow terms as ‘structural problems’, to be addressed pragmatically through technical solutions. Consequently, policy approaches to urban (flood) risk management often follow procedural and monologic paths, grounded on “idealised design principles based on institutional and technological panaceas” (Pahl-Wostl et al. 2012: 25). Following a technical rational perspective, in many cases policy-making processes “start with collection of often descriptive data and end with a blueprint, [...so that they] fail to acknowledge the mismatch between such an ideal world of planning and its actual disordered, uncertain, and essentially political realities” (Davoudi 2015: 2). In the context of risk reduction, policy processes often fail to take into account how risk-related dynamics are rooted, produced and reproduced in specific contexts, nor do they embrace complexity and normative ambiguity<sup>3</sup> issues (Renn and Klinke 2013: 2040).

Regarding the role actors, technical rational approaches often lead to vertical decision-making, which defines priorities following previously established high-level goals. In this view, local actors are mainly conceived as passive beneficiaries of pre-defined policies, rather than as pro-active agents of change (Berke et al. 1993).

For what concerns reflection and learning, even if growing attention is paid to knowledge dynamics, limited attempts have been made to frame resilience-building processes as forms of “knowing in practice” (see Davoudi 2015). Despite risk-related resilience literature has seen a gradual overcoming of evidentialist approaches conceiving learning as a mere “outcome”, it broadly considers it as “an object” with an instrumental role for the definition of sound policymaking. Also, policymaking in the field of (urban) risk reduction mainly relies on technical knowledge, still primarily conceived as something that can be transferred and reproduced.

### *(iii) Researching resilience building processes through*

Finally, little guidance is provided to researchers interested in investigating the evolution of complex reorganisation processes. Due to conceptualisation

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3 Normative ambiguity alludes to “different concepts of what can be regarded as tolerable referring, e.g. to ethics, quality of life parameters, distribution of risk benefits, etc.” (Renn and Klinke 2013: 2040).



shortcomings mentioned above, the definition of methodological approaches and of adequate research tools that allow investigating complex resilience building processes without performing reductionist analysis constitutes a significant challenge. Besides, difficulties emerge in detecting learning, i.e. in investigating whether it has taken place, through which mechanisms (e.g. related to critical reflection and knowledge dynamics), and which are its outcomes.

### 1.3 Tracing a direction: Research questions, goals and expected contributions

Reflecting the research conceptual, operative and methodological problems discussed above, the thesis identifies three sets of research questions. In line with the approach adopted by the research (see Chapter 1.4), research questions are exploratory and open-ended. When necessary, those are complemented by more specific guiding questions, that will be introduced and discussed directly in the next chapters.

- 1 *What meaning and role does learning assume in relation to (risk) resilience?*

The research seeks to disentangle conceptual nexuses between resilience building and learning in the context of (flood) risk. In particular, it considers how the latter are related to forms of institutional action aimed at improving the capacity of territories and citizens to reduce vulnerability and to cope with the effects of more or less unpredictable flood events.

- 2 *How do flood-prone cities reorganise in the face of risk? Under which conditions and through which mechanisms do they learn?*

The thesis aims to enter in the “black box” of resilience building paths and to inductively deconstruct the processes through which urban flood risk resilience is (possibly) developed and implemented in specific contexts. Considering institutional actions proposed and carried out to support flood risk reduction, the thesis analyses policy-driven reorganisation processes taking place in selected risk-prone areas. The overall goal of the analysis is to uncover the mechanisms through which they succeed or fail in: (i) enhancing the “inherent and adaptive resilience of place” (see Cutter et al. 2008); (ii) supporting relational social

capital development; (iii) enhancing knowledge diffusion and capacity building and (iv) producing “learning loops” that feed back in policy practices.

### *3 How can post-flood reorganisation attempts be investigated through a learning sensitive lens? How can learning be captured?*

The research attempts to provide insights about how complex, dynamic and inherently political reorganisation processes can be explored and to specifically discuss how learning dynamics taking place can be captured and framed. To do so, it proposes an analytical framework, which is drafted and empirically illustrated with the support of two examples from the UK and of one case study: the recurrent flooding of the Seveso Torrent in Milan.

The theoretical analysis of the resilience-learning nexus will contribute to better framing the learning dimension, and its meaning and role for resilience building dynamics in risk-prone areas. The analytical framework will also contribute to a better understanding of the learning and social dynamics affecting inherent and adaptive resilience. The identification of contextual obstacles to learning and action may be used to identify priorities to be addressed in the contexts analysed. Finally, the framework hopes to provide a methodological contribution to the investigation of local capacity building and risk reduction processes from a learning perspective.

## **1.4 Conducting a process-focused inquiry: Research approach, design and methods**

The thesis adopts an exploratory and interpretative (Yanow and Schwartz-Shea 2009) research approach to investigate the evolution of resilience building attempts (for more insights, see Chapter 4). This approach focuses on “understanding phenomena in their own right” (Elliott and Timulak 2005: 147), rather than on “explaining” them based on some outside perspective (see Haley 1986: 385). Also, the research adopts a process-focused approach, which examines questions of how phenomena emerge, change and unfold over time (Elliott and Timulak 2005: 149). Such a perspective recognises the centrality of time, and it draws on theorising that “explicitly incorporates temporal progressions of activities as elements of explanation and understanding” (Langley et al. 2013: 1). Furthermore, the thesis investigates the nexus between resilience building and learning “inductively” (Bernard 2011), through the

observation of institutional actions undertaken in the attempt to support risk reduction.

The research design is structured through a recursive scheme, in which different parts mutually inform each other (see Figure 1.1). The core part of the research consists of the development of an analytical framework. This tool is proposed to guide the observation of risk-reduction-oriented processes and the identification of learning dynamics (eventually) taking place. The first part of the thesis identifies the conceptual, methodological and practical elements for developing this framework, which is built through “methodological bricolage” (see Denzil and Lincoln, in Rogers 2012). Insights from the resilience debate are used to identify the structural coordinates of the analysis and to define relevant objects of observation. A mapping exercise analysing actions developed in two selected flood-prone UK cities is used to refine insights from the literature connect, and to bridge conceptual insights with the analytical framework. The framework is then tested through an in-depth process analysis performed on risk-reduction oriented attempts carried out to face the recurrent flooding of the Seveso Torrent in Milan. The choice to develop and test the proposed analytical tool in different socio-spatial and institutional contexts (i.e. the UK and Italy) is meant to enhance the potential applicability of the analytical framework itself. Finally, the results are used to re-discuss previously identified conceptual nexuses, to evaluate the relevance of the proposed framework and to reflect upon the opportunities and limits of adopting a process-oriented, exploratory research approach to the analysis of learning dynamics in relation to institutional action for flood risk reduction.

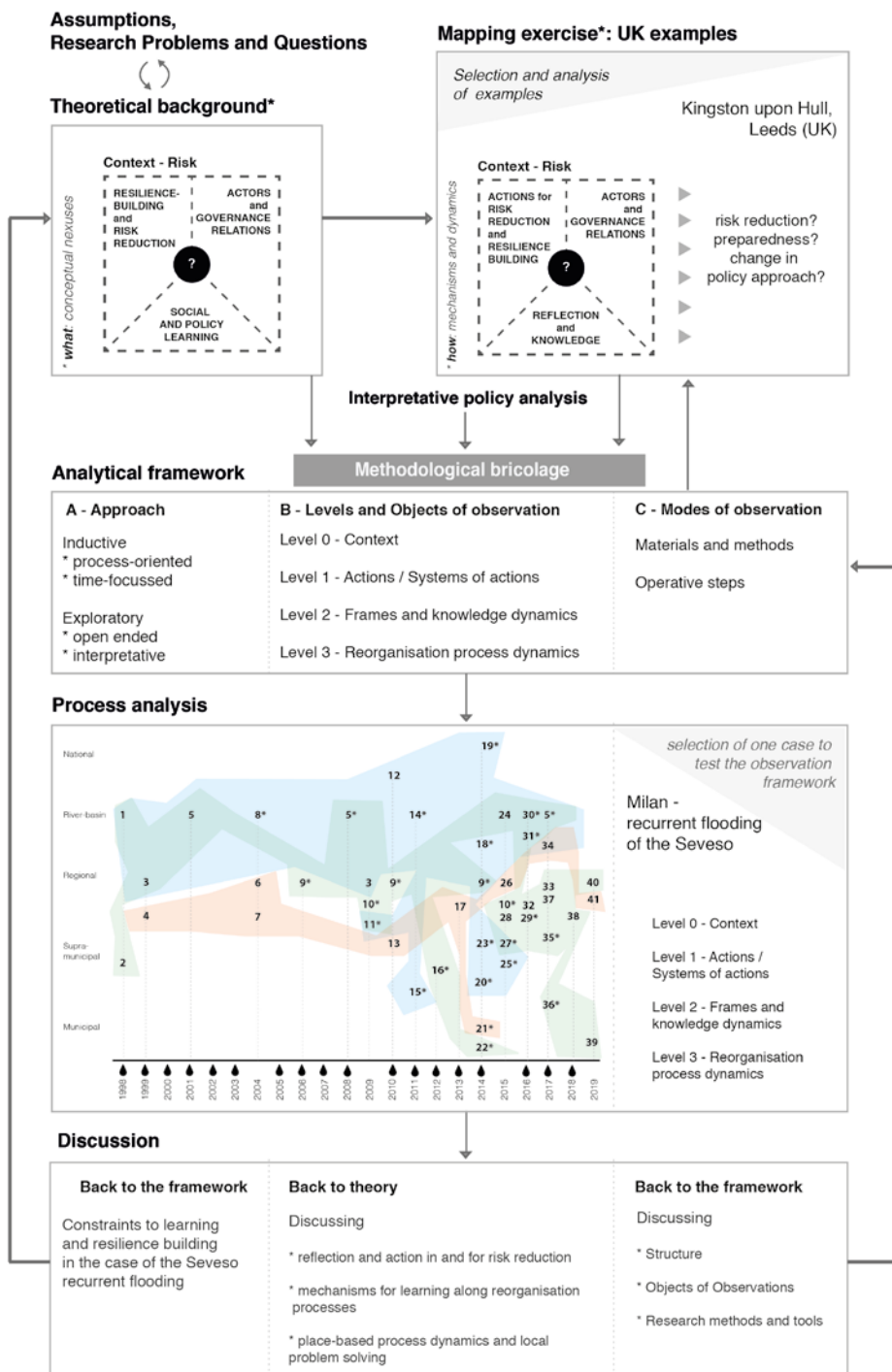


FIGURE 1.1 RESEARCH DESIGN.

Figure 1.2 provides an overview on research methods used in the different sections. The empirical part of the research relies on a combination of qualitative research methods, including semi-structured interviews, longitudinal media analysis, and policy analysis. The materials analysed include policy and planning documents, interviews transcripts, but also media sources and gray literature (e.g. including interim reports, social media reports, press releases). Process analysis is further supported by problem frame analysis and thematic content analysis (see Chapter 4).

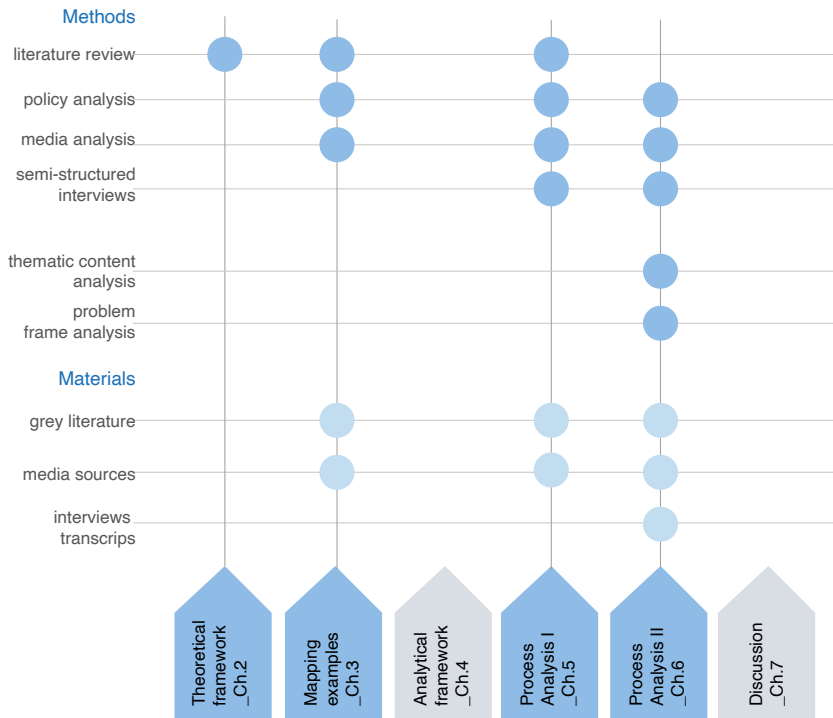


FIGURE 1.2 RESEARCH METHODS.

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## 1.5 Outline of the Thesis

The outline of the thesis follows the scheme outlined in the research design (see Figure 1.1).

*How do socio-spatial systems reorganise in the face of disturbances? How is learning defined in relation to resilience, and what role do academic and policy discourses attribute to learning and capacity building?* Chapter 2 lays the ground for the exploration of these broad interrogatives through an interdisciplinary review of the literature. On the one hand, the Chapter discusses how different bodies of literature conceptualise and connect some relevant concepts i.e. resilience, risk reduction and learning. On the other, it reconnects conceptual nexuses among (flood) risk resilience, flood risk governance and learning, and it seeks to understand: (i) how they conceptualise reorganisation processes and (ii) which elements they identify as crucial for the evolution of reorganisation dynamics. Also, mechanisms for building resilience are discussed, with attention being posed on the role of reflection and learning. Outcomes are used to refine research questions and goals, to frame research problems and needs better and to provide the conceptual coordinates for drafting the analytical framework.

Chapter 3 presents the results of an exploratory mapping exercise focused on the observation of risk reduction-oriented reorganisation attempts developed in two UK cities, namely Kingston Upon Hull and Leeds. These examples are used to connect conceptual nexuses identified in the literature to actual attempts to support resilience building and risk reduction. This chapter identifies relevant study objects and analytical dimensions, therefore contributing to the development of the analytical framework. Notably, the mapping exercise and the analytical framework definition have developed in parallel, in a dialectic way that allows these two parts to inform each other mutually.

Chapter 4 presents the analytical framework. After describing how it is built, the chapter illustrates the research approach followed for the critical analysis of risk reduction reorganisation processes through a learning sensitive lens. Finally, it introduces levels of analysis and corresponding objects of observation and discusses methodological and operative steps.

Chapter 5 and 6 apply the framework on the Milanese case study. Chapter 5 analyses the context, describing place-based factors and territorial dynamics

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and illustrating the normative and governance structure in which flood risk reduction attempts are rooted. Also, it provides a historical overview of recurrent flood events and identifies relevant actions carried out to reduce flood risk and improve water and risk management. Chapter 6 looks at knowledge and sense-making dynamics affecting the definition, design and implementation of actions seeking to reduce flood risk, improve water management, and innovate river-related governance arrangements in the context analysed. Also, the chapter reflects on catalysts that triggered reflection and (in-)action across governance scales, and on the broader process and structural dynamics that affected the evolution of post-flood reorganisation attempts.

Finally, Chapter 7 goes back to the theoretical, empirical and methodological research questions. It further discusses the results of the Milanese case study with the support of loop learning theory (Argyris and Schön 1978). It then proposes concluding reflections on the relationships among learning, resilience building and policy change, and on the methodological contribution provided by the proposed analytical framework.

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# 2

Reorganising after disturbances:  
Drafting conceptual nexuses  
between resilience and learning in  
the context of risk reduction



## ABSTRACT

*How do socio-spatial systems reorganise in the face of disturbances? How is learning defined in relation to resilience, and what role do academic and policy discourses attribute to learning and capacity building?*

*Chapter 2 lays the ground for the exploration of these broad interrogatives through an interdisciplinary review of the literature. It discusses the meaning of key concepts, and reconnects conceptual nexuses among relevant dimensions to be explored in this research. In particular, it investigates how reorganisation processes can be related to learning dynamics. To pursue this double objective, the chapter first explores resilience literature, comparing disciplinary perspectives in order to understand: (i) how they conceptualise reorganisation processes and (ii) which elements they identify as crucial for the evolution of reorganisation dynamics. Second, mechanisms for “building” resilience are discussed, with attention being posed on the role of reflection and learning. The outcomes are used to refine research questions and goals (see Chapter 1) and to guide the development of a draft analytical framework on post-floods re-organisation processes (see Chapter 4).*

## 2.1 Resilience and risk reduction: Insights from the resilience debate

The term “resilience” has been used “with many different intentions and with a very wide extension” (Brand and Jax 2007: 9), and it has undergone a “gradual sprawl and a simplification in both its meaning and its application” (Chelleri et al. 2015: 181). Over the last decades, the concept “branch[ed] out from a single ordinary term into a series of different and increasingly sophisticated scientific concepts characterised by different and specific definitions” (Béné et al. 2018: 118, Figure 2.1).

From the Latin verb *resilire*, (literally ‘to bounce’, ‘to jump back’), the term “resilience” was used for the first time in the modern age in 1858, when a Scottish mechanical engineer employed it to describe the strength and ductility of a steel beams (Alexander 2013: 2710). From the 1960s onwards, the concept acquired increasing fame in natural sciences, where it has at first been understood in “engineering” terms (Holling 1996) as the capacity of an object or

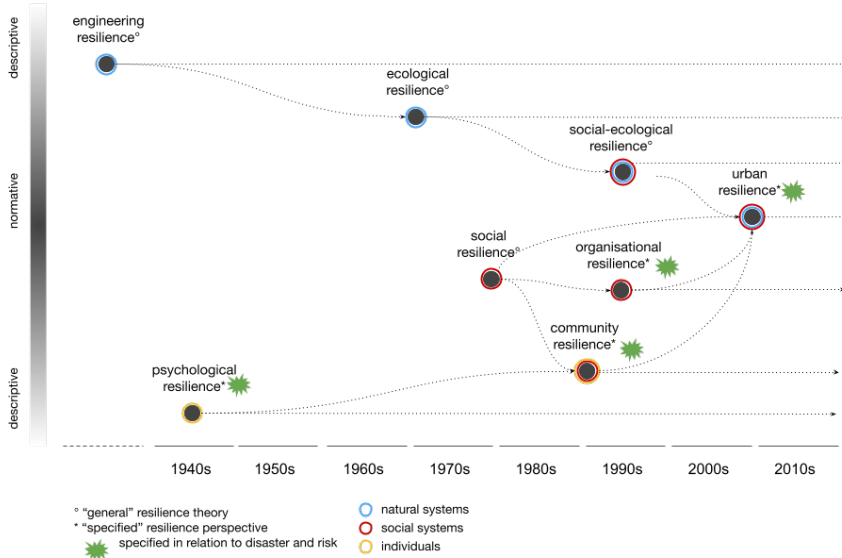


FIGURE 2.1 THE EVOLUTION OF THE 'RESILIENCE' CONCEPT. (SOURCE: AUTHOR).

a system to “bounce back” to initial conditions after a perturbation. The origins of the modern use of the term, however, are mainly grounded on the definition of “ecological resilience” firstly provided by C.S. Holling, who maintained that the previous definition provided “little insight into the transient behaviour of systems that are not near equilibrium” (Holling 1973: 2). He, therefore, stated the need to develop a new model, capable of “representing a more dynamic and less predictable perception of ecosystem dynamics” and of “recognizing the contributions of disturbance, spatial heterogeneity, and multiple stable states, in addition to internal biotic regulation” (Briske et al. 2017: 198). The concept has then been further expanded (e.g. Holling 1996, Gunderson and Holling 2002, Walker et al. 2002, 2004), also in light of emerging theories of Complex Adaptive Systems (CAS, from Levin 1998). These portray systems “not as deterministic, predictable and mechanistic, but as process-dependent organic ones with feedback among multiple scales that allow these systems to self-organize” (Folke 2006: 257). To describe patterns of permanence and transformation in CAS, Holling and Gunderson elaborated the “adaptive cycle model” (Gunderson and Holling 2002). This model conceives ecosystem behaviours as a succession of growth and conservation, focuses processes of (creative) destruction and reorganization and emphasises “the inevitability of both stability and transfor-

mation” (Redman 2005: 72, in Davidson 2010). The extended ecological understanding of resilience developed in parallel with the so-called “social-ecological resilience” perspective. This emerged from the late 1990s (e.g. Berkes and Folke 1998; Walker et al. 2002) and reflects a “new paradigm meant to overcome the separation of social from natural sciences and to create a new intellectual basis for responding to the ‘environmental’ challenges of the modern world” (Béné et al. 2018: 218). Social-ecological resilience considers non-linear dynamics of continuity and transformation within Social-Ecological Systems (SESs), defined as “integrated systems of ecosystems and human society with reciprocal feedback and interdependence” (Folke et al. 2010: 3). Social-ecological resilience implicitly assumes that social actors’ individual and collective behaviours strongly affect the way CAS respond and react to disturbances. This assumption stems from a social understanding of the resilience concept, which emerged from the late 1970s and that spread across many disciplinary fields such as sociology, human geography, disaster studies, anthropology, economics, political science and planning. In the gradual migration from natural to social science, the resilience frameworks proposed and discussed in the literature are increasingly heterogeneous in terms of underlying assumptions, understanding of resilience goals, systems of reference, fields of application, role of the involved actors and understanding of resilience building mechanisms. Notably, the translation of resilience to the social domain and its use (in either descriptive or normative terms) in social and political context are not unproblematic. In particular, issues emerged about: the conceptual clarity of the concept, whose specific meaning got diluted (see Brand and Jax 2007); its practical relevance, i.e. its capacity of describing and guiding dynamics of permanence and change; and its meaningfulness in the broad debate about social and spatial transformations (e.g. see Davoudi et al. 2012).

Changes in understanding of resilience as a concept and as a framework are reflected in disaster literature, and resonates with changes in disaster management theories and practice. A comprehensive definition of disaster resilience is provided by Cutter and colleagues, that describe it as “the ability of a social system to respond and recover from disasters and includes those inherent conditions that allow the system to absorb impacts and cope with an event, as well as post-event, adaptive processes that facilitate the ability of the social system to re-organise, change, and learn in response to a threat” (Cutter et al. 2008: 599). This definition incorporates the capacity to reduce or avoid losses through mitigation, contain the effects of disasters in the

response phase, and recover with minimal social disruptions (Manyena 2006; Tierney and Bruneau 2007). In relation to disaster risk, the concept of resilience has been “specified” (Carpenter et al. 2001) and framed mainly in relation to cities (see Meerow et al. 2016, Mehmood 2016, Chelleri et al. 2015, Davoudi et al. 2012), communities (e.g. Cretney 2016, Ross and Berkes 2014, Kulig et al. 2013, Magis 2010, Norris et al. 2008, Cutter et al. 2008), and organisations (e.g. Wildavsky 1991[1988], Lanzara 1983, 1993, Weick and Sutcliffe 2007). Although overlapping, these three main perspectives adopt different lenses and partially differ in defining resilience attributes and resilience-building mechanisms.

### 2.1.1 Organisational and institutional resilience

In organisational and institutional studies, resilience refers to the capacity of more or less formal organisational systems to deal with unpredictable hazards and surprises. Definitions and characteristics of the concept depend on how an organisation is defined, i.e. whether it is conceived as a closed system resulting from “clear delineated set of well-defined rules, roles and relationships that are created to achieve a set of specific objectives” (Birkmann et al. 2012: 18) or more broadly as “a series of interlocking routines, habituated action patterns that bring people together around the same activities in the same time and space” (Westley 1990: 309, in Weick 1993: 632). In organisational and management studies, resilience has been applied to closed systems, such as firms or High-Reliability Organisations (HRO<sup>4</sup>). In this case, the organisation *is* the system. Accordingly, the focus is on the resilience of the organisation itself, and on individual or micro-organisational sense-making processes affecting the capacity of agents to come to terms with threatening events (Weick and Sutcliffe 2007). In describing the fundamental principles of a “resilient organisational performance”, Weick and Sutcliffe highlight the role of “situational awareness”, which is crucial for people to make “continuous adjustments that prevent errors from accumulating and enlarging” (p. 9). Also, they stress the importance of learning from failures (p. 14) through anticipatory activities and of relying on expertise, which has to be prioritised independently from the position that the expert occupies within a hierarchical structure (p. 16).

4 HROs are defined as organizations capable of avoiding catastrophic events despite the fact that they operate in a risk-prone context and may potentially cause disasters in the surrounding environment, e.g. nuclear plants (Weick and Sutcliffe 2007, Weick 1988).

A similar notion of resilience has been also applied to open, complex and dynamic organisational systems, such as institutions. In this case, the debate encompasses a double set of questions, i.e., how an organisation can be more resilient, and how it can support the resilience of the system it is acting in/ upon. Given the complexity of the systems observed and the non-linearity of their behaviours, it is recognised that structural configurations and procedural mechanisms can affect the capacity of a given system to deal with risk, but do not determine it. The first to refer to resilience in relation to public administrations was the U.S. American political scientist Aaron Wildavsky, who defines it as the “capacity to cope with unanticipated dangers after they have become manifest, learning to bounce back” (Wildavsky 1991[1988]: 77). What distinguishes resilience from what he calls “anticipation” is precisely the unknown, unspecified and unpredictable nature of hazards, that does not allow avoiding or mitigating it. In other words, anticipation is not possible when agents acting under “bounded rationality conditions” (Simon 1962) have to face “wicked problems” (Rittel and Webber 1973), characterised by high degrees of unpredictability. According to Wildavsky, a resilient organisation should be prepared to face adversity through an “improvement in overall capability, i.e., a generalised capacity to investigate, to learn, and to act, without knowing in advance what one will be called to act upon” (Wildavsky 1991[1988]: 70). This understanding of resilience strongly resonates with the notion of improvisation, and more specifically of “organisational improvisation”, defined as “the conception of action as it unfolds, by an organisation and/or its members, drawing on the available material, cognitive, affective and social resources” (see Pina e Cunha et al. 1999). Improvisation is also defined as one of the sources of resilience by Weick (1993), who connects it to the capacity of actants to “bricolage”, i.e. to “create order out of whatever material at hand” (Weick 1993: 639). Weick defines improvisation as a creative process, where people make sense and enact (see Weick 1988) the reality around them creatively, i.e. by “figuring out how to use what [they] already know in order to go beyond what they currently think” (Bruner 1983: 183, in Weick 1993: 639)<sup>5</sup>. Despite a dynamic understanding of organisational behaviour, the emphasis on improvisation, and the skeptical attitude

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5 The importance of dealing with the unexpected had been acknowledged as a characteristic of “individual resilience”. Gian Francesco Lanzara, for example, identifies what he calls the “negative capability” of “being under uncertainty” as a crucial part of an individual’s capacity to deal with the disorientation generated by disruptive events and by changes in contextual conditions (see Lanzara 1983).

towards rigid prescriptive approaches in dealing with uncertainty, organisational studies view resilience mainly as oriented to the permanence of organisational structures and to the maintenance of their functions and routines, thus resonating with engineering understanding of resilience as a system's return to equilibrium after disturbances (Holling 1996).

A different perspective is proposed by studies on adaptive governance that emerged in the fields of natural resource management, climate change adaptation and disaster risk reduction. This view is grounded on a broader social-ecological understanding of resilience<sup>6</sup> (e.g. Berkes and Folke 1998; Walker et al. 2002, Carpenter et al. 2001), that also recognises adaptability, i.e. “the collective capacity of actors in the system to manage resilience” (Walker et al. 2004: 5) and transformability, i.e. “the capacity of a system to transform the stability landscape itself in order to become a different kind of system, to create a fundamentally new system when ecological, economic, or social structures make the existing one untenable” (ibidem: 3). This body of literature investigates possible alternative institutional models viable from a resilience thinking perspective, i.e. capable of coping with non-linearity and surprise (see Lebel et al. 2006), of grasping opportunities opened up by endogenous and exogenous disturbances and - ultimately, of guiding social and social-ecological systems in phases of transition or transformation (Berkes et al. 2003). Adaptive governance frameworks (see Dietz et al. 2003, Olsson et al. 2004, Folke et al. 2005) considers complex, multi-layered and polycentric arrangements, and attempts to “shifts policies from those that aspire to control change in systems assumed to be stable, to managing the capacity of social-ecological systems to cope with, adapt to, and shape change” (Folke 2006: 254). Also, they describe attributes that allow institutions to “strategically navigate” (Hillier 2011) a system facing risk and its effects. In particular, they stress the role of institutional adaptive capacity, which is favoured by the co-existence of the following features:

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6 Social-ecological defines resilience as: (1) the amount of disturbance a system can absorb and still persist; (2) the degree to which it is capable of self-organization; (3) the degree to which it can build and increase the capacity for learning and adaptation. Resilience is primarily about “the opportunities that disturbance opens up in terms of recombination of evolved structures and processes, renewal of the system and emergence of new trajectories” (Folke, 2006: 259).

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- *Robustness* supports “the maintenance of some desired system characteristics despite fluctuations in the behaviour of its component parts or its environment” (Carlson and Doyle 2002, in Anderies et al. 2004: 2);
- *Institutional variety*, i.e. having different bodies that “employ a variety of decision rules to change incentives, increase information, monitor use, and induce compliance” (Dietz et al. 2003: 1910), can potentially enhance flexibility. Also, it can “broaden the collective knowledge base and increase the capacity for innovation and maintenance of different knowledge systems and frameworks for interpretation” (Bodin et al. 2006: 3);
- *Flexibility* enables institutions to adapt to changing conditions (see Nelson et al. 2007: 399);
- *Polycentricity* enables systems to handle scale-dependent governance challenges (Folke et al. 2005: 449) as well as cross-scale interactions (see Lebel et al. 2006: 6);
- *Redundancy* of institutions and their overlapping functions provides systems with a “buffering capacity” (Bodin et al. 2006: 3), thus increasing their preparedness to change;
- *Capacity* to learn enables institution to adapt their actions to changing conditions (ibidem).

This adaptive perspective has been applied explicitly to risk governance (see, e.g. Renn and Klinke 2013, Birkmann et al. 2013, Klinke and Renn 2012, Djalante 2012), which considers how structural configuration and procedural mechanisms affect the capacity of a system to support resilience by reducing risk.

### 2.1.2 Community resilience

Soon after the emergence of institutional perspectives (from the late 1990s), disaster scholars started to shift their attention towards communities<sup>7</sup> and the sustainability of disaster and risk management strategies and practices (from Berke et al. 1993). In contrast to what they defined as “paternalistic views”, new approaches conceived disaster-stricken people as proactive agents of change (Berke and Campanella 2006: 203), rather than as exclusively as “helpless, poor victims” (ibid.). References to “community resilience” started to proliferate. This expression soon diffused also among governments and NGOs that widely used it when referring to disaster vulnerability issues, since it was “viewed as a more proactive and positive expression of community engagement

with natural hazard reduction” (Cutter et al. 2008: 589). Despite the growing attention to community resilience as an operative concept, however, limited attempts have been made to conceptualise community resilience and to connect it with resilience discourses developed in different fields (Ross and Berkes 2014). Reflecting the tensions of the overall resilience debate (Figure 2.2), heterogeneous definitions of “community resilience” emerged (e.g. see Adger 2000, Norris et al. 2008, Berke and Campanella 2006, Paton and Johnson 2006, Magis 2010, UNISDR 2009, IPCC 2014. See also CARRI 2013: 10-11).

Patel et al. (2017) group definitions of community resilience in three main categories. The first one defines it as a dynamic *process* of change and adaptation, along which communities play a proactive role. In this perspective, community resilience generally refers to the ability of groups or networks to “intentionally take planned actions and affect change [...in order to] thrive in an environment characterised by change, uncertainty, unpredictability, and surprise” (Magis 2010: 404). Similarly, the concept has been defined as “the ability of community members to take meaningful, deliberate, collective action to remedy the impact of a problem, including the ability to interpret the environment, intervene, and move on” (Pfefferbaum et al. 2007). The second category refers to resilience as an *outcome*. Gibson (2010: 246), for example, defines it as “a demonstrable outcome of an organisation’s capability to cope with uncertainty and change in an often volatile environment”, This understanding implicitly links resilience to the ability of the involved actors to avoid adverse effects and maintain stable functioning of a system in the face of substantial adversity (Patel et al. 2017). A third class defines community resilience as

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7 The definition of the term “community” raises “the same concerns as the concept of *resilience per se*” (Norris et al. 2008: 128). Communities have been conceptualised as places, targets and forces for prevention and intervention concerning disaster risk reduction and management (Mancini and Bower 2009: 246). Following Deeming and Fordham (in Birkmann et al. 2012: 35-38), communities have been defined in relation to the existence of: (1) common geographical boundaries (place-based/geographical communities); (2) shared interests or goals (*communities of interest*); (3) shared fate and common experiences (*communities of circumstance*); (4) shared repertoire of practices and the engagement in collective actions (*communities of support or communities of practice* - see Lave and Wenger 1991); (5) shared identity: related to the sense of belonging to a particular group or area (*communities of identity*). Also, communities have been increasingly understood in terms of relations, i.e. as spheres of social interaction characterised by multi-scalar connections. Accordingly, the concept of *social capital* acquired an increasing role in community and disaster resilience literature (e.g. in Aldrich 2010, 2012, Aldrich and Mayer 2015, Vallance and Carlton 2015).



a range of attributes or as a *set of capacities*, mainly related to post-event response. Along this line, Norris and colleagues (2008) defined resilience as “a process linking a set of networked adaptive capacities to a positive trajectory of functioning and adaptation in constituent populations after a disturbance” (Norris et al. 2008: 131). Coherently with adaptive governance literature, they argued that resilience is favoured by the ability to “withstand stress without suffering degradation” (robustness); the extent to which “elements are substitutable in the event of disruption or degradation” (redundancy); and the “capacity to achieve goals in a timely manner to contain losses and avoid disruption” (rapidity) (p. 134). On the same line, Magis (2010) views community resilience as shaped by a set of community resources. She also highlights the active role of communities in resilience building, emphasising their (potential) ability to develop new capacity through collaboration and learning.

Recent contributions tend to blend one or more of these definitions’ categories and generally agree in conceptualising community resilience as a process, an ability, or a set of networked capacities rather than as an outcome. Aldrich and Mayer (2015: 255), for instance, refer to “the collective ability of a neighbourhood or geographically defined area to deal with stressors and efficiently resume the rhythms of daily life through cooperation following shock”. Also, Pfefferbaum et al. argue that community resilience can be defined “as an attribute, a process, or an outcome associated with successful adaptation to, and recovery from adversity” and that it “differs depending on context and purpose” (2015: 241–242).

### 2.1.3 Urban resilience

Given its origins in ecology (Holling 1973), resilience scholars historically devoted “less attention to the specifically human and social elements of human-dominated systems, such as cities” (Ernstson et al. 2010: 533). In the last two decades, however, resilience has been often studied and analysed in relation to social-territorial and urban systems (see Pelling 2003 for an introduction). Increasing attention has been paid to cities, “humankind’s most durable artefact” that, despite the fact that they “were sacked, burned, bombed, flooded, starved, irradiated – have, in almost every case, risen again like the myth of the Phoenix” (Vale and Campanella, 2005: 3). The use of “resilience” in the urban studies policy field is quickly expanding, and it is now associated e.g.

to urban climate mitigation and adaptation, disaster risk reduction (including post-disaster recovery), energy and environmental security, water management, land use planning and urban design.

The use of the notion of resilience in this context originates from disaster literature, which has long investigated how cities prepare, respond and recover in the face of extreme events (see Olshansky 2017 for a review). Definitions and characterisations of “urban resilience” reflect different intellectual and disciplinary lineages and are grounded on a shifting perspective about the relation between cities and risk. The first point of discussion concerns the characterisation of “urban” that has been vaguely addressed by the main urban resilience definitions (Meerow et al. 2016: 42). Traditionally, disaster literature focussed on the built environment and physical infrastructures, *de facto* equating recovery to rebuilding and physical restoration (e.g. see Haas et al. 1977). The recognition that cities are complex adaptive and networked systems (Batty 2008) composed of “dynamic linkages of physical and social networks” (Godschalk 2003: 141) gradually supported the adoption of integrated envisionings, also acknowledging the social and relational dimension of (disaster) risk reduction. Also, urban (disaster risk) resilience literature defines the nature of resilience and its pathways in different ways. A first interpretation –widely diffused in political statements or everyday discourses– focuses on maintenance, recovery and stability. This perspective refers to system persistence and is rooted in an engineering understanding of a system’s resilience. In this case, urban resilience is defined as the capacity of a city to rebound from destruction (Vale and Campanella 2005), with the focus often being on whether “the city has recovered, in quantitative terms, its economy, population or built form” (Davoudi, in Davoudi et al. 2012: 301). A second interpretation focuses on adaptation, understood as “the processes of adjustment to actual or expected changes and its consequences, disregarding system boundaries by moving thresholds in order to make the system persist within the same regime” (Chelleri et al. 2015: 187-188). A third understanding considers “transition” (as conceptualised by Geels 2005, 2011), and views resilience building pathways in terms of systemic change that allow the cities -as components of socio-technical systems- to enter a new regime<sup>8</sup>. These approaches to urban

8 A regime is defined as a ‘the semi-coherent set of rules that orient and coordinate the activities of the social groups that reproduce the various elements of socio-technical systems’ (Geels 2011: 27).

resilience are not mutually exclusive, and they may overlap given the multiplicity of spatial and temporal scales. They are based on different scopes of resilience, that include permanence, adaptiveness, transformation (see Chelleri et al. 2015, Matyas and Pelling 2014, Chelleri 2012).

In the search for an integrative definition, Meerow et al. described resilience as “the ability of an urban system –and all its constituent socio-ecological and socio-technical networks across temporal and spatial scales– to maintain or rapidly return to desired functions in the face of a disturbance, to adapt to change, and to quickly transform systems that limit current or future adaptive capacity” (2016: 39). This complexity is only partially reflected by institutional definitions, that describe “urban resilience” as the ability of (urban) systems “exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions” (UNDRR 2009). In policy narratives, a resilient city has been defined as ‘a city that has developed the systems and capacities to be able to absorb future shocks and stresses over time so as to still maintain essentially the same functions, structure, systems, and identity, while at the same time working to mitigate the present causes of future shocks and stresses’ (Resilientcity.org 2010).

TABLE 2.1 SYNTHESIS ABOUT RESILIENCE FRAMEWORKS SPECIFIED IN RELATION TO RISK.

	<b>Institutional/organisational resilience</b>	<b>Community resilience</b>	<b>Urban resilience</b>
<b>System(s) of reference – resilience of what?</b>	A – Organizations (as closed or open systems): HRO; Institutions; Multi-level governance systems. B – System the organisation acts in/ upon.	Communities, mainly conceived as networks of social interactions, with or without a spatial connotation.	Urban and socio-territorial systems. Focus may be on: built environment, social networks, urban institutional systems, urban ecological systems.
<b>Type of disturbance – resilience to what?</b>	Failure (closed systems); unexpected change (closed/ open systems); disruptive events (closed/open systems); risk (e.g. industrial risk, disaster risk).	Internal disturbance (including human actions); external shock affecting ecosystems, social-ecological systems, socio-territorial systems.	environmental criticalities; risk and disasters.
<b>Definition of 'resilience' – what is resilience?</b>	A – 'The capacity to cope with unanticipated dangers after they have become manifest, learning to bounce back' (Wildavsky 1991[1988]: 77); the 'intrinsic ability of an organization (system) to maintain or regain a dynamically stable state, which allows it to continue operations after a major mishap and/or in the presence of a continuous stress' (Weick and Sutcliffe 2007: 14). B - Institutional capacity to "strategically navigate" (Hillier 2011) a system towards improved resilience through risk reduction.	A dynamic process of change and adaptation; 'a demonstrable outcome of an organization's capability to cope with uncertainty and change in an often volatile environment' (Gibson 2010); 'a process linking a set of networked adaptive capacities to a positive trajectory of functioning and adaptation in constituent populations after a disturbance' (Norris et al. 2008: 131).	'The ability of an urban system-and all its constituent socio-ecological and socio-technical networks across temporal and spatial scales to maintain or rapidly return to desired functions in the face of a disturbance, to adapt to change, and to quickly transform systems that limit current or future adaptive capacity' (Meerow et al. 2016).
<b>Scopes' of resilience – resilience to what end?</b>	A - Permanence of organisational functions. B - Institutional Adaptive Capacity.	Heterogeneous and contested views (permanence, adaptiveness, transformation).	Heterogeneous and contested views (permanence, adaptiveness, transformation).
<b>Resilience pathways – resilience how?</b>	Mindfulness; collective sensemaking; enactment; improvisation; bricolage; respectful interaction; learning; overall capability development; improvement of the structural configuration of organisational and institutional settings.	Collective action; learning; social capital restructuring; capacity building	Continuity through change; adaptation, renewal, systemic transition; capacity building.
<b>Degree of normativity – Is resilience a value-free concept?</b>	Mainly normative.	Hybrid (descriptive + normative); normative.	Hybrid (descriptive + normative).
<b>Fields of application</b>	Organizational studies; institutional theory; urban studies, disaster studies (adaptive risk governance).	Urban planning; risk management; climate studies.; development studies; urban sociology; critical studies.	Urban planning; disaster studies; climate studies; urban ecology.; urban sociology; critical studies.

### 2.1.4 Resilience building and risk reduction

Notwithstanding all the differences (Table 2.1), the evolution of academic discourses about resilience and risk shows some common trends, that also affected disaster risk-related policy narratives and management approaches.

A first element concerns the *understanding of the system at risk*. Whether the focus is on the institutional, physical, or social dimension, systems are considered as complex and characterised by non-linear behaviours. Different resilience perspectives view system dynamics as determined by structural configurations, but also by agency (Davidson 2010: 1143, Olsson et al. 2015: 4), hereby defined as a function of the capacity of individuals, groups, or organisations to act intentionally, to anticipate through learning and foresight, and to decide how to behave also on the basis of the (partial) information they have about other systemic components and dynamics.

In line with this understanding of systems, the previously discussed perspectives conceive actors as (potentially) capable of enacting change<sup>9</sup>. Accordingly, growing importance has been attributed to the role of local communities (Vallance and Carlton 2015: 27, Cutter et al. 2008; Norris et al. 2008) that can shape risk management through active participation in decision making (Berkes and Ross 2013; Vallance and Carlton 2015), activation of social memory (Bodin et al. 2006) and social learning (Tidball et al. 2010, Cretney 2016). Also, emphasis has been put on institutional action (see e.g Renn and Klinke 2013 on adaptive risk governance), which is ideally needed to “strategically navigate” (Hillier 2011) socio-territorial systems towards resilience.

9 Urban resilience, for example, has been itself conceptualised in emancipatory terms as a ‘proactive rather than reactive view to planning, policy-making and strategic steering in which communities play a vital role in resilient place-shaping through their capacity for active learning, robustness, ability to innovate and adaptability to change’ (Mehmood 2016: 413). Following resilience thinking, agency is relevant as in human-dominated systems adaptability is mainly ‘a function of the social component’ (Walker et al. 2004: 3) that coincides with ‘the capacity of people in a social-ecological system to build resilience through collective action’ (Folke 2006: 262). More critical approaches, claiming for the recognition of the political dimension underlying resilience-building approaches highlight the need to view resilience as “socially contingent” (Brown 2014: 109).

Furthermore, scholars generally agree in understanding risk *resilience as situated* in a specific spatial and organisational context (see Cote and Nightingale 2011), and in highlighting the importance of place-specific vulnerability<sup>10</sup> patterns. Critical contributions from urban resilience scholars also urged the adoption of a relational understanding of place (e.g. Wilkinson 2011), where “places” are not to be conceived as “units of analysis or neutral containers [... but rather as] complex, interconnected socio-spatial systems with extensive and unpredictable feedback processes which operate at multiple scales and timeframes” (Davoudi, in Davoudi et al. 2012: 304).

Finally, a shift occurred in the *epistemological interpretation of events* and of their role along broader system dynamics. They are no longer perceived as exogenous drivers of disruption. Extreme events are increasingly associated to socio-natural hazards (UNDRR 2009) and are viewed as rooted into specific risk patterns (e.g. see Cardona 2004, Renn 2008). Disaster resilience perspectives, therefore, seek to develop “an integrated vision of the natural risks and their management associating hazard and anthropogenic vulnerability, the complexity of the causal relations and a re-contextualisation of the risks within the entire social system” (Vinet 2008: 114). In this view, more or less severe events have been conceived as “threshold events” (Birkmann et al. 2008: 638) that may provide social-territorial systems with the chance to transform and reorganise. On the one hand, they are viewed as drivers of change - to the extent that depends on disaster intensity and on the coping capacity of the system itself. On the other, they are considered as “focusing events” (Birkland 1997, in Choularton 2001: 67) that bring attention to themselves and their causes: they bring out both pre- and post-disaster structural and social vulnerability patterns, bring attention to problems and risk-related dynamics that had been previously underestimated or ignored and often lead to the emergence of new needs and challenges. They have therefore the potential to open “window of opportunities” (Gunderson 2010) for reflective action to develop.

The gradual shift in understanding what resilience entails and how it can be built also formulation of related disaster management narratives and policy approaches Initially disaster resilience was understood in ‘engineering terms’ as the capacity of a system to bounce-back, i.e. to “return to normalcy” after a

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10 Vulnerability is the pre-event, inherent characteristics or qualities of social systems that create the potential for harm (Cutter et al. 2008).

disturbance (e.g. Haas et al. 1977). In this view, post-event reorganisation was conceived as a linear process, focused on recovery and on the restoration of vital urban functions. The rise of social-ecological resilience perspectives (e.g. Berkes and Folke 1998; Walker et al. 2002,) contributed to the adoption of a “forward-looking” understanding of resilience (Pickett et al. 2004: 373), which ultimately concerns “how to persist through continuous development in the face of change and how to innovate and transform into new more desirable configurations” (Folke 2006: 260). Accordingly, post-event reorganisation dynamics have no longer been defined as linear, but rather as complex, multi-level processes influenced by local contextual variables (including e.g., local leadership, social capital structure, conditions of critical infrastructures, local disaster vulnerability, local attitude towards public participation in collective action, etc. See Smith and Wenger 2007, Cutter et al. 2008).

This evolution resonates with a reorientation of policy discourses about disaster recovery and risk management. They gradually shifted their focus from crisis management to integrated Disaster Risk Reduction (DRR)<sup>11</sup>. This approach claims for the adoption of a more systemic and context-aware envisioning to risk management, to include not only emergency management and recovery, but also prevention (i.e. hazard reduction and avoidance, UNDRR 2009), vulnerability reduction, preparedness and adaptation (Birkmann et al. 2013). DRR attempts to operationalise resilience in relation to natural risk, and brings together – through the definition of diversified strategies – its different attributes, including robustness, adaptability and transformability. In this view, different phases of disaster management, i.e. response, recovery and preparedness, are conceived as part of a continuous process, where mitigation is constantly pursued

In this changing context, adaptive policy cycles have been widely applied to water management (e.g. Pahl-Wostl and colleagues) and to Flood Risk Management (FRM, see e.g. Diepering et al. 2016, Hegger et al. 2014, 2016 and Liao 2012). The latter, in particular, is based on an adaptive policy cycle and

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11 DRR is defined as ‘the concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events’ (UNDRR 2009).

foresees the definition of structural and non-structural measures<sup>12</sup> (Table 2.2,). Also, it foresees the alignment and mainstreaming of FRM objectives within more comprehensive environmental and natural resource strategies at different scales. Furthermore, it promotes participatory management and encompasses different dimensions of resilience, thus also including the capacity to adapt and change, e.g. generating new ideas, adopting new approaches and perspectives (see Hegger et al. 2014, 2016).

TABLE 2.2 FLOOD RISK MANAGEMENT STRATEGIES AND CORRESPONDING RESILIENCE ATTRIBUTES. (SOURCE: HEGGER ET AL. 2016, MODIFIED).

Type of strategy	Definition	Resilience Dimensions
<b>Flood risk defence</b>	<b>Aim:</b> “keep water away from people” <b>How:</b> structural measures (flood defence infrastructures) to increase the capacity of existing channels for water conveyance (natural or man-made) to increase space for water.	Robustness
<b>Flood risk prevention</b>	<b>Aim:</b> “keep people away from water” <b>How:</b> prohibit or discourage development in high-risk areas (e.g., spatial planning, reallocation policy, expropriation policy, etc.).	Absorptive capacity
<b>Flood risk mitigation</b>	<b>Aim:</b> decreasing the consequences of floods <b>How:</b> regulations, smart design of the flood-prone area, flood-proof building.	Absorptive capacity Adaptability Preparedness
<b>Flood preparation</b>	<b>Aim:</b> preparing for a flood event. <b>How:</b> flood warning systems, disaster management.	Capacity to cope Preparedness

12 “Structural measures are any physical construction to reduce or avoid possible impacts of hazards, or the application of engineering techniques or technology to achieve hazard resistance and resilience in structures or systems. Non-structural measures are measures not involving physical construction which use knowledge, practice or agreement to reduce disaster risks and impacts, in particular through policies and laws, public awareness raising, training and education” (UNDRR 2009).



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## 2.2 Resilience building and learning

### 2.2.1

#### Resilience to risk as capacity building

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Risk research encompasses two interrelated and mutually dependent dimensions of resilience. Inherent resilience (Cutter et al. 2008) is defined as the capacity of a system to function well during the non-crisis period. This depends on “antecedent” (i.e. pre-event) conditions, shaped by local vulnerability patterns (Cutter et al. 2003) that interact with hazard in producing risk. At the same time, it depends on the capacity of actors at all levels to cope, recover and anticipate future events (Birkmann et al. 2013: 200, see table 2.3). Adaptive resilience, on the other hand, focuses on “continual learning and taking responsibility for making better decisions to improve the capacity to handle risk” (Cutter et al. 2008: 600). This depends on the capacity of a system to be flexible in the face of crisis situations, and is centred on the development of adaptive capacity, which “reflects learning, flexibility to experiment and adopt novel solutions, and development of a generalised response to broad classes of challenges” (Pelling et al. 2015: 1). Accordingly, as mentioned in the previous section, disaster management literature calls for the adoption of a pro-active, resilience-building approach, that “recognises that human-environment interactions are both the cause of increased risk, but also the space where interventions can refocus efforts on preparedness” (O’Brien et al. 2010: 504). Such an approach underlies integrated risk management based on risk reduction. This underpins the need for capacity building at all levels, to allow for governance and management innovation and to support learning. This understanding views extreme events as “learning opportunities” (Lanzara 1983: 71), and requires incorporating procedural and epistemic uncertainty (Brugnach et al. 2008), intrinsically embedded in processes that take place within complex socio-territorial systems.

In sum (see Table 2.3), a resilience-building perspective on (disaster) risk reduction involves building capacities to cope, recover, anticipate and adapt, that - in turn - depends on the capacity of agents involved to reflect *in-* and *on action* (Schön 1983) and ultimately to act in the face of risk. In terms of expected and potential outcomes, the development of these capacities affects both inherent and adaptive resilience (Cutter et al. 2008). This set of capacities affects the ability of actors to support risk reduction through action,

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broadly defined to include both formalised institutional action (e.g. planning, policy-making) and spontaneous practices that emerge at the individual and community level. Also, through action, learning can feed back to the system level, affecting contextual and place-based element that contribute to risk production and contributing to modify system configurations and procedural mechanisms (see Renn and Klinke 2013).

TABLE 2.3 RESILIENCE AND CAPACITY BUILDING.

A - Resilience building as capacity building at all levels (O'Brien et al. 2010)				
	Before the Event Capacity to anticipate	During the Event Capacity to cope	After the Event Capacity to recover	Always Adaptive capacity
Capacity to reflect	Capacity to learn 'from' crisis; Capacity to learn from; previous experiences (including failures); Know the risk Mobilise social memory.	Capacity to support shared sensemaking (Weick 1988); Capacity to learn <i>in</i> crisis.	Capacity to learn from previous experiences (including failures).	Build risk awareness; Capacity to adjust management practices as a result of what is learned (Folke et al., 2010); Acquire 'procedural' knowledge (what to do/how to act); Facilitate knowledge exchange and integration along the policy process.
Capacity to act	Cultivate the capacity to respond; Cultivate the capacity to recover.	Capacity to 'be' in uncertainty (Lanzara 1983); Capacity to improvise; Capacity to trust; Capacity to mobilise existing resources.	Capacity to mobilise existing networks; Capacity to attract/mobilise resources.	Capacity to collaborate; Mainstream risk reduction objectives in laws and regulations; Mainstream risk reduction objectives in strategic planning across sectors and scales.

B - Goals / Potential outcomes	
<b>Changes in actions (towards Risk Reduction)</b>	<b>Institutional level</b> (actions declared/implemented) Development of strategies and measures for: Flood risk defence, Flood risk prevention, Flood risk mitigation, Flood preparedness, Floor recovery; Improve self-protection (community level); Decrease risk exposure.
<b>Changes in system configuration and procedural mechanisms</b>	<b>Reduce vulnerability</b> (Cutter et al. 2003) <b>Enhance adaptation</b> (Birkmann et al. 2013, Renn and Klinke 2013) Enhance absorptive capacity (Cutter et al. 2008); Enhance institutional adaptive capacity; Enhance capacity to attract financial resources; Support Adaptive Governance; Modify procedural mechanisms; Change decision-making processes; Change organisational routines.

Drawing on previously discussed literature, Table 2.3 identifies different interlinked capacities that are relevant to support resilience building for risk reduction (Section A). The capacity to anticipate, cope, recover and adapt are required along different phases of the disaster management cycle (Birkmann et al. 2013), and require the capacity to reflect and act in the face of risk. Resilience building in this context ideally results in the design and implementation of actions for risk reduction, but also in a modification of structural configurations and procedural mechanisms affecting the inherent resilience of a place and the adaptive resilience of actors involved (Section B).

### 2.2.2

#### **Social learning as a mechanism for building resilience**

In describing those processes through which capacities are built, fed back into risk-reduction practices and, possibly, into system configurations and procedural mechanisms, disaster resilience literature increasingly refers to “social learning”. *What meaning does this concept acquire in relation to resilience building for risk reduction?*

Initially, the term was used to describe individual learning in social contexts and to underpin the importance of reciprocal interactions between cognitive,

behavioural and environmental influences in shaping individual cognition (Bandura and Walters 1977). Authors from knowledge management (see organisational learning perspectives, e.g. Argyris and Schön 1978, Senge 1990; community of practice perspective, Lave and Wenger 1991) have then extended the sphere of application of the concept to investigate how social organisations (i.e. groups, institutions or communities) learn. On the one hand, these authors challenged previous understanding conceiving learning as the acquisition by individuals of both explicit and abstract knowledge and claimed that “the fruits of learning can be found in many *locations*, including brains, bodies, routines, dialogues and symbols” (Reed et al. 2010: 4, emphasis added). On the other, they claimed that the outcomes of learning were not solely manifested through changes in behaviours, that had long been seen as “observable, measurable indicators for learning” (Muro and Jeffrey 2008: 327). They rather maintained that learning processes could also result into cognitive changes leading, for example, to modifications in beliefs, ideas, understanding and ways of making sense of a problem (Weick 1995, see also Heikkila and Gerlak 2013).

This perspective of social learning as a collective process was applied in the field of policies and planning, where it emerged as a critique to strictly positivist rational approaches, and was described as “an approach to planning in which practice would be joined to theory within a single movement involving four intersecting dimensions, namely theory of reality, political strategy, social value and social action” (Friedmann 1981: 2). The term was then broadly adopted in the environmental policy domain, particularly in natural resource management (see contributions of Pahl-Wostl and colleagues 2010, 2008, 2007 on social learning and water management). In this case, the emphasis is on the role of participatory policy processes for knowledge exchange and co-production, which is viewed as a prerequisite for both individual behavioural change and collective action (Muro and Jeffrey 2008: 332). A similar understanding of learning has been proposed in disaster resilience literature, where the capacity of systems to recover after disturbances, to adapt in a changing environment and to cope with future events is associated with the capacity of social organisations and individuals to engage within social learning processes and to integrate learning outcomes in institutional actions and community practices (see Table 2.3). In this context, social learning is held to be crucial for actors to collectively make sense of things (Walker et al. 2006: 8, see also Borri 2010), to “build capacity to respond creatively to current and future shocks” (Smith et al. 2016: 442) and, generally, to enhance risk reduction through mitigation and prepared-

ness. Within institutions, learning is needed to foster governance adaptation, to support the flexibility of governance structures (Kumar 2015, in Olschansky 2017: 4) and to improve policy-making by overcoming the use of what Pahl-Wostl and colleagues define as “idealised design principles based on institutional and technological panaceas” (Pahl-Wostl et al. 2012: 25). Community resilience literature also stresses that “through facilitated social learning, knowledge, values and action, competences can develop in harmony to increase a group’s capacity to build disaster resilience” (Pelling et al. 2015: 1).

In relation to resilience building for risk reduction, social learning has been specifically defined as an “on-going, adaptive process of knowledge creation that is scaled-up from individuals through social interactions fostered by critical reflection and the synthesis of a variety of knowledge types that result in changes to social structures (e.g. organisational mandates, policies, social norms)” (McCarthy 2011). On the same line, Reed et al. (2010) argued that “to be considered as social learning, a process must: (i) demonstrate that a change in understanding has taken place in the individuals involved; (ii) demonstrate that this change goes beyond the individual and becomes situated within more comprehensive social units or communities of practice; and (iii) occur through social interactions and processes between actors within a social network”. These definitions reveal a specific way of understanding learning in relation to knowledge dynamics and actions.

(i) *Social learning is based on knowledge exchange and creation grounded on critical reflection*

First, social learning is informed by different types of knowledge, which are exchanged through dialogue and interaction. Classifications of knowledge in this field have attempted to overcome the classical dichotomy between expert and experiential knowledge, which implicitly envisions knowledge as an end-product, that is additional and actionable (Concilio 2010: 238). Borrowing from Flyvberg (2001), McCarthy and colleagues (2011: 18) identify three types of knowledge that are relevant for resilience building, including scientific knowledge (*episteme*), that is “universal, invariable, and context-independent knowledge generated through standard”; local knowledge (*techné*) which is “pragmatic, variable, and context-dependent and is generated through local experience and historical community interactions”; and governance knowledge (*phronesis*), that is “pragmatic, variable, and context-dependent and involves deliberation

about values that reflect an understanding and informed interpretation of political, legal, and regulatory discourses or regimes in a given context". Also, emphasis is put on the role of *experience*, as it is related to the "capacity to learn from previous and similar risk handling experiences to cope with current risk problems and apply these lessons to cope with future potential risk problems and surprises" (Renn and Klinke 2013: 2041). As social learning views knowledge as subjective, process-relational and created through interaction and practice – as opposed to additional, stable, and transferable– (see knowledge attributes in Gherardi 2008, Nonaka et al. 2008, Concilio 2010), when circulating in a network of actors it does not remain the same, but is translated, adjusted and adopted by individuals and organisations (Pelling et al. 2015: 16). Knowledge exchange and integration within more or less formalised networks has therefore the potential to create new knowledge, e.g. by making use of portions of knowledge that already exist through a sort of bricolage activity (Lanzara 1999), or by attributing a new meaning to available information. Also, knowledge exchange can lead to a redefinition of those frames through which actors make sense of risk and define what ought to be done.

*(ii) Social learning is built through interaction*

Peculiar attention is paid to the modes through which knowledge is acquired, shared and translated into action, i.e. to interaction. This approach underlies an overcoming of positivist conceptualisations based on technical rational understanding based on knowledge transfer, in which 'experts' can teach to a small group of citizens about their social and natural surroundings so that they can appropriately act upon this knowledge (Muro and Jeffrey 2008: 325, referring to Mumford 1938). In risk management, this traditionally occurs when expert knowledge is translated into policy action that is then communicated to the general public or to a target audience. Spaces for interaction can be negotiated or formally defined, i.e. explicitly incorporated into the decision-making process (as for adaptive management schemes). In both cases, communicative and interactive spaces are constrained by structural configurations related to institutional settings and actor-network structures (e.g. in terms of linking social capital, see Newig et al. 2010; Prell et al. 2010).

*(iii) Social learning is situated and embedded into changes in behaviours, attitudes, values or norms*

As previously discussed, learning processes can produce different outcomes. They can result, for example, in the acquisition of new knowledge and skills, also including a procedural knowledge of how to behave in a given situation (what Mezirow 1990 referred to as “instrumental learning”). Also, they can lead to cognitive and behavioural changes (see Heikkila and Gerlak 2013), that can be manifested, for example, in changing attitudes towards risk, or in the modification of policies or individual actions. For social learning to occur, however, all these outcomes are required. Knowledge creation or re-interpretation need to be based on reflection in- and on action (Argyris and Schön 1978, Schön 1983), and need to be performed, i.e. be embedded and fed-back in practice.

To connect outcomes of learning in their cognitive and behavioural dimensions, references are done to the loop-learning theory by Argyris and Schön (1978, see, e.g. McCarthy et al. 2011, Pelling et al. 2015).

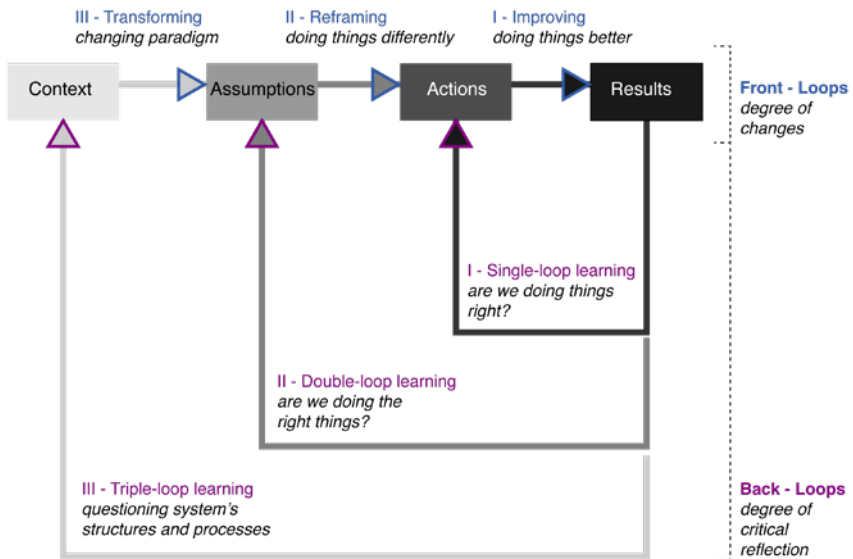


FIGURE 2.2 LOOP LEARNING THEORY. (SOURCE: AUTHOR).

They identify loops that depend on the degree of critical reflection developed along the learning process. On the one hand, single-loop learning is centred on the question “*are we doing things right?*” (McCarthy et al. 2011: 18). It consists in learning about the consequences of specific actions (e.g. policies) through a modification of the action itself aimed at minimising the “error”, i.e. difference between expected and reached outcomes. On the other, double-loop learning focuses on the question “*are we doing the right thing?*” (ibidem). It is based on a re-iterative process of interpretation in which errors are corrected by questioning the underlying values, assumptions and frames embedded in an action (e.g. policies). A third loop was proposed in following theorisations (see e.g. Fanzey et al. 2005) to indicate learning that challenges values, norms and higher-order thinking, and that explicitly integrated notions of power (see Tosey et al. 2012).

### **2.3 Synthesis, critiques and open questions**

In conclusion, for what concerns the nexus between resilience and risk reduction, literature generally supports the adoption of a resilience-building perspective. This approach defines resilience as a function of the adaptive and transformative capacity of a system. Resilience to risk within complex social-territorial systems is defined as place-based, socially contingent, co-produced in practice, grounded on knowledge creation and on the development of capacities at all levels. Accordingly, reorganisation processes depend on a variety of factors, related to both system’s structural configurations (e.g. physical, social and institutional vulnerability patterns, social capital structures, norms and values) and agency, which - in turn - is shaped by the capacity for reflection and action of the actors involved. Within vulnerable social-territorial systems, resilience building is related to risk reduction, that requires a change in actions and behaviours and a constant effort towards mitigation. Also, to be effective behavioural change needs to be grounded on cognitive shifts (e.g. related to sense-making and capacity building). The co-existence of those two levels is crucial for individuals and social organisations to disentangle risk-related problems, to reflect on possible (re)solutions and to engage in risk-reduction actions that can positively affect the inherent and adaptive resilience of a system.

In sum, the literature identified social learning as an ideal-typical mechanism for building resilience in the context of risk reduction. Although social learning



does not automatically enhance the resilience of a system, it is maintained that if it occurs, “there is a greater likelihood that mitigation and preparedness will be improved” (Cutter et al. 2008: 603). Social learning is generally defined as a collective, iterative process, based on social interactions, grounded on critical reflection, producing outcomes that are embedded in practice. There are, however, some open questions concerning social learning and its role in risk reduction.

### ***What is ‘learning’, and what does it entail?***

Despite an almost unanimous call for learning, literature on resilience and risk often fails to specify “what is social learning, what processes does it entail and what is actually learned” (Muro and Jeffrey 2008: 326). References to social and organisational learning theories are limited, and they mainly refer to a desirable mechanism, without critically discussing its meaning nor its applications. Paraphrasing Armitage et al., it can be argued that while “the value of learning as a normative goal and process is recognized, yet vague notions of learning are often encouraged in the absence of careful examination of the factors that determine if, who, how, when and what type of learning actually occurs” (2008: 87). Consequently, even if disaster and risk-related literature has seen a gradual overcoming of evidentialist approaches conceiving learning as a mere outcome, it mostly considers it as an object with an instrumental role in resilience-oriented policy making, rather than as a (collective) process that is (co-)produced through the interaction among the agents involved. Difficulties in understanding the meaning of learning and its relevance in this context also affect the risk-reduction policies and (urban) planning domain, where limited attempts have been made to frame resilience-building processes as forms of “knowing in practice” (see Davoudi 2015).

### ***A desirable process for a desirable outcome?***

Social learning is mostly conceived as a “desirable process” through which actors involved become “confident and competent at identifying, analysing, reflecting and adapting their schema of understanding and practices” (Pelling et al. 2015: 2). Doubts about the normative connotation of the concept resonate with critiques that had been moved to the notion of resilience itself (e.g. Davoudi et al. 2012, Brown 2014, Brand and Jax 2007), which has been accused of being uncritically defined as a positively connotated process leading to just as much positive outcomes (e.g. sustainability, risk reduction, community capacity building etc.).

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Also, social learning depicted as an ideal-typical process has a limited capacity to describe how learning dynamics (eventually) unfold over time in real settings. As previously discussed, for social learning to be possible, several pre-conditions need to be satisfied. Social learning requires “institutional settings that guarantee some degree of stability and certainty without being rigid and inflexible” (Pahl-Wostl et al. 2007: 5). Also, “learning capacity [...] develops when institutions that are adaptive allow for transformation to occur through learning, which includes challenging the dominant paradigms and structures that may have led to stasis up to this point” (Pelling et al. 2015: 12). Furthermore, social learning assumes the existence of a communicative space for dialogue and interaction, as well as the willingness of actors involved to dialogue, to question their frames, to engage in collective sense-making processes and, ultimately, to go beyond routines and modify their actions (see Gupta et al. 2010). These assumptions require that actors involved trust each other and are willing “to collaborate in a wide range of formal and informal relationships ranging from formal legal structures and contracts to informal, voluntary agreements” (Pahl-Wostl et al. 2007: 5). This is not always the case. As pointed out by Pelling and colleagues (2015: 22), “disasters are not always galvanising events in which the community all share the same views and opinions on its causes and potential solutions”. This understanding does not address issues of power, and does not acknowledge the inherently political nature of resilience building practices, (Davoudi et al. 2012) that often entail controversies and conflictual issues at different scales.

### ***How can learning be captured?***

Finally, difficulties emerge in detecting learning, i.e. in investigating whether it has taken place, through which mechanisms, and which are its visible and invisible outcomes. With this respect, a first issue lies in the ephemeral nature of social learning. As discussed in this chapter, learning is grounded on knowledge that is open, process-relational, embedded in action (see Nonaka et al. 2008), often transient (Lanzara 1999) and developed through interaction that is constrained in time. Second, learning processes take place within broader social-institutional settings and are embedded in open, complex systems whose dynamics are non-linear and mostly unpredictable. As a result, a misunderstanding occurred in equating learning processes to *learning outcomes* (e.g. acquisition of procedural or technical skills) and to *learning modes* (e.g. participatory management, stakeholder involvement). Also, many attempts to assess social learning in open, complex systems, fail “to disentangle the effects of an

intervention from other mechanisms through which wider learning might have occurred” (Reed et al. 2010: 3).

In conclusion, while learning and capacity building are recognised as crucial to enhance resilience to risk and to support risk reduction, the conceptual clarity and the explanatory power of social learning in and for risk reduction along the management cycle are under question. *What alternative processes of reflection and knowledge exchange take place in risk-prone areas in the absence of the pre-conditions for social learning? Can they lead to capacity building? Of which kind? Can they result in action that is effective in supporting risk reduction through preparedness and mitigation?* This thesis will try to contribute to the discussion by proposing a framework for the investigation of learning dynamics that (eventually) unfold along post-event reorganisation processes.

# 3

Exploring post-flood  
reorganisation processes:  
Insights from Kingston upon  
Hull and Leeds (UK)

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## ABSTRACT

*Chapter 3 analyses attempts to support risk reduction carried out in two UK cities: Kingston Upon Hull and Leeds. In the context of the research, this exercise seeks to connect the conceptual nexuses identified in the literature (Chapter 2) with an operative dimension related to place-specific practices. The Chapter aims at identifying analytical objects that are relevant for the exploration of post-flood reorganisation processes and of reflective and learning dynamics. The proposed mapping exercise and the development of the analytical framework (Chapter 4) have been carried out simultaneously, in a dialectic way that allows these two parts to inform each other mutually.*

## 3.1 Introduction

Urban flood resilience increasingly emerged as a guiding principle in policy and management schemes developed worldwide to support flood risk reduction (Chapter 2). As for the resilience debate in general, much efforts are made to define resilience and to identify the characteristics of a resilient system. Limited attention, however, is paid to the mechanisms through which resilience is (eventually) co-produced and situated in practice (see Chapters 1 and 2). This lack of attention is often reflected in policy approaches to urban (flood) risk reduction, which tend to follow procedural and monologic approaches (Pahl-Wostl et al. 2012: 25). This chapter attempts to look inside these black boxes. It presents the results of a mapping exercise that analysed actions carried out to reduce flood risk in two UK cities that have been recurrently affected by flood events over the last decades, namely Kingston upon Hull and Leeds<sup>13</sup>.

Kingston Upon Hull and Leeds have been selected as they respond to the set of criteria, also applied for the selection the Italian case study analysed in following chapters (Table 3.1). Both cities have been recently affected by recurrent floods events and have performed different attempts to support risk reduction and flood preparedness. Interestingly enough, the two cities are at the

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<sup>13</sup> Material collection and a preliminary part of the analysis have been carried out in 2018 during a visiting research period at King's College London, Department of Geography. This chapter benefits from the support provided in particular by Dr. Sophie Blackburn and Prof. Mark Pelling.

opposite ends in terms of their economic status and political centrality within the UK context. Consequently, the observation of their post-flood reorganisation processes allows identifying a broad range of process dynamics related to institutional capacity building and local problem solving, while also framing them in a broader picture. Starting from the analysis of risk-reduction actions developed in the aftermath of significant events, this chapter identified drivers of change that supported resilience-oriented activities and looks at place-based process dynamics that affected the development of adaptive and mitigative measures.

TABLE 3.1 CRITERIA FOR CASE STUDY SELECTION.

Criteria	Motivation
<b>Focus on: Event/risk</b>	
Type of events/risk: flood	<ul style="list-style-type: none"> <li>• Main type of extreme event in Europe (Pesaresi et al. 2017)</li> <li>• Urbanization and land use as main drivers for flood risk</li> <li>• Strong interdependence between natural and socio-spatial dynamics</li> <li>• Intersection with land use management and water governance</li> <li>• Common principles for flood risk reduction set by EU Regulations</li> </ul>
Intensity: medium/low	<ul style="list-style-type: none"> <li>• Centrality of local governance and management schemes for resilience and capacity building (≠major disasters)</li> <li>• Less affected by the 'urgency' for action and political pressure</li> </ul>
Frequency: recurrent	<ul style="list-style-type: none"> <li>• Higher motivation to act</li> <li>• Longitudinal analysis to identify modification in approaches and actions along time</li> <li>• Higher potential for learning</li> </ul>
<b>Focus on: Area/Context</b>	
Type of place: urban systems	<ul style="list-style-type: none"> <li>• Higher vulnerability/exposed values</li> <li>• Urban planning and design choices affect risk</li> </ul>
Geographic location: Italy and UK * No comparison	<ul style="list-style-type: none"> <li>• Common EU regulatory framework (pre-Brexit)</li> <li>• Comparable multi-level governance systems</li> <li>• High vulnerability to flood events</li> <li>• Heterogeneous political and institutional systems</li> </ul>
Spatial Focus: local, in a multi-level framework	<ul style="list-style-type: none"> <li>• Heterogeneous distribution of risk</li> <li>• Different spatial scope and scale of the events</li> <li>• EU Regulations stress the need to adopt a 'river basin' perspective also in local decision-making.</li> </ul>

**Focus on: Reorganisation process**

Degree of formalisation:	• Formalised reorganization attempts
Formally established actions	• Attempt to support changes in the systems (e.g. reduce risk, innovate governance, change routines, etc.)

Goals:	• Prevention
Flood risk resilience	• Risk Mitigation
	• Preparedness (response)
	• Preparedness (recovery)

The observation focuses on formalised actions carried out to support risk reduction, preparedness and capacity building in the contexts analysed. Notably, this exercise does not aim at achieving an in-depth understanding of the cases, or at comparing the two experiences. Following a bricolage approach, it rather seeks to identify analytical objects that are relevant to explore the processes through which risk is framed, addressed and ultimately managed. Accordingly, the analysis considered: (i) the history of cities with flood risk; (ii) actions undertaken to support risk reduction; (iii) dynamics affecting changes in risk management approaches; (iv) drivers to action; (v) specific exogenous and context-specific factors affecting (both positively and negatively) the capacity of local institutional actors to reflect, learn and act. Elaborating on the classification proposed by Dieperink et al. 2016 (refined and further developed in the analytical framework, see Chapter 4), the latter are categorised in relation to: problem framing and discourses; actors and actors relations; norms and rules; material and financial resources; and immaterial resources. Those categories are not exclusive and highly interconnected.

The observation is grounded on the analysis of institutional actions and their interaction with other practices. Actions are identified and analysed through a review of secondary sources. These sources include research articles (publication period: 2007-2018) and grey literature, namely policy and technical documents and reports from selected Projects on risk reduction and flood resilience. To gain more information about specific actions and about declared intentions underlying their development, the analysis has been also integrated with information retrieved on national and local newspapers, selected websites and the social media pages of relevant stakeholders.

### 3.2 Kingston upon Hull<sup>14</sup>

Kingston upon Hull (Hull), in the East Riding of Yorkshire, is at an ever-present risk of flood. The city sits at the mouth of the river Humber, with 90 per cent of the urban area standing below the high-tide line. The Hull City area is mainly urban and built on reclaimed marshland. It is subject to all sources of flooding, i.e. tidal influences, fluvial, pluvial, surface and groundwater water (see River Hull Advisory Board 2016: 1). In addition, due to its location, it is highly exposed to sea level rise. As pointed out by Prof. L. Frostick, “if you asked for planning permission to put Hull where it is now, you’d probably be refused” (The Guardian, 3<sup>rd</sup> January 2018). In Hull, physical and locational vulnerability factors are intertwined with high levels of social vulnerability. Over the last decades what used to be the UK third largest port has suffered a long economic decline following the loss of the shipping and fishing industries started in the 1970s, and in the last few years has been at the bottom of every indicator of UK socio-economic wealth<sup>15</sup>. In parallel to increasing unemployment rates, the city experienced depopulation, partially counterbalanced recently by an increase in migrant population (Centre for Cities 2015). Economic decay contributed to strengthen the negative image of Hull, which was historically rooted in the “snobbishness, partly natural political tension between the Tory-voting, middle-class shire and the Labour-voting, working-class city” (The Guardian, 11<sup>th</sup> September 2014). Hull’s reputation as an inactive, “poorly run and badly educated” (ibidem) city, where “ambition, never required in the fishing days, remains stubbornly absent” (Legatum Institute 2016) resonated in the media<sup>16</sup> debate, and contributed to raise questions about the future of the city. Over the last ten years, Hull City Council (HCC) has made serious efforts to turn Hull’s

14 Selected contents included in this Section were published in: Bianchi, I. (2018) Mapping actions to explore post-flood reorganisation processes: Kingston upon Hull (UK). *Urbanistica Informazioni* 278 (Sez. 3): 30-34.

15 In 2014 Hull was UK’s poorest city in terms of weekly wage. In 2015, it ranked last in the rate of employment for 2015 (65%, Centre for Cities 2015) and classified 2nd worst place to live in the UK following the UK Quality of Life index. In 2016 it ranked last in the UK Economic Prosperity Index.

16 A controversial article of the Economist argued that “some towns cannot be preserved” (12<sup>th</sup> October 2013), and “called on policymakers to admit they were battling against implacable forces and abandon these places, rather than continuing to pour in money in the form of benefits and regeneration projects” (Financial Times, 17<sup>th</sup> June 2016).



trajectory around, to regenerate its economy and to improve its reputation (e.g. see HCC 2013a). These changes have been pursued through the creation of new (public-private) partnerships (e.g. see Hull Surface Management Plan) and the participation to a number of national and international competitions, through which Hull managed to attract funding and capital investments, e.g. becoming the UK European Capital of Culture in 2017.

For what concerns flood experiences, Hull has been recurrently affected by more or less severe events over the last century (see Figure 3.1). Following the construction of defence infrastructure in the 1970s and 1980s, however, fluvial and tidal flood risk was consistently reduced and the level of assumed safety among local inhabitants was so high, that most of them perceived flood risk to be “eliminated” (Rogers-Wright 2013: 102). As recurrent flooding events over the last 15 years show, however, this was not the case.

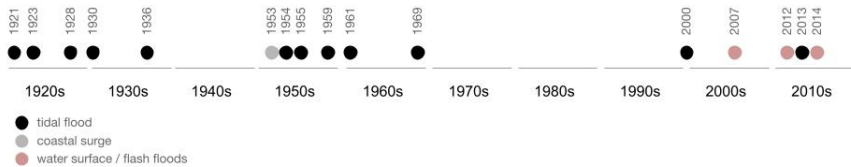


FIGURE 3.1 FLOOD EVENTS IN HULL. (SOURCE: AUTHOR).

The need to deal with flood risk emerged again as a political priority after a severe event in 2007 (24-25<sup>th</sup> June), when intense rainfalls caused floods in different parts of the UK, leading to what the Fire Brigade Union and the RAF described as “the biggest national rescue effort undertaken in peacetime Britain” (The Guardian, 28<sup>th</sup> June 2007). Also Hull, after receiving a sixth of its annual rainfall in just 12 hours, experienced a severe flood, which caused one fatality and affected over 20.000 people (Hull Live, 25<sup>th</sup> June 2007). Of these, 6.300 were forced to live in temporary accommodations. More than 10.500 homes were evacuated, and many residents were unable to return to them for over two years. Also, 95 of the 98 schools in Hull suffered flood damage (Coulthard et al. 2007a, b). Unexpectedly, the flood was not caused by rivers bursting their banks, but by intense rainfalls, that led to the collapse of the existing drainage system. This major flood was followed by some minor events. In 2012, an intense localised storm caused a flash flood that “did not impact significantly on the city” (Hull City Council 2013b: 6). Much more relevant

impacts were caused by an exceptional tidal surge in 2013, which was caused by “a storm surge that [...] coincided with high spring tides, resulting in record water levels along our coast and tidal rivers” (Hull City Council 2014a: 3 ff.). The tidal surge came within centimetres of overtopping the Hull tidal barrier. Another flash flood occurred on the 10<sup>th</sup>-11<sup>th</sup> of August 2014. According to the Hull City Council, the event was another reminder that “infrastructure needs to be more adaptable to be able to cope with flash flooding type events” (Hull City Council 2014b: 28).

### 3.2.1 Facing flood risk: What has been done?

Different actions undertaken after the 2007 flood to reduce flood risk and to improve flood preparedness (see Figure 3.4). Their development shows the emergence of some relevant dynamics. First, a shift occurred in the approach to flood risk management (Alexander et al. 2016). Historically, flood risk in Hull had been managed through a defence-dominated approach, operatively translated in the implementation of protection infrastructures. In addition to Flood Alleviation Schemes (FAS) – currently at different stages of design and implementation – mitigation measures have been gradually incorporated into flood risk management and urban planning strategies. Also, increasing attention has been paid to preparedness, in terms of readiness and institutional capacity building (Dieperink et al. 2018, Alexander et al. 2016). Concerning this latter point, institutional actions show an attempt to support reflection about the causes of flood vulnerability, and to incorporate the lessons learnt into subsequent planning and policy documents, as well as flood risk management strategies. This reflexive effort is witnessed for example by the creation of an independent investigation committee (see Coulthard et al. 2007a, 2007b) that was asked to investigate the causes of flooding and to identify political and organisational blockages contributing to urban flood risk. Also, some of the lessons learnt were used to update planning and policy strategies, e.g. in the field of urban drainage (see Dieperink et al. 2018, Coulthard and Frostick 2010). In the aftermath of the 2007 flooding, local and regional authorities have intensified their efforts for coordinated action, leading to the establishment of formal sub-governance agreements. In parallel, voluntary partnerships emerged to facilitate information sharing, and to overcome the fragmentation of responsibilities in flood risk related fields (Coulthard et al. 2007a, 2007b, see also Walker et al. 2010, 2011). Finally, both at the local and regional level, flood risk reduction goals have been aligned with

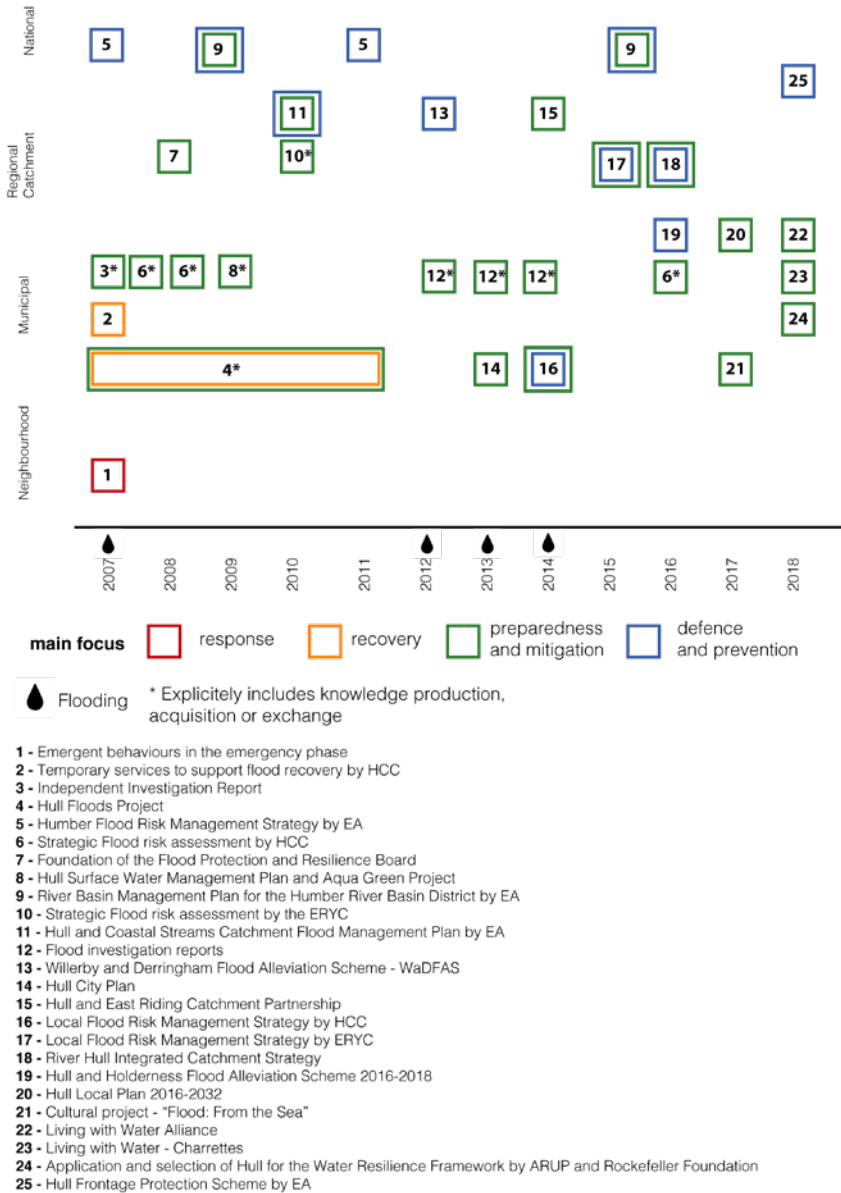


FIGURE 3.2 VISUAL MAPPING OF FLOOD-RISK REDUCTION ACTIONS DEVELOPED IN KINGSTON UPON HULL. (SOURCE: AUTHOR).

other strategic objectives (e.g. poverty reduction, rebranding, urban regeneration, recovery of the local economy). This alignment allowed local institutional actors (and particularly the Hull City Council) to attract public and private investments and to devote part of the funds to flood risk reduction strategies and measures.

### 3.2.2 Drivers of change

The analysis of actions allows identifying some drivers that contributed to triggering risk-reduction efforts at different scales.

First, *flood experiences* - and in particular the 2007 event – called into question the whole defence-dominated approach to flood risk management. On the one hand, residents became aware of their vulnerability to flooding, thus overcoming the “absolute safety” perception they had after the construction of infrastructural defences in the 1980s (Coulthard et al. 2007a,b). On the other hand, floods worked as a catalyst for institutional reflection at the local level, eventually contributing to policy change and a partial redefinition of local flood risk governance schemes. A first object of reflection concerns flood risk roots. As stated by the investigation report (Coulthard et al. 2007a,b), the 2007 event brought out Hull’s vulnerability to surface water flooding, a risk that had been previously ignored. As admitted even by the actors most directly involved in managing flood risk, “at the time it was all about tidal and fluvial flood risk. Then it rained” (A. Codd, HCC Planning Manager, in: HullLive, June, 25<sup>th</sup> June 2017). After the recognition of this new source of risk, the adequacy of existing defence schemes was questioned, bringing to light the necessity to incorporate flood risk mitigation and preparedness (Rogers-Wright 2013: 147) and to update flood risk assessment and planning documents.

Second, changes in local flood risk governance and management are driven by substantial *modifications in UK national laws*. In compliance with European Regulations (e.g. Flood Directive 2007/60 EU), regulatory changes affected all the sub-arrangement that compose the National Flood Risk Governance Arrangement (see Alexander et al. 2016: 17ff). Specifically, changes were introduced in the national norms on water and flood risk management (2009, 2010), local planning (2011), and post-disaster recovery (2013). Also, new rules were introduced in relation to the national funding scheme (2012, 2013). These

regulatory changes contributed to modify policy actions at the local level, supporting the adoption of a risk reduction perspective based on mitigation measures. Also, the obligation to conduct post-flood investigation activities -formally introduced nationwide after the 2007 flood- supported reflection on the roots on risk and on the adequacy of existing risk management strategies.

Finally, these two drivers of change intertwine with broader processes of urban transformations. Particularly relevant is the changing attitude of local institutional actors, who started to frame flood risk reduction objectives also in light of *other political priorities*, e.g. related to the need to redefine the city identity through the rediscovery of the relation between Hull and its water. This effort is witnessed by the foundation of the Living with Water Alliance<sup>17</sup>, but also by the emphasis posed to flood risk reduction in the participation to international calls and competitions, that lead to the selection of Hull as one of the five cities worldwide to participate to the definition of the Water Resilience Framework by ARUP and Rockefeller Foundation (see Figure 3.2)

### 3.2.3

#### **Enablers and obstacles to learning and risk reduction**

As mentioned in the introduction, context-specific dynamics affecting risk reduction and capacity building are classified adapting the analytical categories proposed by Dieperink et al. 2016. For an overview, see *Table 3.1*.

##### *(i) Problem framing - discourses*

*As mentioned above, the 2007 event increased residents' awareness about risk exposure and vulnerability. In parallel, they increasingly recognised the role of human and political responsibilities, e.g. starting to refer "to the issues around blocked drains and pumps failing, accusing the technology which normally regulates the amount of water in the city of failing and blaming its custodians for its lack of maintenance" (Rogers-Wright 2013: 109). At the institutional level, higher risk awareness about the new type of risk -water surface flooding- lead*

<sup>17</sup> Founded in 2017, the partnership includes Yorkshire Waters, Hull City Council, East Riding of Yorkshire Council and the Environmental Agency. More info at: <https://livingwithwater.co.uk/> (Accessed: March 2021).

local institutions to update technical and policy documents (see, e.g. HCC 2009b). More recently, discourses about flood risk reduction have been framed as part of a new narrative about the future of the city and its identity. Flood risk reduction strategies developed in the last decade are therefore to be also understood in light of this *turn* in Hull's urban policies, and of an increasing optimism and confidence<sup>18</sup>. Also, the strengthening of "partnership working" as a discourse (Alexander et al. 2016) affected the development of risk reduction strategies. This narrative - in turn - has been enabled by multi-agent approach to flood risk management promoted by EU and National regulations (e.g. Flood Directive 2007/60 EC and its transposition in UK domestic law) and by the recommendations provided locally (Coulthard et al. 2007a) and nationally (Pitt 2008) after the 2007 flood. Finally, they have been affected by the emergence of discourses about risk reduction and climate change, which supported the incorporation of climate mitigation and adaptation goals into technical and policy documents.

*(ii) Actors and actors' relations*

Institutional fragmentation and lack of a lead agency in flood risk and water management were identified among the main reasons for inaction by the post-flood investigation report (Coulthard et al 2007a,b). As highlighted in the report, "no single agency [...] accepts responsibility for any elements outside their terms of reference, nor have they historically allowed others to influence their obligations. [As a result], the flooding in Hull has revealed the difficulties of having multiple agencies responsible for different areas of the drainage system" (Coulthard et al. 2007a: 3). In addition, the fragmentation of institutional responsibilities was "a source of anger in Hull, with residents feeling that the relevant agencies were using the complex ownership regime as an excuse to evade their responsibilities and avoid taking action" (Walker et al. 2010: 34). Crucially, this fragmented governance and the consequent lack of communication also affected the recovery phase (e.g. see Sims et al. 2008, 2009, Whittle et al. 2010,

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18 The Hull City Plan 2013, in particular, contributed to boost the confidence of local institutions, as reported by media "We've shown we're not saying 'Poor Me', we're actually getting down to it. We're confident and we feel that certainly in 10 years' time, this city will be totally different to how it is now. We are going to show the major companies that investing in Hull is the right thing for them and will produce good returns for investors." - Steve Brady, Hull city council leader (The Guardian, 11<sup>th</sup> September 2014).

Medd et al. 2015), hindering coordinated actions at the household level<sup>19</sup>. Since 2007, some efforts have been made to overcome these barriers and to support cross-scalar and cross-sectoral coordination. To this regard, a relevant role was played by the collaborative attitude of the two Local Flood Authorities (i.e. the Hull City Council and the East Riding of Yorkshire Council), that developed a “symbiotic relation” (Alexander et al. 2016: 69, e.g. see Hull and East Riding Catchment Partnership). Cross-scalar cooperation was also facilitated by the emergence of local and regional working groups and fora. While some of them are established by national regulations (as in the case of the Local Resilience Forum, founded by the 2004 Contingency Act), others are spontaneously defined through voluntary agreements. Finally, over the last decade, local institutions have increased their degree of collaboration with financial investors from the third-sectors and with national and international bodies working on flood resilience (e.g. ARUP 2016 and the Rockefeller Foundation).

*(iii) Norms and rules*

As previously mentioned, changes in National (and European) regulations strongly affected the evolution of institutional risk-related activities in Hull (see EA 2010b, DEFRA 2011, 2017 DEFRA et al. 2014, East Riding of Yorkshire Council 2010, HCC 2009a,b, 2013b, 2014a,b, 2016). On the other hand, national policies also contributed to shaping Hull vulnerability patterns. Privatisation schemes implemented in the late 1980s increased local vulnerability to flooding, as private companies had no interest in investing in maintenance (see Walker et al. 2010: 32; Coulthard et al. 2007a,b; Coulthard and Frostick 2010). Privatisation also led to a fragmentation of responsibilities at the local and the national level. Concerning the latter, the Pitt Review (2008) highlights that “each of the organisations with responsibility for certain assets tends to carry out maintenance and improvement works independently, as there is currently little incentive to do otherwise. This results in investment decisions being made in isolation, which at best leads to inefficiencies and at worst increases the risk of flooding” (Pitt 2008: 84). At the local level, flood risk objectives and measures have been increasingly integrated into other sectoral documents, thus facilitating the

<sup>19</sup> As highlighted in the Hull Floods Project, “it is up to the resident to negotiate his or her way through this organisational maze and this can be very difficult when conflicting advice is provided and when the various agencies involved do not communicate with each other” (in Walker et al. 2010: 37).

development of risk reduction-oriented measures in multiple sectors. Planning policies, for example, has evolved “to reflect the greater concern and awareness of the consequences of flooding has to the health and safety of the general public” (HCC 2009a: 2). Research activities carried out in the aftermath of the 2007 flood also show that rules set by other parties have contributed to hinder innovative and adaptive action. The choice of insurance companies not to finance property-level flood resistance measures -considered “to constitute an improvement to a property” (Walker et al. 2010: 38) - has hindered the development of adaptive behaviours, *de facto* reproducing people vulnerability.

*(iv) Materials and financial resources*

The review of gray literature and media sources showed how low-income levels and high unemployment rates, associated with a severe process of economic decay, have limited the adaptive and coping capacity of residents in the aftermath of the 2007 flood. As witnessed by Heather Shepherd, from the National Flood Forum “the EA tells people to be prepared, but the people we were dealing with in Hull could not afford protection in their houses. They didn't have that sort of money” (in *The Guardian*, 3<sup>rd</sup> January 2018). This obstacle to prevention and recovery is even more severe in light of the increasing delegation of responsibilities to private households: “we're at the end of the row [...] For house-level protection to work, you'd have to do a barrier for [everyone]. It would cost thousands” (Nick Fitzgerald, resident, flooded in 2007, in *The Guardian*, 3<sup>rd</sup> January 2018). A further obstacle is related to the limited time availability of resources for long-term flood recovery (e.g. see Milojevich et al. 2016; Medd et al. 2015, Whittle et al. 2010). Funds mobilised by the Red Cross to support recovery in Hull (£720.000), for example, were available only for one year (Walker et al. 2010: 38). Also, budget cuts led to a reduction of the community wardens (from 110 to 38) that were involved in supporting the everyday recovery of affected communities (see *Life After Flooding Research Project*, Economic and Social Research Council, Lancaster University 2011). Similarly, the Flood Advice Service provided by the HCC was closed one year after the flood due to spending cuts.

For what concerns access to funding, due to Hull's high levels of deprivation, the implementation of risk reduction depends on external financial resources (Alexander et al. 2016). Risk defence schemes have been almost entirely subsidised by the National Government, which has spent more than £50M of



flood defence in the Hull and Humber area, and has allocated funds for about £120M for the coming years. In the last decade, however, local institutions in Hull have made significant efforts to receive funds from other sources (Dieperink et al. 2018). On the one hand, the alignment of FRM objectives with economic development and urban regeneration goals provided access to additional resources, e.g. from the European Regional Development Fund and the Humber Local Enterprise Partnership (Alexander et al. 2016: 75). On the other, partnership working has enhanced the capacity of local institutions to attract funds, e.g. through the participation in international competitions.

*(v) Immaterial resources – knowledge*

As discussed above, the 2007 flood in Hull revealed previously unknown vulnerability patterns and contributed to enhancing local awareness about flood risk from multiple-sources (Haughton et al. 2015). It also led to inquiries that triggered reflection, contributing to policy change and update at different scales, as well as to the emergence of more or less formalised agreements. Some of the new partnerships (as the Resilience Board or Living with Water Alliance) established cross-scalar collaborative platforms, bringing together experts and policy-makers, as well as members of local associations and private sector operators. They explicitly aimed to support knowledge exchange and to inform urban planning and risk reduction strategies. Also, direct experience with flood enhanced the preparedness of residents -within the financial constraints discussed above- and of other stakeholders involved in response and recovery activities (Whittle et al. 2010). Concerning this last point, however, the persistence of organisational routines hindered to the effective translation of the lessons learned into action (Walker et al. 2010: 39). Finally, it is worth mentioning that reflections about the Hull experience were used to support policy update at higher levels, informing changes in the UK National Recovery Guidance (Deeming et al. 2011).

TABLE 3.2 HULL: OBSTABLES AND ENABLERS.

<b>Problem framing and discourses contribute to (+) or obstacle (-)</b>	
Assumed safety (pre-2007)	(-) institutional action (-) self-protection actions at the household level
Awareness about water surface flood risk (post-2007)	(+) institutional reflection about the adequacy of existing flood risk reduction measures (+) institutional action to update technical and policy documents (+) residents' reflection about political and institutional responsibilities (+) private preparedness initiatives (+) governance innovation through new partnerships
Higher risk perception (post-2013)	(+) institutional reflection about the adequacy of flood defence infrastructures
Bad reputation of Hull	(-) actions from national and international stakeholders (affecting fund allocation)
Higher optimism about the future of the city	(+) institutional action - participation to international calls
Strengthening of "partnership working" as a political discourse	(+) governance innovation - new partnerships (+) institutional action - participation to international calls
Emergence of CCA and DRR discourses	(+) reflection about the need to support adaptive and mitigation actions (+) institutional action - policy update, participation to international calls
<b>Actors and networks contribute to (+) or obstacle (-)</b>	
Urgent need for action in the emergency phase	(+) spontaneous/emergent networks
National privatisation of water infrastructures (1980s)	(-) coordination and action - fragmentation of responsibilities, isolation of investment decisions
Institutional fragmentation and lack of a 'lead agency'	(-) institutional action to support flood risk preparedness and post-event recovery (-) coordination and action
Cooperative attitude between Lead Flood Authorities (post-2007)	(+) governance innovation - new arrangements at the regional scale, joint initiatives
Formal modification of flood risk sub-governance arrangements	(+) governance innovation - new partnerships, agreements among actors active in water management (+) collaborations between universities and policy-makers
<b>Norms and Rules contribute to (+) or obstacle (-)</b>	
Change in national norms and regulation	(+) institutional reflection – investigation reports (+) changing policy approaches - incorporation of risk mitigation strategies and measures (+) governance innovation - new partnerships and of a participatory approach

National privatisation of water infrastructures (1980s)	(-) coordination and action - fragmentation of responsibilities, isolation of investment decisions
Pressure for urban development	(-) risk reduction - new developments despite risk awareness
Insurance rules about post-flood reconstruction	(-) adaptive action at the household level
<b>Material resources contribute to (+) or obstacle (-)</b>	
Low income and high unemployment rates	(-) adaptive and coping mechanisms at the household level
Limited availability of recovery resources (budget cuts also related to the economic crisis)	(-) maintenance of support networks emerged in the response phase (-) recovery
Structural deprivation and limited availability of funds by local authorities	(-) to action - dependence from external funds
Alignment of flood risk reduction objectives with other strategic goals	(+) institutional action - capacity to attract funds from other sources
Partnership working	(+) institutional action - capacity to attract funds from other sources (+) innovation in funding schemes
<b>Immaterial resources contribute to (+) or obstacle (-)</b>	
Pre-existing local knowledge	(+) action - emergent networks, provision of support services in the response and recovery phase
Event-triggered knowledge rising awareness about water surface flood risk (post-2007, 2013)	(+) institutional reflection about the adequacy of existing flood risk reduction measures (+) institutional action - update technical and policy documents and incorporate flood mitigation
Lack of systems for information sharing	(-) action at the household level in the response and recovery phases (+) centralisation of temporary services' provision
Persistence of organisational routines	(-) translation of learning into action
Local investigation about the Hull flood	(+) institutional action - update technical and policy documents and incorporate flood mitigation (+) policy learning at higher scales – used to update the National Guidance for recovery (+) policy learning in other contexts - workshop in Cumbria in 2009
National investigation about the 2007 flood	(+) policy change at the local level
New local partnerships	(+) exchange of technical information and knowledge
Scientific research on Hull recovery processes (Hull Flood Project, 2007-2011)	(+) reflection on community recovery paths (+) policy documents at the local and national level
Participation to international projects	(+) access to new sources of information and knowledge exchange

### 3.3 Leeds

Leeds is the third-largest city in the UK, and –despite the sharp economic contraction that took place during the 2008 recession (Centre for City Outlook 2015)– it plays a strategic role in the regional and national economy. It is the UK’s fastest-growing city, with the economy forecast to increase by 25 per cent over the next ten years (Environmental Agency 2016: 1). Leeds’ city centre is exposed to fluvial flooding, influenced by the River Aire and the various tributaries including the Hol Beck, Wyke Beck and Meanwood Beck (Environmental Agency 2016: 1, Leeds City Council 2014: 8ff.). The city has experienced recurrent fluvial flooding of over the last decades (see Figure 3.2), even if events never resulted in fatalities. There are also some localised issues with surface water flooding, which recurrently affects the same areas of the city (Leeds City Council 2017: 1, Leeds City Council 2014: 8).

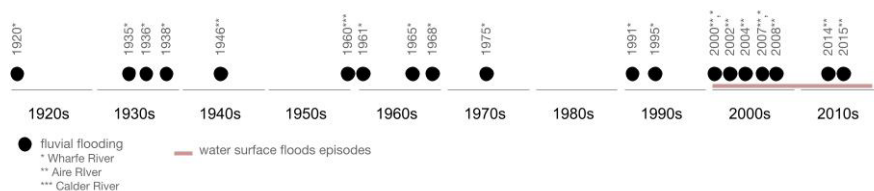


FIGURE 3.3 FLOOD EVENTS IN LEEDS. (SOURCE: AUTHOR).

In the last two decades, Leeds was affected by the floods of the Aire River in 2000, 2007 and 2015. The 2000 flood only had minor impacts on the city, but it started the discussion about the need to build defence infrastructures (Alexander et al. 2016). Following this event, a proposal to build defence walls has been made, but “objections were raised by Leeds City Council (LCC), who felt that this would detach the city from the river, and undermine the character of the city and its cultural heritage” (ibidem: 90). The 2007 flood, which bypassed the city centre, further highlighted the vulnerability of Leeds and made local institutions aware of the “reinforced need for action” (Alexander et al. 2016: 94). Finally, Leeds experienced a severe floods in December 2015, following the storm EVA (the event is known as “Boxing Days” flood). The 2015 floods were “unprecedented in their impact on Leeds City Region in both the extent and severity of the flooding and the damage and devastation that was caused” (West Yorkshire Combined Authority 2016: 3). 4.000 homes and almost 2.000 businesses were flooded, and critical infrastructure such as bridges

and roads were severely damaged. In Leeds' city centre, the deluge battered 3,355 properties, 672 of which were businesses (Yorkshire Evening Post, 26<sup>th</sup> December 2017). In the next years, Leeds exposure to flood risk is expected to increase further, due to the effects of climate change and to the further development of the Leeds urban area (Alexander et al. 2016: 1).

### 3.3.1

#### **Facing flood risk: What has been done?**

Different actions were undertaken to reduce flood risk after 2004 (see Figure 3.4). The review of actions shows growing attention to flood risk in Leeds, whose policy agenda has for long focused on other priorities, particularly after the economic crisis of 2008. Local flood events brought to light local vulnerabilities and triggered a debate about risk management approaches and measures. The discussion concerned the implementation of specific measures (e.g. see controversies on the River Aire Flood Alleviation Schemes), also questioning the approach to be followed. Even if the proposed FRM strategies mainly seek to support flood defence, increasing attention has been paid to mitigation (e.g. through the adoption of nature-based solutions). This turn, in line with Integrated Water Management goals set at the European and UK national level, is mostly grounded on an economic understanding of risk related phenomena, where risk is defined as a deterrent to growth and economic development, and risk reduction as a strategic priority in light of the political and economic centrality of Leeds in the UK context. Also, the review shows attempts to improve the knowledge base to enhance policy-making for flood-risk preparedness. Fora, alliances and charity groups emerged to support multi-level cooperation and raise awareness. Some of those, like the Learning and Action Alliances (LLAs), explicitly focus on learning, seek to “to help deliver an adaptive approach to FRM and to promote active and group learning” (Ashley et al. 2012: 16) and to promote “catchment-scale surface water management planning through development of a common approach between stakeholders by improvement of stakeholder capacity, integrating activities and encouraging information sharing” (from Dudley et al. 2013: 2). Finally, actions' mapping shows the emergence of “ephemeral communities of practice” (see Lanzara 1983) in the recovery phase. Those informal groups managed to consolidate in the medium run and to support dialogue among affected communities and local institutions.

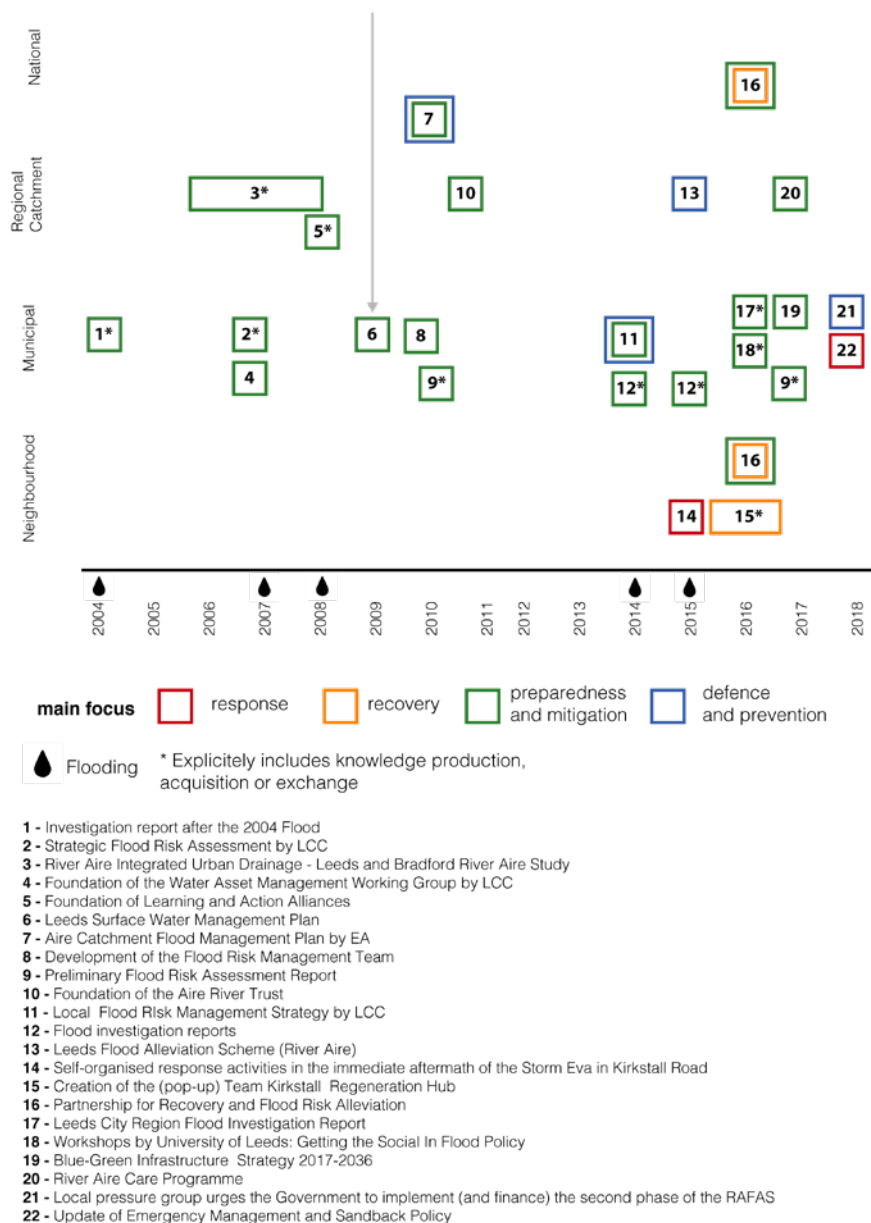


FIGURE 3.4 VISUAL MAPPING OF FLOOD-RISK REDUCTION ACTIONS DEVELOPED IN LEEDS. (SOURCE: AUTHOR).

### 3.3.2 Drivers of change

First, recent floods in Leeds worked as a driver to policy change, and “played both a stabilising and driving role in FRM in Leeds” (Alexander et al. 2016: 94). The 2000 Flood brought on the table issues related to flood safety, that had been previously underestimated due to “difficulties to find favorable cost-benefit ratio in an area that is principally business”, but also because of the assumed safety related to “the absence of significant flood events, which have created stability” (ibidem). Also, the 2007 flood reinforced the need for action. However, it was the 2015 event that triggered the action of local authorities<sup>20</sup> and to the development of the Flood Alleviation Schemes (FAS). Also, after the Boxing Day flood, the Leeds City Council (LCC) has been asked “to progress appraisal work, business case, site investigation, outline design, consultation and procurement to further reduce the risk of flooding to Leeds city centre” (Environmental Agency 2016b: 2). Furthermore, the LCC addendum updating the Preliminary Flood Risk Assessment report published in 2017 stresses how recurrent events in localised urban areas allowed to better understand the link between flood risk and urbanisation processes, defining how “heavily developed urban areas face high probability of risk of a complicated nature, with networks of drainage and sewer assets both above and below the ground being heavily compromised by years of irresponsible development and alterations” (LCC 2017: 1). Other flood events in the UK –particularly the 2007 flood– triggered policy reflection and action at the national level, contributing to modify FRM schemes also at the local scale. Finally, as in the case of Hull, changes in European and national laws worked as the main driver for local policy change.

### 3.3.3 Enablers and obstacles to learning and risk reduction

As for Hull, the observation of post-flood reorganisation actions allowed to identify factors affecting action and reflection capacity of local institutions (see Table 3.3).

<sup>20</sup> As highlighted by the LCC, “widespread and extensive flooding as a result of Storm Eva on December 2015 showed how vulnerable both residential and business properties are to fluvial and pluvial risks in the city and that often the two types of flood risk are seldom seen in isolation meaning we must now always seek to look at reducing flood risk holistically and not look to find solutions to these risk types separately” (LCC 2017: 1).

*(i) Problem framing - discourses*

First, the Boxing Day event contributed to change the perception of Leeds inhabitants and local institutions, to prioritise flood risk reduction strategies and to reinforce the perceived need for institutional action. Despite the recurrence of local flooding episodes, the lack of direct experiences with severe events had led to the prioritisation of other policy areas, mainly related to Leeds' economic growth. Similarly, assumed safety has affected individual choices of people living in flood-prone areas, as reflected by the lack of self-protection actions. Second, the actions observed show increasing attention towards risk prevention and mitigation, in line with shifting perspectives on risk reduction at higher scales. Nevertheless, institutional strategies still mainly focus on flood defence, as shown by the centrality of the debate about FASs in the political debate. Also, increasing attention to Climate Change Adaptation and a general trust in the capacity of "technological advancement" to provide a new solution to flooding in the near future affected the evolution of local policy paths. As highlighted, e.g. by Alexander et al. (2016), the latter has been one of the reasons underlying the rejection of structural solutions in favour of more adaptive approaches to FRM.

*(ii) Actors and actors' relations*

Pre-existing collaborative relations with bodies at other scales were crucial "for incorporating the resilience principles within the landscaping and design of new developments" (Alexander et al. 2016: 96). Well-established cooperation between the LCC with supra-local agencies (e.g. the EA) favoured the design and implementation of FASs. Accordingly, an essential input to action has been provided by "active lobbying to Government amongst local MPs and other vested stakeholders [... that] has helped get the scheme recognised as nationally important, also leading to the allocation of money from the Regional Growth Fund" (ibidem). Also, policy championship plays a role. Thanks to the pro-activity of individuals working within city institutions, indeed, LCC has been among the early adopter of a local flood strategy, and has been involved in pilot projects addressing both modelling and forecasts for risk reduction and sustainable water management. Furthermore, new partnerships emerged focussing on learning and flood risk reduction (e.g. LAAs). Even if it is not clear whether these platforms (supported by academic networks and involving experts and policy-makers) succeeded in establishing new relational links, in strengthening existing ones and in influencing the political agenda, they constitute a first attempt



to support supra-local reflection through collaboration. Finally, spontaneous initiatives emerged in the aftermath of the 2015 flooding. Those were supported by local alliances including community members, local enterprises and local policy members (e.g. see the Regeneration Hub, developed under the umbrella of the RAFAS). The evolution of these initiatives shows how the strengthening of social capital relations in the response phase led to the development of joint recovery and preparedness activities at the neighbourhood scale.

*(iii) Norms and rules*

As for Hull, a shift in national (and supranational) regulation worked as a driver of change in governance arrangements and flood risk management at the local level. Following the duty to investigate flood events (set by the Water and Flood Management Act), for example, the LCC has been required to investigate flood episodes, and to reflect on place-specific flood risk dynamics. The decentralisation of competences, foreseen by the redefinition of governance regimes in compliance with the subsidiarity principle, also played a central role. In addition, place-specific flood risk dynamics are affected by local planning, that failed to prioritise risk reduction. As highlighted by the LCC (2017: 1), the increasing political pressures to further develop urban areas “to support both local and national growth drivers [...] add to both the number of areas at risk and the frequency to which these areas are affected”.

*(iv) Material and financial resources*

For what concerns financial resources, the strategic and economic importance of Leeds contributed to mobilising funding for DRR, including national and private funds. After the 2015 flood, for example, “local authorities and the Leeds City Region Enterprise Partnership (LEP) were quick to identify additional funding for recovery and repairs to key infrastructure and to put in place support for businesses to continue operating” (West Yorkshire Combined Authority 2016: 7). Also, as previously mentioned, the political centrality of Leeds allowed the RAFAS to be considered as a nationally-relevant plan, thus opening up possibilities in terms of funds allocation. Concerning the second phase of the FAS implementation, however, investment cuts by the EA caused the reaction of Yorkshire representative in the Parliament, leading to a conflict about the allocation of resources. Second, changing criteria for the allocation of funds defined by national regulation (for an overview, see Penning-Roswell and

Johnson 2015) also played a role. The reform of the national funding system in 2012 (Partnership Funding) affected the definition of FRM schemes, leading to a rejection of the original plan (£188M) and the definition of the RAFAS Scheme. This change pushed towards the adoption of a lower level of protection and the cancellation of the previous flood defence scheme (Alexander et al. 2016: 93). With this respect, despite the participation of other partners, the FAS remains essentially state-funded. Also, nationally-driven post-crisis austerity hindered the embedding of the “lessons learnt” in local long-term strategies: “the lessons from Leeds are clear, but government policy is heading in the opposite direction. While the government promotes community resilience in its rhetoric, austerity politics reduces available resources to support and enhance local civic institutions and infrastructure” (FDSD 2016).

*(v) Immaterial resources – knowledge*

As for Hull, national legislation sets the obligation to investigate flood events, *de facto* supporting reflection at the local level (see investigation reports written in 2015 and 2016). In Leeds, the City Council had already launched investigation reports aimed at the identification of flood-risk causes in specific affected locations after the 2004 flood. The regulatory obligation introduced by the Water and Flood Management Act in 2010 managed to systematise investigation efforts. Interestingly, more than as a reflection attempt, the investigation report about the 2015 flood was used to highlight the responsibility of national Government, blamed for not providing enough funds for the implementation of the Flood Alleviation Schemes. Second, the policy document’s knowledge base improved. New technical information about flood risk allocation provided by the EA was used to update urban development plans. Also, knowledge about fluvial risk and its interaction with pluvial networks acquired through the participation to researches and pilot projects allowed for a re-definition of sustainable water management goals and measures within local policy and planning documents. A third interesting dynamics concerns the emergence of local alliances focussing on learning for flood risk reduction (LLAs). Local collaborative forums were complemented by the emerging, pan-regional, Yorkshire and Humber Learning and Action Alliance (YHLAA). This was meant to bridge regional and national perspectives on flood and water management and to “include a number of nested but autonomous Catchment Action Alliances [...] dealing with specific river catchments within the Region” (Dudley et al. 2013: 13). YHLAA was created to enhance “active and shared learning about ways to innovate across the water

cycle”, and it became “part of the formal process for the future delivery of FRM in Yorkshire via the local government association” (Ashley et al. 2012: 18). Within the alliances, shared reflection and governance innovation has been hindered by the reluctance to engage by representatives of supra-local institutions, such as the EA and the Yorkshire Water Company. According to Dudley et al. (2013: 17), this unwillingness to collaborate is to be attributed both to the fear of losing control and to a “we know best” attitude.

TABLE 3.3 LEEDS: OBSTABLES AND ENABLERS.

<b>Problem framing and discourses contribute to (+) or obstacle (-)</b>	
<b>Assumed safety (pre 2000)</b>	(-) action at the institutional and household level
<b>Prioritisation of other areas (economic growth, heritage protection, urban development)</b>	(-) action on risk reduction – funds allocation, local opposition to the construction of defence walls in the city centre
<b>Higher risk perception (post 2015)</b>	(+) institutional reflection about the adequacy of FAS
<b>Strategic role of Leeds</b>	(+) institutional action – funds allocation
<b>Strengthening of ‘partnership working’ as a political discourse at the national and local level</b>	(+) governance innovation – new partnerships
<b>Shift in perspective from protection to prevention at the national scale</b>	(+) overcoming a defence-dominated flood risk management approach
<b>Increasing awareness of Climate Change effects</b>	(+) institutional reflection about CCA and DRR integration (+) shift in policy and management approach
<b>Trust in technological advancement</b>	(+) in policy and management approach from protection to prevention
<b>Actors and networks contribute to (+) or obstacle (-)</b>	
<b>Emergence of collaborative platforms including local/regional institutions, organisations and universities</b>	(+) reflection and information sharing about flood risk related issues at the regional level
<b>Pre-existing relations and collaboration schemes</b>	(+) Ease FAS’s development and implementation
<b>‘Policy championship’ and pro-activity</b>	(+) institutional action at the local level
<b>Active lobbying to government by local institutions</b>	(+) FAS’s development and implementation
<b>Urgent need for action in the emergency phase (post 2015)</b>	(+) spontaneous/emergent networks
<b>Proactivity of flood affected citizens and of local institutions (post 2015)</b>	(+) emergent networks and behaviours in the response phase, working in parallel with official response
<b>Coordination between local institutions and business leaders (post-2015)</b>	(+) creation of local ‘community of scopes’ in the response phase, consolidated to support recovery and preparedness

<b>Norms and Rules</b> contribute to (+) or obstacle (-)	
<b>Change in national norms and regulation</b>	(+) institutional reflection – investigation reports (+) changing policy approaches - incorporation of risk mitigation strategies and measures (+) governance innovation - new partnerships and of a participatory approach
<b>Increasing pressure for further urban development</b>	(-) risk reduction - new developments despite risk awareness
<b>Major changes in land-use and redevelopment of large urban areas</b>	(-) alignment of flood risk reduction objectives
<b>Material resources</b> contribute to (+) or obstacle (-)	
<b>Strategic role of Leeds</b>	(+) knowledge about fluvial risk (+) informed decision-making
<b>Change in national regulation about funds allocation</b>	(+) knowledge about fluvial risk
<b>Post-crisis 'austerity'</b>	(-) governance innovation
<b>Identification of synergies among DRR and economic development</b>	(+) knowledge about fluvial risk (+) informed decision-making
<b>Immaterial resources</b> contribute to (+) or obstacle (-)	
<b>Update of technical information provided by the Environmental Agency (Flood Risk Maps for Planning)</b>	(+) knowledge about fluvial risk (+) informed decision-making
<b>Update to hydraulic models in catchments across Leeds</b>	(+) knowledge about fluvial risk
<b>Distrust/Reluctance of Supra-regional and corporate actors to engage in knowledge sharing activities promoted by the LLA</b>	(-) governance innovation

# 4

## Looking for learning: Towards an analytical framework

## ABSTRACT

*Chapter 4 presents an analytical framework for the investigation of risk reduction reorganisation processes through a learning sensitive lens. The first part explains why a framework is necessary and how it contributes to the debate introduced in Chapter 2. Also, it describes the methods through which it has been built, i.e. methodological bricolage. The Chapter then describes the framework, considering: indications about research approaches held as relevant, levels of analysis and corresponding objects of observation. Finally, it provides methodological indications for the exploration of learning dynamics along post-flood reorganisation processes.*

### 4.1 Building an analytical framework: Why and how?

This Chapter lays the groundwork for the development of an analytical framework, aimed at providing methodological support for the investigation of risk reduction reorganisation processes through a learning sensitive lens. The proposed framework seeks to inductively capture essential learning processes that (eventually) take place along institution-led attempts to support risk reduction, enhance preparedness and increase the overall resilience of fragile, flood-prone territories. It is specifically designed to support the observation of dynamics taking place in contexts that have been recurrently affected by more or less severe events, and that have therefore a history with floods and flood management. The framework can be used to observe *ex post* reorganisation processes taking place after one event. Also, it can be used to identify patterns of continuity or discontinuity among attempts to address risk developed in different time periods. The draft framework presented in this chapter relies a set of assumptions. These assumptions derive from the literature (Chapter 2) and from the preliminary discussion of some test examples (Chapter 3), and that will be further substantiated throughout the thesis:

#### ***About resilience building and flood risk***

- Flood risk and events are rooted in context, and specifically in the interaction between the social-institutional and the physical and ecological components. Antecedent, place-based conditions and constraints affect the inherent resilience of a place, as well as the adaptive capacity of the actors involved (see Cutter et al. 2008);

- Resilience is situational and co-produced through actions<sup>21</sup> carried out by agents at multiple scales. Accordingly, from a resilience-building perspective, risk reduction is grounded on processes of reorganisation at different levels, which affect how risk-related problems are addressed in practice. Those processes find their material translation into actions that support inherent and adaptive resilience;
- Resilience building requires the development of capacities at all levels and is ideally rooted in collective processes of learning, encompassing both changes in understanding and behaviours.

### ***About reorganisation processes to support risk reduction***

- Reorganisation processes are affected by how actors involved make sense of the problem and by the knowledge they acquire, exchange and use along the development of risk reduction actions;
- Reorganisation processes depend on broader dynamics related to structural constraints and procedural mechanisms (e.g. norms, relational dynamics, resource availability and allocation, constraints to knowledge and information, pre-existing ways of framing the problem). Those dynamics affect the capacity of actors involved to reflect and act in the face of risk and – ultimately – to engage in learning processes;
- Given the complex and inherently political nature of reorganisation processes, meanings, scopes and actions are negotiated and potentially contested.

Despite the increasing attention towards learning in both resilience and risk reduction literature, the understanding of reorganisation processes *in-context* and in direct relation with learning dynamics is understudied (Chapter 2). First, most contributions discussing the resilience-learning relation seek to describe conditions for resilience building often identify social learning as a normative goal, or as a desired process needed to achieve the desired outcome, i.e. (urban) resilience to flooding. Accordingly, they often fail to problematise the

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21 Actions here are broadly defined to include any behaviour or decision that produces a change in a given environment. In the context of flood risk, these range from individual self-protection, to community practices, to formally implemented policies and strategies. The framework focuses mainly on institution-driven actions (policies, plans, strategies, agreements, campaigns etc.) aimed at supporting flood risk defence, prevention, mitigation, as well as flood preparedness and recovery.



nexus between learning and resilience building, and to frame those mutually influencing processes in a broader context, e.g. considering structural constraints and procedural mechanisms affecting their development. Also, evidence suggests that reorganisation attempts seeking to support risk reduction are not necessarily grounded in social learning, but are often developed in the absence of learning, or grounded on non-reflective learning<sup>22</sup>. Conditions for social learning to emerge are indeed quite restrictive, as they include both the capacity of actors to learn (i.e. reflect and act collectively) and the capacity of the system to generate learning (e.g. through flexible governance arrangement supporting dialogue and cooperation). Accordingly, a discussion about how different types and levels of learning can contribute to support risk reduction is necessary. Finally, while relying on different and sometimes divergent understanding of resilience (e.g. see Kaufmann et al. 2016), literature on risk reduction rarely tries to specify what learning entails, under which conditions it occurs, how it develops and how its results contribute to support risk reduction and to enhance the overall resilience of a social-territorial system to flood events. In addition, difficulties emerge in detecting learning processes, which are ephemeral and often blurred into action. As a result, learning has often been confused with the conditions or methods that may facilitate its development or with its potential outcomes (Reed et al. 2010: 2-3). The proposed framework seeks to contribute to the discussion about these gaps investigating:

- How learning can be detected along risk-reduction-oriented reorganisation attempts;
- How is it possible to verify if learning has taken place in a specific setting, and if/how it is embedded into attempts to support the reduction of risk in flood-prone areas.

Rather than looking for the conditions for social learning, the framework proposes to disentangle reorganisation processes starting from the observation of actions undertaken in the attempt to reduce risk, and in particular to enhance preparedness and support risk mitigation. Starting from an understanding of learning as meaningful knowledge embedded in practice, the framework views actions as those objects where learning outcomes can be situated.

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22 Non-reflective learning takes place “in action contexts in which implicitly raised theoretical and practical validity claims are naïvely taken for granted and accepted or rejected without discursive consideration” (Habermas 1976, in Mezirow 1990: 2).

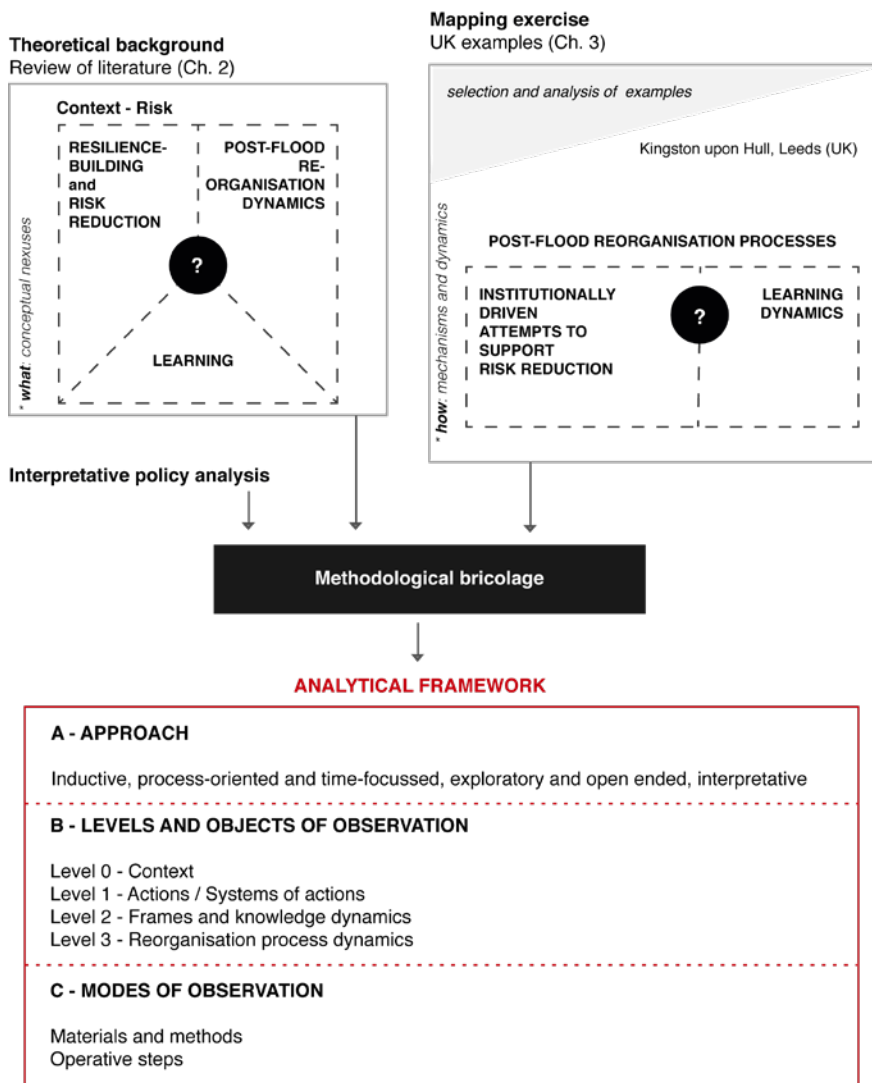


FIGURE 4.1 BUILDING THE ANALYTICAL FRAMEWORK THROUGH METHODOLOGICAL BRICOLAGE. (SOURCE: AUTHOR).

To the scopes of the analysis, they are *entry points*, that observed in their interactions with sense-making, knowledge and broader reorganisation dynamics, can reveal:

- If changes in actions occurred and if they embed results of learning processes;
- If changes that occurred are based on critical reflection, and which degree of reflectivity they embed (e.g. incremental improvement of specific solutions – single-loop; reframe, i.e. questioning and alteration of the variable governing those actions - double-loop; transformative, i.e. involving a shift in the way in which the whole problem is framed and approach - triple-loop);
- If learning is collective, and at which level it occurred;
- How learning dynamics are affected by broader reorganisation dynamics taking place in the attempt to reduce risk (e.g. in relation to normative changes, the availability of human and financial resources);
- What are the main obstacles to learning.

The framework is built through methodological bricolage, i.e. using tools and materials at-hand without following rigid pre-defined indications (see Denzil and Lincoln, in Rogers 2012, Figure 4.1). It mainly draws on a review of the literature (Chapter 2) and on the results of the mapping exercise presented in the previous chapter (Chapter 3). To draft the framework, insights from the literature on resilience and resilience building in the context of risk reduction have been re-read in light of relevant information about dynamics and mechanisms that affected risk-reduction reorganisation pathways in the examples previously discussed. Given the focus on learning in institutional action, the framework also mutates from the literature on interpretive policy analysis (e.g. Yanov 2003, Fisher 2003) and from specific concepts discussed in social and organisational learning literature.

## 4.2 Towards an exploratory, interpretative and process-focused analysis

As previously mentioned, the framework proposes to investigate the nexus between resilience building and learning inductively<sup>23</sup>, i.e. starting from the observation of institutional actions undertaken in the attempt to support risk reduction. It seeks to look at actions “as conceived in principle and expressed in

23 Inductive research involves “the search for pattern from observation and the development of explanations – theories – for those patterns through series of hypotheses” (Bernard 2011: 7).

formal legislation, regulation and speeches” (Rein and Schön 1996: 93), but also “as realised, i.e. what people in institutional political settings actually do when they carry out the activities that correspond to any given (policy) domain” (ibidem). To pursue this goal, it adopts an approach that is:

*Process-focused and time-sensitive:* The framework design follows a process-focused approach, which examines questions of how phenomena emerge, change and unfold over time (Elliott and Timulak 2005: 149). Such an approach recognises the centrality of time, and it “draws on theorising that explicitly incorporates temporal progressions of activities as elements of explanation and understanding” (Langley et al. 2013: 1). It focuses indeed on change and becoming, where change is viewed “not [as] something that happens to things, but [as] the way in which reality is brought into being in every instant” (ibidem: 5). A process-focussed and time-sensitive approach resonates with evolutionary resilience perspectives that emphasise the dynamic nature of socio-spatial and social-ecological systems. Also, it allows recognising the role of path-dependency. Furthermore, this perspective is relevant for detecting time-compression and expansion dynamics that take place: (i) in different phases of the disaster management cycle (see e.g. reference to the urgency for action in the emergency phase and to the *speed VS deliberation dilemma* described in recovery literature, e.g. Olshansky 2017) and (ii) along the policy decision-making process, also in relation to administrative and electoral cycles.

*Interpretative, exploratory and open-ended:* The framework does not seek to identify causal links, nor to identify solutions to a given problem, but rather to look at how process dynamics interact and affect the evolution of risk-reduction action. In doing so, it relies on an interpretative<sup>24</sup> methodology, which generally holds that “social reality is not singular or objective, but is rather shaped by human experiences and social contexts (ontology), and is, therefore, best studied within its socio-historic context by reconciling the subjective interpretations of its various participants (epistemology)” (Pelz 2019: no page). On the one hand, the framework investigates exploratory, open-ended research questions, i.e. *if* and *how* learning dynamics emerge along post-event

24 As a research paradigm, interpretative research assumes that “there is no direct, unmediated access to reality, and this, in turn, means that humans’ interactions with their external worlds are always already mediated by the historical, cultural contexts in which they find themselves” (Yanow and Schwartz-Shea 2009: 34).

reorganisation processes, and how they affect institutional attempts to support risk reduction. On the other hand, it focuses on “understanding phenomena in their own right” (Elliott and Timulak 2005: 147), rather than on explaining them based from some outside perspective (see Haley 1986: 385). This exploratory focus is maintained to be suitable for the investigation of processes that are situated in complex, open social systems and that are related to wicked problems (Rittel and Webber 1973). Also, it allows investigating processes as they emerge, rather than describing how they should be. Such an approach thus allows minimising deterministic and reductionist biases.

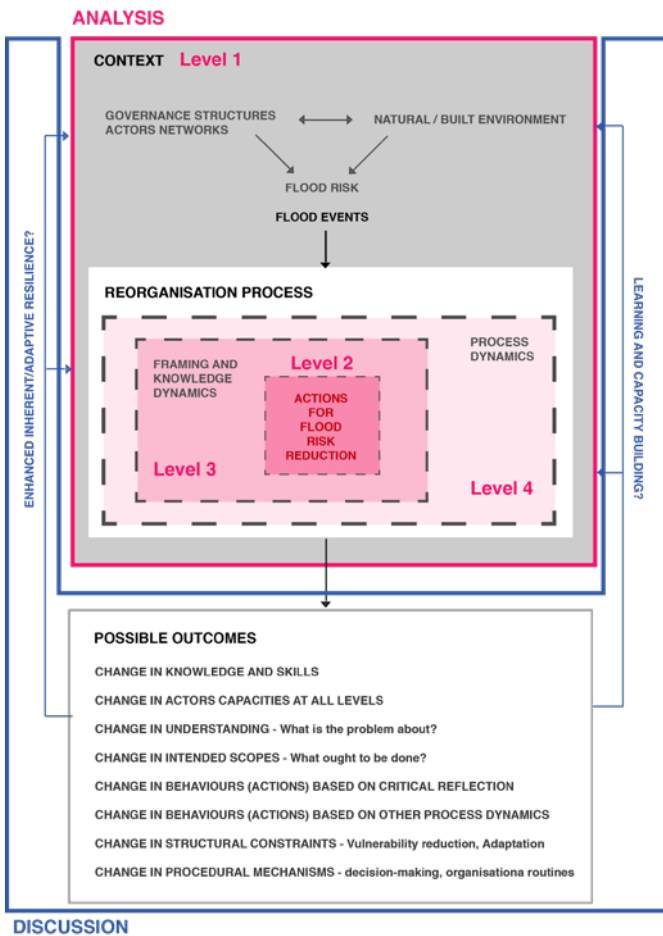


FIGURE 4.2 DETECTING LEARNING: THE ANALYTICAL SCHEME. (SOURCE: AUTHOR).

### 4.3 Detecting learning: Analytical levels and objects

The framework considers different levels of analysis, that are interconnected, mutually influencing and partially overlapping (Figure 4.2). The first level focuses on the *context* and seeks to place flood risk and events in time and space, identifying relevant risk-related variables and considering how risk has been historically approached and managed. The second level looks at *actions* undertaken in the attempt to support risk reduction and identifies *systems of action* that pursue similar goals or reveal a similar understanding of flood events and approaches. The third level considers specifically (i) *frames* adopted to make sense of the problem and support action design and implementation and (ii) *knowledge* produced and used within systems of actions. Finally, the fourth level zooms out in order to identify broader *process dynamics* (e.g. related to structural conditions, external influences, and procedural mechanisms) that affect the capacity of actors involved in decision making to reflect and act in the face of risk. The outcomes are used to inform a discussion about changes introduced along attempts to support risk reduction, and about their effects on resilience building.

#### 4.3.1

##### Setting the context for a place-based analysis

In line with a place-based understanding of resilience building dynamics (Cutter et al. 2008), a general understanding of the “context and history of the problematic situation” (Steyaert and Jiggins 2007: 578) to be addressed is crucial. The first analytical level identifies both relevant risk-related issues and attempts to deal with them. This implies looking at the historical relation of the place with risk and events, and at how the problem has been approached. A longitudinal analysis allows to better understand recent attempt to support risk reduction, but also to observe if and how capacities for resilience building emerged, and whether they relate to reflection on past experiences (see Tidball et al. 2010 on social memory).

Also, a context-sensitive analysis requires defining the spatial scope of the observation. Even if the analysis of resilience building processes can focus on a specific spatial scale (e.g. the local, one, as in the case of this thesis), it need to acknowledge the interrelations among multiple spatial scales and governance levels. Accordingly, the framework looks at:

- 1 *Flood risk in-context*, considering historical and territorial dynamics affecting flood risk and relating them to current flood risk patterns;
- 2 *Past flood events*, considering their spatial extension, their recurrence over time, their impacts and how they have been described and understood;
- 3 *Past flood risk management efforts*, looking at how institutions have historically addressed flood risk and flood events (if relevant);
- 4 *Water and flood risk governance networks*, describing the allocation of responsibilities and competencies. Also, based on information available, it identifies relevant stakeholders having specific competencies or interests in risk-reduction actions.

### 4.3.2 Actions

The second level analyses the *actions* undertaken to reduce risk. Hereby actions are broadly understood as units through which changes can occur, as well as objects that implicitly reveal the capacity of agents undertaking them to act and to reflect in- and on- action (Argyris and Schön 1978). Following a situated learning perspective, actions can be viewed as the objects where the *fruits* of reflection and knowledge exchange/acquisition are potentially deposited (Reed et al. 2010). Given the scope of the thesis, that seeks to reflect on learning and local problem solving in the face of flood risk, the framework looks in particular at institutional actions developed at the local – regional level. Those include:

- *Policies, plans and programmes* that directly or indirectly affect flood risk dynamics, including regulations, strategic and sectoral documents, land use/urban plans, formal agreements;
- *Sectoral and design projects* developed to translate policy provisions on the ground;
- *Studies and research*, including scientific and technical studies and assessment reports;
- *Education and communication campaigns* aimed at supporting preparedness and capacity building.

Within the framework, these actions are the basic unit through which reorganisation processes are investigated, and constitute the reference point for

the discussion about dynamics explored in levels 3 and 4 (Figure 4.2). Notably, the framework does not seek to analyse in detail single actions, but rather to assess their contribution within broader attempts to build resilience to flood. Accordingly, it looks at:

- *Single actions* that are reviewed to see how they (seek to) contribute to risk-reduction;
- *Systems of actions* that move towards the same objectives or follow the same approach.

### 4.3.3 Knowledge and sense-making dynamics

The third level focuses on the link between *knowledge and action*. It analyses if and how knowledge is produced, and whether it is embedded into institutional practices aimed at flood risk reduction. Starting from the assumption that within complex organisations “knowledge creation is a continuous and dynamic interaction between tacit and explicit knowledge”<sup>25</sup> (Nonaka and Takeuchi 1995: 70), this level ideally encompasses both the dimensions. For what concerns the former, the focus is on *explicit knowledge* embedded into institution-driven attempts to support risk reduction. Assuming that “knowledge is socially mediated information [that] cannot be separated from the application, use, and development of information” (Weber and Khademan 2008: 338, see also Lave and Wenger 1991, Gherardi 2008), the interest is on how knowledge relates to action<sup>26</sup>. Also, social learning, that ideally includes a synthesis of various types of knowledge and relies on a continuous

25 The implicit-explicit knowledge divide was introduced in organisational science by Nonaka and Takeuchi (1995), who built on the tacit-explicit knowledge notions by Polany. On the one hand, explicit knowledge includes codified and articulated knowledge, which can be readily transmitted to others (e.g. data, statements, manuals). On the other hand, tacit knowledge involved intangible factors. It embeds a technical procedural dimension (the *know-how*), as well as a cognitive dimension related to beliefs, perceptions and values.

26 This part considers specifically the ‘input’ side, i.e. looking at which knowledge is included in institutional attempts to support risk reduction, how it is acquired and used. Dynamics related to the circulation of knowledge within the actors’ networks, e.g. in terms of knowledge diffusion across governance levels is considered in relation to the broader picture of the reorganisation process (level 4).



process of knowledge creation (McCarthy et al. 2011), is co-produced by actors (e.g. through bricolage, knowledge exchange and integration, see Pelling et al. 2015) and produces outcomes that feedback into practice. In order to detect learning dynamics, it is, therefore, crucial to consider which knowledge is produced or acquired, how, and how it is used. In the framework of this research, the focus is on the knowledge base upon which actions for flood risk reduction are grounded. This is analysed through the analysis of:

- 1 *Facts, data, and information*<sup>27</sup> explicitly included in the formulation of the actions;
- 2 *Modes of knowledge production and acquisition*, i.e. those dynamics through which knowledge is mobilised, transferred or produced;
- 3 *The knowledge-action-link*, observed by looking at how knowledge is used to inform or to justify specific actions.

In addition, *implicit knowledge is captured* by analysing the frames<sup>28</sup> through which actors make sense of the problem (Rowley 2007). Hereby, “frames” are understood as “schema of interpretation” that allow making sense of events or occurrences (see Weick 1995) and therefore function to “organise experiences and guide action” (Snow et al. 1986, in Rein and Schön 1996: 89). The analysis of frames is relevant to the scope of this thesis, as “problem understanding and problem resolutions are concomitant to each other” (Rittel and Webber 1973: 161). In the case of wicked issues, the definition of the problem corresponds with the problem itself, as “every specification of the problem is a specification of a direction in which the treatment is considered” (Rittel and Webber 1973: 161). In line with frame-critical policy analysis (Rein and Schön 1996), the

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27 “All of the elements of the continuum of understanding are abstract concepts and the distinctions between each stage are fuzzy” (Weichselgartner and Pigeon 2015: 109). Hereby, data are defined as “a set of objective but meaningless facts that have not been processed and contextualized in to usable information”, which in turn is defined as “data with meaning”(ibidem).

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28 Different definitions of “frame” rest on a common insight, i.e. that ‘there is a less visible foundation - an “assumptional basis” - that lies beneath the more visible surface of language or behaviour, determining its boundaries and giving it coherence’ (Rein and Schön 1996: 88). In the field of policy analysis, frames work as ‘generic narratives that guide both analysis and action in practical situations [...and] tell, within a given issue terrain, what needs fixing and how it might be fixed’ (ibidem: 89). For a genealogy of the concept, see van Hulst and Yanow 2016: 94ff.

investigation works as a “methodology for problem setting” (Rein and Schön 1977: 237), which is particularly suitable for observing situations characterised by uncertainty and ambiguities (Schön and Rein 1994, Brugnach and Ingram 2012). First, frame analysis allows sorting out logics behind the actions observed. Understanding “what is the problem about” is crucial for an in-context analysis of actions undertaken in the attempt to deal with a specific issue in a given situation, also in light of the fact that “in any given issue terrain, there are almost always a variety of frames competing for both meaning and resources” (Schön and Rein 1994: 95). Second, it allows observing if these logics have changed over time, therefore considering issues of “re-framing” (Rein and Schön 1996), potentially leading to the identification of learning loops (Argyris and Schön 1978). Third, as “the nature of the public problem appears to different actors in different and often incompatible ways” (Rein and Schön 1977: 210-211), frame analysis can reveal ambiguities and contested understanding that affect knowledge dynamics and learning processes<sup>29</sup>. Accordingly, the framework looks at:

- 1 *Framing and reasoning devices*, consisting in “metaphors, exemplars, catch-phrases, depictions, icons, visual images and other symbolic devices” (Gamson 1983, in Rein and Schön 1996: 89), that “suggest how to think about an issue [... and] what should be done about an issue” (Rein and Schön 1996: 89) respectively. They, therefore, constitute the data around which “core packages” (ibidem) shaping frames are built;
- 2 *Diagnostic frames*, based on clusters (i.e. “core packages”) of homogeneous argumentations about what the problem is about;
- 3 *Prognostic frames*, based on clusters (i.e. “core packages”) of argumentations about how the problem should be faced.

#### 4.3.4

#### Broader process dynamics

The last level of analysis zooms in to understand action in a broader context, considering their interaction with structural constraints and procedural mechanisms. This analysis requires investigating how framing and knowledge

<sup>29</sup> We consider that framing “organises prior knowledge – including that derived from experience – and values held, and it guides emergent action” (van Hulst and Yanow 2016: 98).

dynamics are affected by other endogenous and exogenous factors that shape social-institutional and territorial systems (e.g. in relation to norms and regulation, to the allocation of funding and human resources). For what concerns the capacity of the framework to detect learning, a broader view is crucial to overcome limitations deriving from seeing reflection and cognitive learning as a prerequisite for behavioural change. This is particularly relevant as “not all behavioural changes are brought about by learning and [...] changes in beliefs, attitudes and intentions do not necessarily lead to change in behaviour” (Muro and Jeffrey 2008: 338, see also Reed et al. 2010). To better understand the process through which resilience building and learning eventually occur, the framework analyses:

- 1 *Drivers*, i.e. catalysts triggering reflection and action; and
- 2 *Enablers and obstacles*, i.e. process or system dynamics affecting the capacity of actors involved in risk-reduction attempts to reflect, design resilience-oriented actions and translate them into action on the ground.

#### **4.4 Analytical steps and methodological indications**

The framework mainly considers qualitative data, including structured texts (e.g. from policy and planning documents, media), unstructured text (e.g. interview transcripts) and visual data, including archive pictures and cartographic representations. Descriptive quantitative data (e.g. risk-related statistics reported in policy and planning reports, quantitative damage assessment) can complement qualitative data, when relevant. Given the specific interest on a longitudinal understanding of risk-related processes, the framework analyses retrospectively (Ruspini 2002) historical data, e.g. historical media records, past policy and planning documents. The framework relies on diverse data sources. The primary source of information consists in the actions themselves, and more specifically in textual, cartographic and visual materials constituting policies, plans, programmes, projects, studies, as well as education and communication campaigns. Also, relevant data are retrieved through semi-structured interviews with key stakeholders. Furthermore, the framework considers media and social media report, as well as scientific publications. Depending on the case and on the time-period selection, sources might be retrieved through longitudinal data collection. For what concerns data analysis, the use thematic content analysis (see Mayring 2014, Schreier 2012) is proposed to select, categorise and cluster relevant data and information. The coding

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frame, i.e. the identification and structuring of general categories, is defined *a priori*. Content analysis can be complemented by the use of other research methods, depending on the relevance of specific aspects of the process to be analysed. Hereby, it is complemented with frame analysis and stakeholder analysis. The following paragraphs briefly discuss methodological and operative indications.

#### **4.4.1** **Setting the context**

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The analysis of the context does not seek to provide a detailed description of specific risk-related dynamics, but rather a general understanding of the territorial and social-institutional context from a historical perspective. As shown in Table 4.1, it mainly relies on qualitative data, which are clustered through content analysis and are used to provide a descriptive overview.

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TABLE 4.1 LEVEL 1 - THE CONTEXT: MATERIALS AND METHODS.

	Data sources	Analysis	Expected outcomes
<b>A - Flood risk in-context</b>	Scientific literature; policies, plans, programmes and projects; semi-structured interviews with key stakeholders.	Thematic content analysis.	Characterisation of the social-territorial profile and of flood risk dynamics; identification of multiple spatial dimensions of the problem; identification of current risk-related dynamics.
<b>B - Past flood events</b>	Scientific literature; policies, plans, programmes and projects; semi-structured interviews with key stakeholders; media reports.	Thematic content analysis.	Timeline of the events; identification of the most vulnerable/affected areas; identification of relevant impacts.
<b>C - Past flood risk management</b>	Scientific literature; policies, plans, programmes and projects; semi-structured interviews with key stakeholders; media reports.	Thematic content analysis.	Identification of past approaches to flood risk management.
<b>D - Water and flood risk governance and actors network</b>	Scientific literature; policies, plans, programmes and projects.	Thematic content analysis; stakeholder analysis.	Understanding of the formal allocation of responsibilities; identification of relevant stakeholders.

#### 4.4.2 Actions

The selection of relevant actions depends on the time period analysed (e.g. based on flood events or policy changes) and on the allocation of competences and responsibilities within the multi-level governance networks. This selection includes not only actions affecting the material and physical dimension of risk (e.g. concerning land-use change or defence infrastructure development), but also *immaterial* efforts attempting, e.g. to support governance innovation or flood preparedness. Actions are analysed with the support of some

exploratory questions and open descriptive categories:

- What are the declared goals of the action? The analysis looks at flood risk management objectives, but also at other relevant goals, e.g. related to Governance innovation, knowledge integration or exchange, strengthening of social capital, conflict resolution
- What flood *risk management approach* does it follow?
- How does the action emerge and develop? The analysis looks at the genesis of the action (e.g. imposed, negotiated/collaborative or spontaneous) and at the main factors affecting its development (e.g. characteristics of decision-making process, funding schemes)
- (How) does it attempt to support risk reduction? The analysis looks at the changes proposed or produced by the action (e.g. in terms of change in regulation, change in governance arrangements, modification of the built environment, change in fund allocation)

Based on collected information, actions are analysed in relation to each other to identify systems of actions that shape institutional attempts to support risk reduction (Table 4.2). Those are open and potentially overlapping, and can be identified through the following guiding questions:

- (How) are actions directly related to each other?
- Do actions pursue similar/different/conflicting objectives in relation to risk reduction?
- Are actions based on similar/different/conflicting approaches to flood risk management?

TABLE 4.2 LEVEL 2 - ACTIONS: MATERIALS AND METHODS.

	Data sources / Data collection	Data analysis	Expected outcome
<b>A – Single actions</b>	Scientific literature; policies, plans, programmes and projects.	Content Analysis based on selected exploratory questions.	Identification and short description of relevant actions.
<b>B - Systems of action</b>	Scientific literature; policies, plans, programmes and projects; semi-structured interviews with key stakeholders; media records.	Content Analysis based on selected exploratory questions.	Identification of ‘subsystems of action’; preliminary identification of relevant process dynamics characterising risk-reduction attempts.

### 4.4.3 Knowledge dynamics

The knowledge base informing actions is analysed through a review of policy and planning documents, supported by declarations of policy-makers retrieved through interviews. First, the analysis looks at the types of facts, data and information included in the actions' formulation. It investigates, for example, whether they refer to previous flood events; previous actions undertaken to support risk reduction (*facts*). Also, it identifies *data* (e.g. about socio-economic dynamics; flood occurrence; flood damages; water quality, risk perception, etc.) and *information* (e.g. about flood risk management schemes, past events, flood-risk related dynamics) that are used to motivate or justify the action itself.

Second, the framework focuses on the modes of knowledge production or acquisition. This part allows considering to what extent an action is grounded on a “practice of knowing”, defined as “a dynamic process that is situated and provisional, collective and distributed, purposive and pragmatic, and mediated and contested” (Davoudi 2015: 1). For the scope of the thesis, it is relevant to understand if those dynamics are grounded in:

- *Knowledge transfer*, i.e. direct acquisition of knowledge from other sources under the form of products, procedures, regulations, or problem solutions (Weichselgartner and Pigeon 2015);
- *Knowledge exchange*, including the integration of different types of knowledge achieved through dialogue and negotiation;
- *Knowledge creation*, including the (co-)production of new knowledge and associated meaning.

Third, the framework looks at how knowledge is used to inform/support action. As “knowledge is information that is meaningful” (Dewey, in Nonaka et al. 2008: 9), it is worth considering which meanings are associated to specific information, and how they relate to the objectives and and to the measures promoted by specific actions. This part is investigated through the “knowledge utilisation categories” proposed by Moyson et al. (2017) and Dunlop and Radaelli (2013):

- Are they used to define the problem?
- Are they used “instrumentally” to inform action?

- Are they used “symbolically” to justify or legitimise specific policy objectives and measures?

The results of these three dimensions allow discussing relevant modifications of the knowledge use that occurred along the evolution of risk reduction attempts (Table 4.3).

TABLE 4.3 LEVEL 3 - KNOWLEDGE DYNAMICS: MATERIALS AND METHODS.

	<b>Data sources / Data collection</b>	<b>Data analysis</b>	<b>Expected outcomes</b>
<b>A - Facts, Data, information</b>	Policies, plans, programmes and projects; semi-structured interviews with key stakeholders.	Content Analysis based on selected exploratory questions.	Classification of types of knowledge included in policy-making.
<b>B - Modes of knowledge acquisition</b>	Scientific literature; policy and planning documents; projects; semi-structured interviews with key stakeholders.	Content Analysis.	Identification of modes of knowledge acquisition.
<b>C – Modes of Knowledge utilisation</b>	Scientific literature; policies, plans, programmes and projects; semi-structured interviews with key stakeholders; media records. + Diagnostic-Prognostic frames (Table 4.4).	Interpretation of results of the previous step.	Identification of how knowledge is used in risk-reduction attempts; identification of changes in modes of knowledge acquisition.

#### 4.4.4 Framing dynamics

The first step consists in the identification of “framing and reasoning devices” (Rein and Schön 1996), i.e. of words, sentences, expressions that are used to describe/make sense of the problem and propose or justify actions undertaken to deal with it. The analysis looks at frames included into actions, that resonate with “knowledge utilisation categories” discussed in the previous



section. Also, it consider how different stakeholders view the problem and possible solutions, as this might clarify divergences and overlaps among frames related to the different values and interests. As frames are not there but need to be constructed through interpretation (Rein and Schön 1996: 90), the second step consists in clustering and naming “core packages” of argumentations sharing similar views about the nature and causes of the issue to be faced (i.e. flood risk and its effects). This clustering process results in the identification of “diagnostic frames” (see Kaufmann et al. 2016) sharing a similar understanding about the problem, its causes and its characterisation. Relations among diagnostic frames are briefly discussed, considering competing/conflicting or overlapping arguments, as well as the fora in which these frames develop. In light of the results, the third step goes back to the actions previously analysed to identify “prognostic frames” (see Kaufmann et al. 2016), in which a similar understanding of the issue at stake is used to support specific ways of addressing the problem itself.

TABLE 4.4 LEVEL 3 - FRAMES: MATERIALS AND METHODS.

	Data sources	Data analysis	Expected outcomes
<b>A - Framing and Reasoning Devices</b>	Policies, plans, programmes and projects; semi-structured interviews with key stakeholders; media records.	Frame analysis; content analysis.	Identification and mapping of framing and reasoning devices.
<b>B - Diagnostic frames</b>	Results of the previous step (reasoning devices).	Frame Analysis based on selected exploratory questions (What is the problem about?).	Identification of :“core packages”, “fora” where they develop and conflicts/synergies among diagnostic frames.
<b>C - Prognostic frames</b>	Results of previous steps (diagnostic frames, framing devices).	Frame Analysis based on selected exploratory questions (What action should be taken?).	Mapping actions in relation to core packages.

#### 4.4.5

#### **Drivers, obstacles and enablers to reflection and action**

To analyse drivers, the framework proposes some descriptive/interpretative categories. A first one distinguishes between drivers triggering –more or less intentionally– critical reflection (as in the case of flood events leading to investigation reports, see Chapter 3) from the ones triggering action (e.g. contributing to policy change). Also, drivers can be classified on the base of their genesis (Solecki et al. 2017), thus distinguishing among:

- *Contextual drivers*, internal pressures related to place specific dynamics (e.g. local flood events, emergence of community of interest, etc.);
- *Proximity drivers*, i.e. external pressures affecting actors' perceptions and actions (e.g. changes in national funding, changing regulations and norms, ...); and
- *Root-drivers*, related to the historical momentum and to path-dependency, or to dynamics that affected the evolution of the context over time.

The analysis of obstacles and enablers, identified through the content analysis from all the documents collected, is carried out with the support of an indicative taxonomy. As made clear in Chapter 3, obstacles and enablers to reflection and to action can come from within the system or be exogenous. Even if, as previously mentioned, this distinction is not always significant or meaningful within complex, open systems characterised by high levels of interdependence, we held that it still has an explanatory potential. Furthermore, the framework proposes interpretative, not mutually exclusive, thematic categories. Drawing on the classification proposed by Dieperink and colleagues (2016), the following typologies are identified:

- 1 *Problem framing* i.e. related previously identified diagnostic and prognostic frames;
- 2 *Knowledge and capacities*, i.e. concerning how data, information and knowledge is produced, mobilised and exchanged, but also to the development of specific capacities by the actors involved;
- 3 *Governance and actors relations*, i.e. concerning how social capital relations affect attempts to reorganise to reduce flood risk;
- 4 *Material assets*, including financial and human resources; and

- 5 *Norms and rules*, which can foster or constrain the space for reflection and (policy) change.

## 4.5 Next steps

The framework identifies changes in understanding and behaviours taking place along the attempts to reduce risk reduction (see Figure 4.2). The interpretation of the results will be supported through loop-learning model (see Chapter 2), which will be used to explicitly connect the findings with the learning dimension explored in this thesis. In the next part of the thesis, the framework is tested in the case of Milan, considering in particular responses to recurrent flooding of the Seveso Torrent (see Chapters 5 and 6). Chapter 5 provides insights about the context, identify and map relevant action and attempt to preliminary identification of relevant process dynamics. Chapter 6 proposes a more in-depth reflection on obstacles and enablers to reflection in-and on-action and changes in institutional practices.

# 5

The “eternal flood”  
of the Seveso Torrent:  
Mapping institutional actions to  
detect risk-reduction attempts

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## ABSTRACT

*This Chapter introduces the case of Milan, focussing on the Seveso Torrent floods that have recurrently affected the northern neighbourhood of the city. In line with the analytical framework, this Chapter describes relevant contextual factors related to territorial dynamics, normative frameworks and governance structures. Also, it provides a historical overview of recurrent flood events, and of different actions carried out to reduce flood risk and improve water management. Afterwards, it identifies homogeneous systems of actions that emerged along the evolution of policy development and implementation.*

### 5.1 Why the Seveso floods in Milan?

The first reason for choosing this case is the recurrence of flood events (on average 2,6 events/year). Over the last decades, they frequently affected the northern neighbourhoods of Milan (in particular Niguarda and –to a lesser extent– Isola), causing severe damages to properties and commercial activities. The recurrence of events allows reflecting on the role they have played in the modification of institutional actions and of underlying approaches to water and (flood) risk management. Second, flood risk in the Milanese area is historically rooted in an extensive urbanisation of the whole river basin area, started in the second half of the XX Century. This process led to high levels of soil consumption and soil sealing, and to increased discharges from residential and industrial settlements. Also, flood risk is related to how the Torrent and the hydraulic network it belongs to have been managed and modified over the last decades, when the Seveso riverbed has been constrained, channelled and covered at the entrance of the Milanese administrative borders. This example, therefore, is particularly relevant to look at how pre-existing material and relational assets contributed to the production of risk, and how they affect risk reduction attempts. Third, a preliminary analysis of the case highlighted the multiple spatial dimensions of risk. While flooding mostly affects the northern neighbourhoods of Milan, its causes are rooted in urban development paths that occurred in the whole sub-basin of the Seveso Torrent, which belongs to the Lambro-Olona primary hydraulic system. Accordingly, proposed *solutions* vary in terms of spatial scope, giving rise to several tensions and contestations that will be better analysed in the next chapter (Chapter 6).

## 5.2 Materials and methods

The methodological structure of the chapter follows the indications provided in Chapter 4. Data and information are collected through a triangulation of sources, including media, policy documents and semi-structured interviews with key stakeholders. Media sources include 236 newspaper articles published between 1951 and 2018 in national and local media (for the full list, see Annex 1). They have been retrieved through a systematic search in historical archives available online (i.e.: *La Repubblica*, *Corriere della Sera*, *Il Fatto Quotidiano*), also including local editions (i.e.: *Corriere di Milano*, *Repubblica Milano*). Attention has been paid to interviews reported in media, which have been transcribed and analysed to understand better different actors' viewpoints. For what concerns policy and planning documents, peculiar attention has been devoted to those tools directly addressing issues related to the Seveso Torrent. These include strategic, sectoral and implementation plans at different scales, e.g. River Basin Planning documents (in particular the "Piano di Assetto Idraulico" - PAI and the Flood Risk Management Plan – "Piano di Gestione del Rischio Alluvioni" - PGRA), strategic documents developed under the "River Contract" umbrella (see e.g. Regione Lombardia, ERSAF 2017) and urban planning documents, with a specific reference to the Urban Plan of Milan ("Piano di Governo del Territorio" – PGT). Also, semi-structured interviews were carried out with 13 relevant stakeholders and experts (see Annex 1). Most of interviewees are public officials from Institutions having direct competences on water and flood risk management at the regional, provincial or and municipal Levels. Interviews were mainly addressed to members of the technical staff, and not to political representatives. Also, some are interviewees "experts", that have provided scientific or technical support to public bodies at different levels. Finally, members of the citizens association "Associazione Amici del Parco Nord" were interviewed. These dialogues aimed at: verifying and integrating previously collected information, discussing process dynamics and at selecting specific *focuses* for an in-depth exploration.

All textual sources were analysed through thematic contents analysis, based on a coding framework defined following levels and objects of observation proposed in Chapter 4. Chromatic codes were manually associated with words, expressions, and sentences providing relevant information about; (i) the context (geographic context; social, environmental and territorial characteristics of the context, historical development paths); (ii) the events (events, damages); (iii) actions for risk reduction (e.g., laws, policies, plans, interventions, community

actions); (iv) drivers to action/reflection; (v) process dynamics. Also, three chromatic codes (associated to the font colour) were used to highlight words and expressions used to define the problem, to identify its causes and to refer to possible solutions.

### 5.3 The Seveso Torrent and Milan: Setting the context

Based on the Framework proposed in Chapter 4, this section explores Level 1 of Analysis - *the context*. It describes the territorial profile of the Seveso Torrent and of its sub-basin (5.3.1) and provides a historical overview about the relation of the Northern neighbourhood of Milan with Seveso flooding (5.3.2). Also, it looks at emblematic strategies for flood management developed throughout the last decades (5.3.3). Finally, it shortly presents existing water and risk governance arrangements (5.3.4).

#### 5.3.1

#### Flood Risk in Context: The Seveso Torrent and its Sub-Basin

The Seveso Torrent is 53 Km long and has a surface of 227km<sup>2</sup>. It originates in San Fermo Della Battaglia (Como) and flows through the Provinces of Como, Monza-Brianza and Milano (Table 5.1). As soon as it crosses the municipal borders of Milan (in Via Ornato), it enters an underground channel, where it runs for about 9 km before flowing into the Martesana Channel under Via Melchiorre Gioia. From this point, it flows below the city until it joins first the Redefossi Channel and then the Lambro River (Figure 5.1).

TABLE 5.1 – THE SEVESO TORRENT AND ITS SUB-BASIN.

Seveso length <b>53 km</b>	Inhabitants
River basin: <b>543 Km<sup>2</sup></b>	Sub-basin - <b>1.849.438</b> (2016, ASR)
<b>53 Municipalities</b>	Milan - Districts: 1,2,3,4,5,9 - <b>862.577</b> (2016, SISI)
<b>3 Provinces</b> - Como, Monza Brianza, Milan	Increase in population (2011-2016, ISTAT) in the sub-basin <b>+11,6%</b>
<b>5 Regional Parks</b>	Population Density
<b>7 PLIS</b> (Local Parks of Supra-Municipal Interest)	Sub-basin - <b>3.406</b> inhabitant/km <sup>2</sup> (2016, DUSAF)
Soil Sealing	Milan - Districts: 1,2,3,4,5,9 - <b>8.156</b> inhabitant/km <sup>2</sup> (2016, DUSAF)
Sub-basin: <b>43%</b>	
North of Milan (from Palazzolo): <b>67%</b>	

The Seveso Torrent crosses areas with different geographical and territorial characteristics (for more info: Regione Lombardia 2017, ERSAF: 11-45; AdBPo, Regione Lombardia 2017: 7-8). These range from mountain areas with low urbanisation rates to densely populated, level urban areas, interested by the localisation of productive sites (Provinces of Como and Monza Brianza) and by significant conurbation dynamics (North of Milan). On average, urbanised areas constitute 43 per cent of the sub-basin. In the final part (between Palazzolo and Milan), this percentage rises to 67 per cent (Regione Lombardia, ERSAF 2017: 42). The Torrent is part of the primary hydric network Lambro-Olona. This is composed of an interconnected system of natural and artificial watercourses (Figure 5.1), which drains most of the territory enclosed between the Alps (North), the Ticino River (west), the Adda River (east) and the Po River (south). The network mainly expands vertically (along the north-south axis) through a system of natural rivers, i.e. Ticino, Olona, Seveso, Lambro and Adda.



FIGURE 5.1 HYDROGRAPHIC NETWORK: NORTH OF MILAN. (SOURCE: ADBPO 2016, MODIFIED BY THE AUTHOR).



These watercourses display a progressive reduction of their flow capacity. The Olona, Seveso and Lambro Rivers all converge in the Milanese urban area, where – except for the Lambro River – they flow underground, also interacting with the urban drainage and sewage system. The Lambro-Olona hydric network also expands horizontally (along the west-east axis) through irrigation trenches and the “Navigli”, historical waterways connecting the Ticino and Adda Rivers. Along the same axis, there is also the “Canale Scolmatore di Nord Ovest” (CSNO, see Figure 5.2), a hydraulic defence channel designed to deviate floodwaters from the Seveso and Olona Rivers into the Ticino.

Over the last decades, the entire sub-basin experienced significant transformation processes – mostly related to urbanisation dynamics – that lead to a steady increase in land use consumption and sealed surfaces, to the expansion of surfaces served by drainage and sewage systems, to a reduction of natural flood expansion areas, and to the development of infrastructural networks (AdBPo 2016: 22-23). Those dynamics have strongly affected watercourses, leading to a significant deterioration of their ecosystemic functions, affecting their quality (following ecological, chemical and morphological parameters), while also contributing to increase hydraulic risk levels.

Those dynamics are particularly relevant in the case of the Seveso, whose hydraulic configuration was substantially altered, affecting its morphological and functional quality (Regione Lombardia, ERSAF 2017: 15). The Seveso Torrent was the first watercourse of the Milanese area to be diverted in Roman times, and its course has been modified continuously over the last centuries, along the expansion of the city of Milan and the development of the irrigation network. From the beginning of the XX Century, the last stretch of the Seveso has been gradually channelled and covered. Its current configuration –with the Seveso flowing into the underground channel in Milan– was foreseen by the Milan General Urban Plan in 1953 (see IReR 2001: 41ff., Rosso 2017). In the second half of the XX Century, urbanisation and infrastructure development led to a significant erosion of the space for the Torrent and of its section, to a further anthropisation of its riverbed and to the realisation of bridges and crossings that currently limit the Seveso flow capacity (AdBPo 2016: 22). Also, the expansion of the drainage and sewage system affected the river flow, *de facto* transforming what used to be a torrent into a river (IReR 2001: 24).

A second critical issue concerns water quality. Media reports often refer the Seveso as one of the most polluted rivers in Europe. Monitoring activities carried out by ARPA Lombardia (2018), in compliance with the Water Framework Directive 2000/60/CE, confirm a generally non-good ecological and chemical status of the watercourse, particularly in the final stretch of the Torrent crossing the Provinces of Monza-Brianza and Milan (see table 5.1). This status is to be traced back to both punctual and widespread pressures, including overflow spillways, discharges of urban wastewater treatment plants, urban and agricultural run-off waters, discharge of polluting substances from production sites (Regione Lombardia and ERSAF 2017: 37-38).

A third criticality concerns hydraulic and hydrogeological risk. While interesting the majority of the rivercourse, hydraulic risk is particularly relevant in the Northern Milanese area (south from the intake of the CNSO in Paderno Dugnano, Figure 5.1), and in particular in the Northern neighbourhood of Milan, which has accordingly been selected as the preferred spatial focus of this thesis. The whole Milan system is a relevant hydraulic node. It is directly interested by flood risk from the three watercourses, i.e. Olona, Lambro and Seveso. Also, it is at the centre of an elaborate drainage system (Brescia 2010: 694 ff.). Accordingly, the Flood Risk Management Plan has recently identified it as a high-risk area (AdBPO 2016). High flood risk is attributed to the previously mentioned transformations, to a progressive and rapid increase of built areas and to the poor designing of the sewage system and drainage networks (AdBPO and Regione Lombardia 2017: 22 ff). The interaction between underground Rivers and the urban drainage system contributes to recurrent hydraulic emergencies (AdBPO and Regione Lombardia 2017: 22). In the case of the Seveso Torrent, the outflow capacity of the covered part crossing Milan (about 30-40 m<sup>3</sup>/sec) is lower than the upstream flows, that can reach 130 m<sup>3</sup>/sec (AIPO and ETATEC 2004; ETATEC, Studio Paoletti 2018). This capacity is “barely sufficient” for meteoric urban waters from the hinterland, for events that do not exceed two years return time (Regione Lombardia and ERSAF 2017: 41)

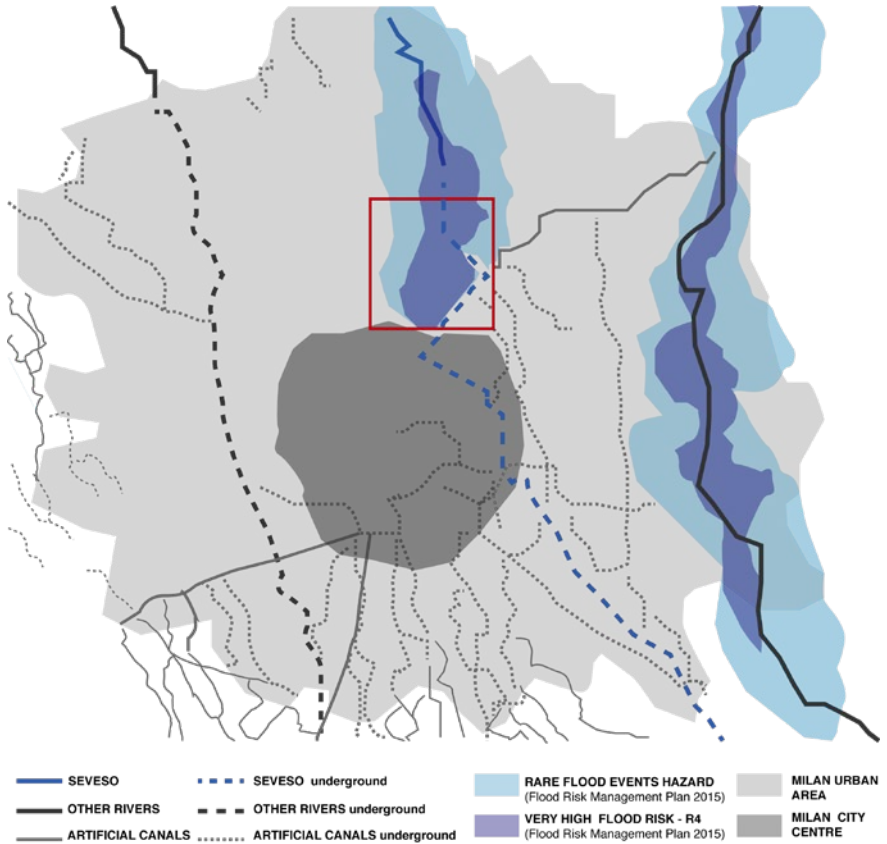


FIGURE 5.2 NORTH OF MILAN: RISK AREAS. (SOURCE: FLOOD RISK MANAGEMENT PLAN, MODIFIED BY THE AUTHOR). IN RED: THE STUDY AREA.

### 5.3.2

#### The “eternal flood” of the Seveso Torrent

“The history of the Seveso Torrent is 40 years and 53 kilometers long” (Il Corriere di Milano, 7<sup>th</sup> August 2010). The history of Seveso flooding is much longer, with 340 events being recorded over the last 140 years (AdBPo and Regione Lombardia 2017). According to the available historical reports, numerous floods took place between 1925 and 1935, when 225 floods (including the Seveso ones) were recorded in the Provinces of Milan and Pavia (Regione Lombardia and ERSAF 2017: 43). Over 100 floods events have been recorded

between 1976 and 2018 (Figure 5.3), mainly affecting the Northern neighbourhoods of Milan, and in particular the area of Niguarda (Figure 5.2). After a high concentration of events in the 1970s, floods frequency has reached significant peaks over the last decade, with 9 and 8 events recorded in 2010 and 2014 respectively. Only in 2010, the floods of the Seveso Torrent caused damages for about 75M Euro (ETATEC, Studio Paoletti 2018). During the events of 18<sup>th</sup> October 2010, reported as “an extraordinary event in a context of objective ordinary criticality” (Municipal Councilor for Public Works, in: *Il Corriere di Milano*, 24<sup>th</sup> September 2010), 300.000 tons of water entered the tunnel of the subway, causing severe damages to the whole transport network. The most severe flooding of 2014 caused damages for 48 (7<sup>th</sup>/8<sup>th</sup> July) and 75 (15<sup>th</sup>/16<sup>th</sup> November) Millions Euro (ETATEC, Studio Paoletti 2018). A synthetic schematisation, including visuals materials and interviews retrieved through a retrospective longitudinal analysis of media, is presented in the following pages.

NEXT PAGE

FIGURE 5.3 SEVESO FLOODS IN MILAN, 1976-2018.

### 5.3.3

#### **How has the problem been approached? A historical overview**

The search for solutions to the recurrent flooding of the Seveso Torrent has long been included in the political agenda of local and regional administrations, leading to a plethora of programmes, projects and plans (see Chapter 5.4). The search for (structural) solutions started in the 1960s, when interventions were proposed to protect citizens from the northern neighbourhoods of Milan, mainly through defence-oriented structural measures. Among these, there was a new channel for the protection of the North/West area of Milan. Optimism about the capacity of this defence infrastructure to solve the issue is witnessed by the positive way local newspapers refer to them: “in six months, Milan will not be flooded every time it rains” (*Il Corriere Milanese*, 6<sup>th</sup> November 1966). However, only some of the proposed interventions were implemented, while others have been discussed and modified for decades.

**Viale Marche, Autumn 1951.**  
 "E' in viale Zara che il fenomeno ha assunto, per quanto riguarda la cerchia urbana, le proporzioni più imponenti. Erano le acque del Seveso, il cui corso incrocia l'arteria al principio di viale Fulvio Testi" (Corriere Milanese, 9th November 1951).



No. floods Year

- 1 1951
- 1952
- 1953
- 1954
- 1955
- 1956
- 1957
- 1958
- 1959

Corriere Milanese, 26th June 2014

**I paesi dell'eterna alluvione**

Le prime piogge ripropongono drammaticamente un problema che si trascina da anni - Cogliè e Ronzaglioli dagli stagni di San Donato, Corsico, Borsariolo-Barolo e San Giuliano - Inverte la data della definitiva sistemazione del canale



Corriere Milanese, 11th November 1969.

- 1960
- 1961
- 1962
- 1963
- 1964
- 1965
- 1 1966
- 1967

1



**Niguarda, Autumn 1976.**  
 "Il Seveso è uscito ancora, come previsto, allagando le solite strade" (Corriere Milanese, 30th October 1976).

Corriere Milanese, 30th October 1976

- 1968
- 1 1969
- 1970
- 1971
- 1972
- 1973
- 1 1974
- 4 1975

1

4

5

6

**S'inaugura la stagione delle piogge  
 La zona nord inondata da due fiumi**

IN QUARANTA ORE ROVESCIATI SULLA CITTA' PIU' DI CINQUANTA MILLIMETRI DI ACQUA  
 Il Seveso, naturalmente, e il Lambro sono stravolti bloccando tutto il traffico - Trasformati in lagune anche piazze e vie di altri quartieri - Serie ininterrotta di incidenti stradali, due dei quali con vittime mortali - Pochi sperano che il tempo migliori prima di domani



Corriere Milanese, 22th September 1979

Corriere Milanese, November 1979

- 14 1976
- 1977
- 1978
- 1979

2

2

1

1



**Straripa il Seveso, Milano allagata**

Le acque del fiume si sono riversate nella zona di Niguarda - Invaso anche alcune cabine elettriche - Bloccati numerosi telefoni - Tram a rilento e treni in forte ritardo - Centinaia le richieste di intervento per pompieri e vigili - Due morti e 6 feriti in incidenti stradali nella provincia

Corriere Milanese 13th October 1988

- 1980
- 1981
- 1982
- 1983
- 1984
- 1985
- 1986
- 1987
- 1988
- 1989

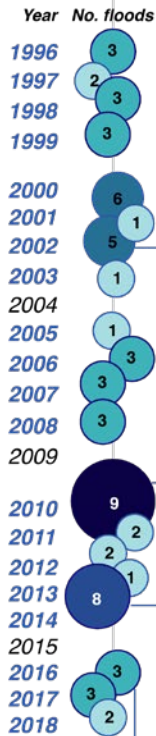
1

2

3

1

- 1990
- 1991
- 1992
- 1993
- 1994
- 1995



**Corriere della Sera, 26th November 2002**

### Il Nord è sott'acqua, mai tanta pioggia in 25 anni

Già caduti 220 millimetri contro la media stagionale di 80, quartieri allagati a Milano. Rischio alluvioni in Friuli

**LA SITUAZIONE**

### Acqua alta, 75 strade bloccate

*Violento temporale, telefoni e semafori in tilt. Viale Zara isolato*

**QUARTIERE A MOLLO** Sott'acqua fino dalla città a quella per il temporale, che ha provocato l'interdizione di alcune linee. Il Comune ha attivato la zona di emergenza di pronto intervento in viale Zara. Molte le richieste di lavoro in servizio per il servizio di manutenzione dell'acqua

**"Lo risolvono. Il Seveso straripante ha le ore contate. Da 25 anni"**  
(La Repubblica, 21st September 2010)





FIGURE 5.4 FINALMENTE! (SOURCE: CORRIERE MILANESE, 6TH NOVEMBER 1966).

The central infrastructure proposed was the ‘Canale Scolmatore di Nord Ovest’ (CSNO), a spillway channel that was intended to deviate the Seveso floodwaters into the Ticino River. The first branch was finalised in the 1980s and was welcomed by local media, which acclaimed it as the final resolution. The trust in this infrastructure, however, started to be questioned after the first floods: “despite the spillway channel, the Seveso has overflowed, flooding not only the entire Niguarda district but causing also problems in other parts of the city” (Informazione Milano, 25<sup>th</sup> September 1981). In the following decade, authorities proposed to increase the channel capacity. The Project had a long iter. It met the opposition of citizens and associations of the Ticino River, worried that the polluted water of the Seveso Torrent would have contaminated the so-called

*light-blue river*, which also crosses Environmental Protected Areas. Also, the project was blocked for years due to a dispute about the tendering procedure that emerged in conjunction with a national corruption scandal in 1992 ('Tangentopoli', see La Repubblica, 19<sup>th</sup> November 2000). In the end, the channel capacity was doubled only for the first part of the CSNO (between Palazzolo and Senago) in 2004. The construction site opened in 2002 when the responsibility was entrusted to the Province of Milan. At that time, the project was not perceived as decisive anymore, but it was clear that it would have been "nothing more than a help" (Cucchiario, Province of Milan, in: La Repubblica, 25<sup>th</sup> July 2003).

In 2003, Metropolitane Milanesi (MM) presented a project for another spillway channel, that was supposed to deviate the Seveso waters in the Lambro River. This project had been included in the Triennial Plan for Public Works of Milan in 2004, but it was never realised. It was cancelled in 2009, also due to the progressive urbanisation of project areas (EX\_3). G. Albertini, the former mayor of Milan who supported the realisation of this infrastructure, accused the administration of having used the allocated funds for other purposes (Il Corriere di Milano, 24<sup>th</sup> September 2010). Experts, however, refer to the failed implementation of the spillway channel as a "narrow escape" (EX\_3, see also Corriere di Milano, 18<sup>th</sup> July 2014), as it would have transferred water pollution and risk into the Lambro River.

Also, soon after the first branch of the CSNO was doubled, in 2004, the first hydraulic study discussing the realisation of water retention areas was released (AIPo and ETATEC 2004). Since then, water retention areas have been the core of FRM strategies promoted at the national and regional level (see Chapter 5.4, Chapter 6), and the centre of contentious debates (Chapter 6). The final project foreseeing the realisation of 5 areas was approved in 2015 and co-financed with National funds (Annex 2).

#### 5.3.4

#### **Water and Flood Risk Governance of the Seveso Torrent: A complex picture**

The water and risk governance of the Seveso Torrent is complex, fragmented and articulated on different levels. It reflects the evolution of a general shift in water and risk management approaches (see Water Framework Directive 2000/60/EC and Flood Directive 2007/60/EC) but is also affected



by national attempts to restructure the governance system and redistribute administrative competences (e.g. the creation of Metropolitan Cities and the –partial– dismissal of Provinces). Also, the allocation of competences has been partially re-arranged and adapted more or less formally at the local level, e.g. through agreements and projects that *de facto* contributed to reshaping local governance (see Chapter 5.4).

For what concerns formal governance structures, the Italian legislation distributes competences on water management, flood risk reduction, river basin planning and land management among public actors working at different levels, including national, supra-regional (e.g. river-basins, national parks), regional, supra-municipal (e.g. provinces, metropolitan cities, regional and supramunicipal parks, ‘Ambito Territoriale Ottimale’ - ATO) and municipal bodies. Currently, the primary normative basis for water and governance and management is the Legislative Decree 25/2016<sup>30</sup>. The decree transposes the EU Water Framework Directive (2000/60/EC), thus adopting a holistic and integrated approach to water management and highlighting the need for co-operation within river-basins. It indicates that the Italian State (and in particular the Ministry for Environment) is in charge of providing guidelines and recommendations (art. 58), while Italian Regions are competent for land and water management within their territorial boundaries (art. 61)<sup>31</sup>. Italian Regions are in charge for the development of Water Protection Plans, for the approval of projects, interventions and works to be realised in their territory and, generally, for supporting sustainable use of land and waters. Also, they collaborate with the Basin District Authorities. In line with EU Directives (Water Framework Directive 2000/60/EC and Flood Directive 2006/60/EC, the latter being transposed by the Legislative Decree 49/2010), Basin District Authorities are the central bodies in river basin planning. They are in charge of designing and approving Water Management Plans and Flood Risk Management Plans within their basins. Furthermore, based on the principle of subsidiarity, Regional

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30 See D.Lgs 152/2006: ‘Norme in Materia Ambientale’, Part III - ‘Norme in Materia di Difesa del Suolo e Lotta alla Desertificazione, di Tutela delle Acque dall’Inquinamento e di Gestione delle Risorse Idriche’.

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31 This scheme follows the Italian Constitution (art. 117, modified in 2001 and in 2016), defining that the State has competences on general and common provision on territorial Governance, while Italian Regions are in charge of regional territorial planning and on infrastructure endowment within their administrative borders.

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competencies are exercised in collaboration with or delegated to other local public bodies (e.g. Municipalities, Provinces, Parks, Consortia, Mountain Communities), following modes that are defined by the Regions themselves (art. 62).

These schemes also apply to the management for the Seveso Torrent. Figure 5.5 provides a general overview of the governance structure, considering public bodies with formal competences over water management, flood risk management and planning.

## Governance levels



FIGURE 5.5 WATER AND RISK GOVERNANCE OF THE SEVESO TORRENT. (SOURCE: AUTHOR).

Included in the Lambro-Olona sub-basin, the Seveso is part of the Po River Basin District. The Po River Basin District Authority (AdBPo) is, therefore, the competent authority for designing Water Management Plans (AdBPo 2015), Flood Risk Management Plans (AdBPo 2016) and Hydrological Plans (see AdBPo 2001 and AdBPo, Regione Lombardia 2017). The AdBPo works in collaboration with the Interregional Agency for the Po River (AIPo), in charge for the

management of the primary hydrographic network and for internal navigation, as well as for the design and implementation of hydraulic safety works. Within the Lombardy Region, competences on water management and risk reduction have been historically shared among three General Directorates: Territory ('DG Territorio'), Environment ('DG Ambiente') and Civil Protection ('DG Protezione Civile'). In recent years, responsibilities have been partially redistributed, and allocated mainly to a new Directorate: 'DG Territorio and Protezione Civile'. This is in charge of landscape and supra-municipal territorial planning, soil defence and hydrogeologic management (e.g. in terms of risk prevention), water services provisions and civil protection tasks. Also, it collaborates with the DG Environment for the design and implementation of the Water Protection Plans (see Regione Lombardia 2016). Furthermore, these Directorates collaborate with the Regional Body for Agriculture and Forestry (ERSAF) for what concerns River Contracts (see Chapter 5.4), and with the Regional Agency for Environmental Protection (ARPA) for environmental monitoring activities.

For what concerns supra-municipal bodies, provinces had long been in charge of the regulation of discharges and of sewage management. In the study area, these competencies have been transferred to the Milan Metropolitan City. Currently, these functions are exercised by ATO Milano ('Ambito Territoriale Ottimale'), which coordinates programmes and interventions on the sewage and drainage system. In carrying out these activities, ATO works with the integrated water system's management, company, named CAP Holding. This has competences over interventions on the drainage and sewage networks.

Among supra-municipal bodies included in the Seveso governance scheme, an important role is played by Parks and – within the study area – by Parco Nord. Parco Nord is a public body composed by the Municipalities of Milan, Sesto San Giovanni, Bresso, Cinisello, Cormano, Cusano e Novate Milanese, as well as by the Milan Metropolitan City. Parco Nord is competent for river banks management over the 4 Km of the Seveso crossing the Park. Also, it carried out specific projects and agreements (e.g. with AIPO in 2018), including: a census of illegal dumpings (in 2000), ordinary and extraordinary maintenance and garbage cleaning interventions, monitoring of water quality, as well as experimental projects for nature-based river banks restorations (see 'La Fine del Seveso', Annex 2). In addition, Parco Nord is going to host one of the five water retention areas foreseen by the Seveso Plan (see Chapter 5.4), and it had an essential role in negotiating the details of the project.

Finally, at the local level, a key role is played by municipalities. Those have specific competences in urban planning. Also, they are in charge of the management of the minor hydrographic network. Within the boundaries of the Milan Metropolitan City, those functions are performed in collaboration with ‘Metropolitane Milanesi’ (MM), a private-public enterprise in charge of managing access to public waters and wastewater treatment. For what concerns real-time risk management, municipalities are in charge of designing, implementing and updating Municipal Emergency Plans. In the north of Milan (south of Palazzolo), municipalities directly crossed by the Seveso sub-basin include Milan, Bresso, Cormano, Cusano Milanino, Paderno Dugnano. The allocation of competences within municipal administrative structures varies from one municipality to the other. In the case of Milan, competences are allocated among the General Urban Planning Area (under the Urban Planning Directorate); the Water Protection and Territory Unit (under the Mobility, Environment and Energy Directorate) and the Integrated Safety and Civil Protection Area (under the Urban Safety Directorate).

## 5.4 What has (not) been done? Exploring actions for risk reduction

This section explores Level 2 of Analysis - *Actions*. It describes the most significant actions designed and carried out to reduce flood risk for the Seveso Torrent<sup>32</sup>. The following paragraphs do not aim at providing a detailed description of the specific actions carried out, but rather at inductively identifying attempts to reorganise in order to face flood risk and its impacts. The review mainly focuses on actions carried out over the last 20 years (approx. from the year 2000 to mid-2018), even if references to previously defined actions are added when relevant.

### 5.4.1 Identifying actions: A synthetic overview

Following the analytical framework, relevant actions undertaken in the attempts to support risk reduction are identified (Figure 5.6). As proposed in Chapter 4, those actions can be observed looking at: the approach they follow, the goals they seek to achieve, the process through which they have been designed and (eventually) implemented, and the effects they generate.

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32 For a short description of the actions mentioned in this section, see Annex 2.

Relevant normative changes have been introduced, witnessing growing attention towards soil consumption reduction, sustainable water management and risk reduction (see, e.g. the Regional Law on Soil Consumption, the Regional Regulation on Hydraulic Invariance, and changes in the normative framework for real-time risk management). Also, actions reflect the reform of river-basin planning introduced by EU Regulations, that promoted an integrated approach to water and flood risk management and a greater focus on mitigation and preparedness. Besides, some voluntary agreements have been developed to support cross-scalar coordination among administrative bodies with competences over water and flood risk management (see, e.g. 'the Agreement for the Hydraulic Safety of Milan' 1999, 2009 and the reorganisation of Civil Protection and Warning Systems). A further governance reorganisation attempt is witnessed by changes in the internal allocation of competences within complex public bodies (as in the case of the Lombardy Region). Furthermore, identified actions show increasing attention towards education and dissemination (see, e.g. stakeholder involvement and dissemination initiatives promoted under the River Basin Planning, or communication campaigns launched by the Regional Civil Protection).

In addition, others actions specifically addressing the Seveso Torrent emerged. Among these, the more relevant are: the Seveso River Contract (a voluntary agreement, signed in 2006, that seeks to support stakeholder involvement in river-basin management) and the so-called *Seveso Plan*, launched and co-financed by the Italian Government. The latter foresees the construction of five water retention areas along the Seveso watercourse, and has been strongly contested by the municipalities where the infrastructures are to be located (in particular Senago and Bresso) and by citizens associations. Furthermore, experimental projects have been launched to support design innovation in river maintenance and risk reduction. Finally, over the last two decades, several studies and analysis have been undergone to support decision-making.

The actions identified refer to all the phases of the disaster risk reduction cycle. They declare to support integrated water management and multi-level cooperation, as well as knowledge production, exchange and dissemination. For what concerns decision-making processes, voluntary agreements (see the River Contract) show an attempt to support governance innovation. On the other hand, actions show a strengthening of the role of the Lombardy Region (see, e.g. the Agreement signed in 2010 with the Ministry of Environment, or the leading role it

play in River Contract Process). Despite the emergence of collaborative projects developed in the framework of calls for funding (e.g. River Contracts related calls launched by the Lombardy Region 2009, 2015; Cariplo Foundation calls), however, structural measures affecting the hydrographic dynamic of the Seveso River have been developed through a top-down decision-making process (see Chapter 6).

### 5.4.2 Identifying sub-systems of actions: “Respond quickly!”, “Protect Citizens” and “Respect the River”

Based on the observation of actions, three subsystems pursuing specific goals are identified (see Figure 5.6, Annex 2).

#### (i) *Subsystem of action 1 – “Respond quickly!”*

A first subsystem consists of all the actions carried out to enhance flood response (see Figure 5.6, in red). Peculiar attention to this specific phase of the DRR cycle is related to the higher political pressure characterising the immediate aftermath of flood events, to its visibility, and to the short-term return, in terms of image, connected to the implementation of flood response measures. Actions included in this subsystem strive to increase coordination among public bodies with competences in real-time risk management; to improve operative procedures for flood risk response and to enhance the coping capacity of local public officers and –to a lesser extent– of affected citizens. Generally, actions included in this subsystem show an willingness to move from *emergency management* to *real-time risk management*, in line with EU and national legislation. For what concerns institutional cross-scalar coordination, the main effort has been undertaken at the Regional scale, leading to a reform of the Regional Civil Protection structure (actions 6, 13). This reform included the creation of new bodies having a bridging function in real time-risk management (action 7) and the definition of a broader agreement to support coordinated risk management (action 34). Also, this effort has been developed through the standardisation of warning and response procedures. On the one hand, the obligation to design and update Municipal Emergency Plans (introduced in the Lombardy Region *before* the national prescription) moved in this direction, showing attention towards preparedness in a field that has traditionally been based on customs (PA\_R4). On the other hand, decision support systems have

been introduced (see action 4), providing a platform for real-time communication in the flood response phase. Also, monitoring and early-warning systems have been updated. On the impulse of the 2010 flood events, and under the umbrella of the Agreement for Hydraulic Risk Management (action 34), the Lombardy Region decided to provide a more detailed alert system for watercourses that require more attention. It set, therefore, a localised risk warning for the Seveso Torrent (PA\_R4), which integrates the standard alert system with more detailed information through nowcasting. Finally, the Civil Protection Directorate of the Lombardy Region supported initiatives and education campaigns to enhance the preparedness of citizens, e.g. through the 'I do not risk' initiative (action 40), where risk flood risk maps have been presented and explained to the citizens. Actions have also been undertaken at the local scale, in the municipality of Milan. After the flood events in 2010 and 2014, in particular, initiatives have been promoted to support preventive action and coordinated response in high-risk neighbourhoods, e.g. through the creation of a Mobile Operative Unite (action 21).

*(ii) Subsystem of actions 2 – “Protect citizens”*

The second subsystem (in blue, see Figure 5.6) includes actions seeking to “protect citizens” from floods. While the focus is on “keeping water away from people”, the approach followed by local institutions shows increasing attention towards risk mitigation, yet also maintaining strong attention towards flood defence. Actions included in this system include agreements on risk governance (actions 3, 12), river basin plans and projects (actions 5, 24, 31, 10\*), technical hydraulic studies (actions 5, 8, 15, 30) and projects for the realisation of hydraulic structural measures. The most relevant ones are the projects about the realisation of five water retention areas (action 18, further details in Chapter 6.4.1) that have all been included in the so-called *Seveso Plan* (action 19) by #Italiasicura.

*(iii) Subsystem of actions 3 – “Respect the river”*

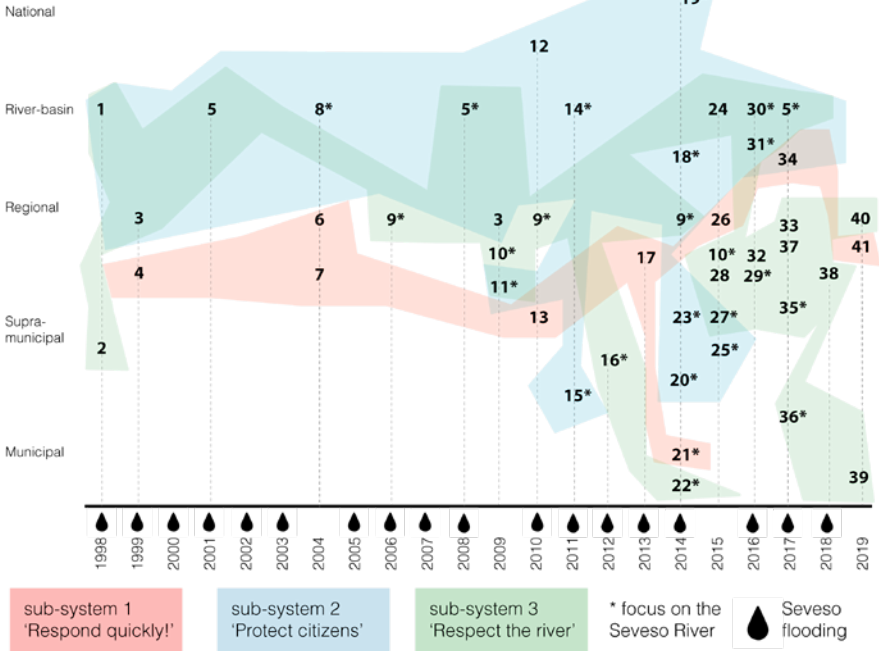
The third subsystem (in green, see Figure 5.6) includes actions undertaken in order to change perspective on river management, i.e. to support risk reduction by respecting the river and its space. While also pursuing flood mitigation objectives, actions belonging to this subsystem generally encompass a broader understanding of risk reduction, explicitly referring to risk prevention and

preparedness and to cross-cutting objectives such as governance innovation, policy co-design, knowledge integration (see actions 9, 35) and education (e.g. action 28). This subsystem partially overlaps with the previous one. It includes, indeed, river basin planning documents and governance agreements on flood risk reduction, as they constitute the general framework for all risk reduction-oriented activities. Also, it includes the Seveso River Contract (action 9) and related initiatives. Actions grouped in this subsystem three tackle both water quality and hydraulic-hydro-geologic risk, pursuing the sustainable use of the water resource, e.g. through better sewage and drainage network management (e.g. actions 9, 35, 38) or by embedding the hydraulic invariance principle in building practices (actions 33). The subsystem also includes small-scale interventions implemented to “give space to the river” and to promote sustainable rainwater management (see actions 9, 11, 16). A step towards this direction has been made, for example, in the update of the new PGT of Milan (2019, action 39), which includes the relation of the city with its water among the strategic themes to be addressed, and tries to support the idea that “water is an important part of the territory, and not something from which we need to defend ourselves” (PA\_C1).

As Figure 5.6 shows, the identified subsystems of actions are overlapping, as institutional attempts work on multiple objectives, or encompass different ways of understanding and dealing with the problem. At the same time, some tensions emerge, especially between subsystem 2 and 3, whose actions pursue diverse and sometimes diverging objectives. As the focus of the thesis is mainly on inherent and adaptive resilience building through mitigation and preparedness, the discussion presented in the next chapter will focus mainly on subsystem 2 and 3, that present the highest level of overlapping and, at the same time, the highest degree of tension.



**GOVERNANCE LEVELS**



- 1 - Milan in the list of Flood-Risk cities
- 2 - Permanent Observatory on Water
- 3 - Planning Agreement for the Hydraulic Safeguard of the City of Milan
- 4 - SINERGIE DSS
- 5 - Hydrogeological Plan for the Po River
- 6 - Regional Law on Civil Protection
- 7 - Regional Operative Centre for Natural Risk Monitoring
- 8 - Hydraulic Study (Seveso)
- 9 - Seveso River Contract (Agreement + Action Plans)
- 10 - Seveso River Contract (Call for projects)
- 11 - 'Fiumi Project' by ARPA
- 12 - Agreement between Lombardy Region and Ministry for Environment
- 13 - Regional obligation for Municipal Emergency Plans
- 14 - Update of Hydraulic Study for the Seveso
- 15 - Hydraulic Study for the Water Retention Area in Bresso
- 16 - 'La fine del Seveso' Project by Parco Nord
- 17 - Update of risk monitoring system
- 18 - New Plan for water retention areas
- 19 - Seveso Plan by #Italiasicura
- 20 - Seveso Plan Litigation
- 21 - Milan: Front & Office Mobile Operative Unit
- 22 - Inquiry about maintenance of underground Seveso
- 23 - Seveso Plan included in the EXPO Plan
- 24 - Po River Management Plan
- 25 - 'Il fiume chiama' Project
- 26 - Update of Regional Norms on Early-Warning Systems
- 27 - Inquiry on discharges and illegal dumping
- 28 - Urban Drainage Handbook and 'A Regola d'Acqua'
- 29 - Inquiry on ecological quality of the Seveso by FLA
- 30 - Update of Hydraulic Study (Seveso)
- 31 - Po River Flood Risk Management Plan
- 32 - Regional Law on Soil Consumption
- 33 - Regional law on Hydraulic Invariance
- 34 - Agreement for Hydraulic Risk management
- 35 - Strategic Project for the Seveso Sub-Basin
- 36 - Action proposed to reconnect the Seveso with the Martesana Chanal
- 37 - Plan for water Protection
- 38 - Update of Regional Regulation of sewage water management
- 39 - Update of the Urban Municipal Plan of Milan
- 40 - Territorial Regional Plan
- 41 - 'lo non rischio' information campaign

FIGURE 5.6 SUB-SYSTEMS OF ACTION TO REDUCE RISK FROM THE SEVESO TORRENT. (SOURCE: AUTHOR).

# 6

Towards risk reduction?  
Exploring frames, knowledge  
dynamics and policy change

## ABSTRACT

*This second Chapter on the Seveso case study further explores institutional reorganisation attempts undertaken to support flood risk reduction. Following the analytical framework (Chapter 4), it first looks at explicit knowledge, also considering how it has been acquired and used by key planning and policy documents. Second, the Chapter looks at how the problem has been framed by involved actors. Accordingly, it identifies five “diagnostic frames” linked to institutional actions. Third, the chapter reflects on “drivers” that triggered reflection and (in-)action across governance scales. Finally, broader process dynamics affecting the capacity of actors involved in decision making to reflect and act in the face of flood risk are identified and discussed. This last part focuses in particular on actions related to the realisation of water retention areas upstream from Milan and to attempts to support capillary flood risk reduction measures.*

### 6.1 Detecting explicit knowledge: An analysis of the knowledge base of selected planning and policy documents

Following the proposed analytical framework (Chapter 4), this section explores Level 3 of Analysis - focusing on the *explicit knowledge* (Nonaka et al. 2008) included in the main programmatic and strategic documents about risk mitigation and river management. Those are:

- The Seveso River Contract (2006 and following updates, see action 9 in Figure 5.6) and associated initiatives (e.g. see Regione Lombardia and ERSAF 2017);
- The Flood Risk Management Plan for the Seveso Basin (AdBPo 2016, action 31 in Figure 5.6) and in particular the annexe on the Milan Hydraulic Node (AdBPo 2016) and the Integration to the Hydrologic Plan including the Seveso Torrent (AdBPo and Regione Lombardia 2017);
- The Seveso Plan by #italiasicura (actions 19 and 20 in Figure 5.6).

After identifying relevant facts, data and information (6.1.1), this section looks at modes of knowledge acquisition (6.1.2) and utilisation (6.1.3).

### 6.1.1 Facts, data, information

Explicit knowledge is identified under the form of: ‘facts’ (mentioned or reported, e.g. references to previous events or initiatives), data (e.g. technical, socio-demographic, flood-related) or information (e.g. in terms of past experiences, technical and socio-spatial analysis performed, see Table 6.1).

The Seveso River Contract Agreement is an *umbrella* action (see Annex 2), which does not have a well-defined knowledge base by itself. It promotes measures that range from small-scale experimental projects for nature-based river-banks restoration to large-scale structural works (as the water retention areas, included in the Action Programme 2014). Those projects rely on heterogeneous and sometimes divergent data and information, which include expert and technical knowledge (mainly related to hydraulic and environmental engineering) and, to a lesser extent, place-based information. Recently, the Strategic Programme for the Seveso sub-Basin (Regione Lombardia and ERSAF 2017) tried to systematise the knowledge base, including information collected along the design of the actions included in the River Contract Action Programme, as well as other types of technical and scientific data and information derived from strategic and sectoral planning documents, monitoring activities and technical reports. This Programme identifies place-specific value elements and critical issues, and drafts an “identity card” for the Seveso sub-basin. This profile includes a short overview of its territorial characteristics, as well as data and information about: past events, past and ongoing projects and interventions, surface hydrology, geology, soil capacity and land use, ecological networks, water quality, hydraulic and hydrological characteristics, and hydraulic risk. Those are mainly retrieved through the Regional Geographic Information System (DUSAF). They have been overlapped through cartographic elaboration that allowed identifying place-specific criticalities and priorities for intervention, which have then been discussed with stakeholders involved in the River Contract Process.

TABLE 6.1 FACTS, DATA AND INFORMATION: EXAMPLES FROM SELECTED PLANNING AND POLICY DOCUMENTS.

	Facts	Data	Information
<b>The Seveso River Contract (2006, 2010, 2014) and the Strategic Programme for the Seveso Sub-Basin (2017)</b>	Past flood events; norms, plans and programmes; actions, initiatives and measures carried out by signatories.	<b>Current status:</b> socio-demographic data; environmental data (water pollution, river hydro-morphological status); pluvio-hydrometric data. <b>Future scenarios:</b> flood forecasts; funding availability.	<b>Strategic Programme</b> – governance framework; value elements; criticalities.
<b>The Seveso Plan by #Italiassicura (2014)</b>	Past flood events.	<b>Current status:</b> flood damages; pluvio-hydrometric data; structural configuration of the hydric network. <b>Future scenarios:</b> flood forecast; costs estimation for the implementation of defence/mitigation infrastructures.	
<b>The Flood Risk Management Plan (2015), the related update of the Hydrological Plan (2016) and the document on Milan Hydraulic Node (2017)</b>	Past flood events; norms, plans and programmes.	<b>Current status:</b> socio-demographic data; pluvio-hydrometric data; floodable areas <b>Future scenarios:</b> flood forecast.	preliminary flood risk assessment; hazard and Risk Map; characterisation of High-Risk Areas; identification of 'respect areas' for the Seveso Torrent; update of hydraulic and hydrologic studies for the Seveso Torrent.

The so-called Seveso Plan consists of the direct transposition of hydraulic projects developed to support the implementation of water retention areas. Those projects are based on technical data deriving from previous hydraulic studies (AIPO and ETATEC 2004, 2011), which scoped the feasibility and localization of lamination infrastructures. These studies consider past events, estimate flood damage, and develop hydraulic models based on flood return times. Their only focus is on flood risk and on the structural configuration of the hydraulic network. Other information - e.g. related to water quality or to the current status

of defence infrastructures - are not considered. Notably, knowledge included in the Seveso Plan has been embedded in River Basin Planning tools, with the Plan being integrated into the Flood Risk Management Strategy (2015) and the water retention areas being included in the Seveso River Contract Action Programme (2014).

Finally, the Po Basin Flood Risk Management Plan (AdBPo 2015) includes a preliminary assessment of flood risk, based on past flood events, as well as hazard and risk maps for the whole Po River Basin. The Plan identifies the City of Milan as one of the 21 high-risk areas with a district-level relevance (AdBPo 2016). Within the Milanese area, it describes the main characteristics of the hydraulic network and its defence system, also tracing back its historical evolution. The Plan also performs a longitudinal analysis of flood events, discussing risk roots with the support of technical data. It presents hazard and risk maps for the whole area, with the support of scenarios developed through hydraulic modelling. Also, it includes data about water ecological and chemical status. For what concerns the Seveso Torrent, the FRMP updates the Hydrological Plan of 2001 (AdBPo and Lombardy Region 2017). The knowledge base characterises the watercourse and its surrounding areas, rooting critical elements within the historical development of the sub-basin. It gathers data and information retrieved from other sectoral documents, from hydrogeologic studies carried out in 2004 and 2011, as well as updated land-use data. With the 2017 update of the Hydrological Plan, the Seveso Torrent enters for the first time in River Basin Planning documents.

### 6.1.2 Modes of knowledge acquisition

The knowledge base of the main plans and programmes was built through the direct acquisition of data and information from previous planning and sectoral documents, technical reports, environmental monitoring activities and *ad hoc* studies carried out along the design of specific projects (e.g. Hydraulic Studies by AIPO). Knowledge is retrieved through a direct transfer of information, that is mostly “copied and pasted” from one document to the other. As a result, strategic and sectoral documents rely on a similar knowledge base, even if they emphasise different types of information, depending on the objectives they pursue (see next section). Some documents (e.g. AdBPo 2016, AdBPo and Regione Lombardia 2017, Regione Lombardia and ERSAF 2017, update of the

Milan Urban Plan) try to systematise available information in order to make it more usable for decision-making (PA\_C1)<sup>33</sup>. Even if these attempts display efforts to support cross-sectoral knowledge integration within and among institutions (EX\_2), they are based on the overlapping of informative layers<sup>34</sup>. In general, scientific knowledge is used to support the interpretation of technical data, while local and experiential knowledge is mostly absent. For what concerns knowledge creation, knowledge embedded into plans and programmes is mainly grounded on technical studies (e.g. see the hydraulic studies carried out by AIPO), or derived from monitoring activities (e.g. see reports on water quality by ARPA). Other efforts to enhance the place-based understanding of local dynamics have been performed (see, e.g. the inquiry on illegal dumpings, action 27 in Figure 5.6), but they were never formally included in the knowledge base of policy documents.

### 6.1.3 Types of knowledge utilisation

The knowledge-action link (Chapter 4.4.3) mainly relies on “instrumental” forms of knowledge utilisation (Dunlop and Radaelli 2013). In line with an evidentialist approach (see Davoudi 2015), technical-scientific knowledge is used as a key-source for “sound” policy-making. Different typologies of instrumental knowledge utilisation can be identified, depending on the degree of dependence between knowledge and policy goals and actions. When policy objectives are not defined *ex ante* – as in the case of the Strategic Programme for the Seveso Sub-basin (Regione Lombardia and ERSAF 2017) – knowledge is used to identify priorities for intervention. On the contrary, when policy goals are already set, as they derive e.g. from higher-level policy objectives, knowledge is used

33 “The knowledge base of traditional planning tools is continuously replicated and duplicated, sometimes in a contradictory way. The final planning prescriptions then often do not even consider the results of the analyses performed, as they are so long and self-referential that no one reads them” PA\_C1.

34 The Strategic Programme for the Seveso Sub-basin (Regione Lombardia and ERSAF 2017), for example, has tried to overlap different types of information creating “maps of criticalities” to support local decision-making. Those maps divided the whole territory into cells and assign a criticality score to each of them. The score is defined by overlapping and rating pre-defined information about problematic issues (e.g. high hydrogeologic risk, non-good ecological status of the watercourse, artificialisation of the riverbed), while the interactions among them are not directly tackled.

instrumentally to list and specify them in light of place-specific dynamics (see the Flood Risk Management Plan and associated documents). Still, when objectives are well established and already associated with specific actions or ways of acting, knowledge is used in order to convey a *modus operandi*, i.e. to educate local policymakers providing them with specific guidelines. This is, for example, the case of the Handbook and Guidelines developed under the River Contract umbrella (see Gibelli et al. 2015, action 28 in Figure 5.6, in Chapter 5).

Also, knowledge has been utilised “symbolically” to provide a source of legitimation for top-down action (see Dunlop and Radaelli 2013, Moyson et al. 2017). This is the case of knowledge produced within feasibility studies for the retention areas (AIPO and ETATEC 2011), which was directly transferred into river basin planning documents. Besides justifying the localisation of infrastructures, forecasts about flow capacity differentials before and after the implementation of retention areas are used to legitimise the Plan itself.

## 6.2 Sense-giving and policy-making: Problem frame analysis

This section focuses on *sense-making dynamics* (see Chapter 4), presenting “framing and reasoning devices” (Rein and Schön 1996) identified through thematic content analysis performed on interview transcripts, media sources and policy and planning. The following sections provide insights about how actors define and understand the problem (Chapter 6.2.1), and how they make use of these frames when attempting to deal with the problem itself (Chapter 6.2.2).<sup>35</sup>

### 6.2.1

#### What is it all about? Framing devices and diagnostic frames

Framing devices about “what the problem is about” allowed identifying five main “core packages”, leading to the definition of five diagnostic frames (Figure 6.1). Even if they show some tensions, these frames are not (necessarily) mutually exclusive, but might instead be conceived as lenses of observations, that sometimes diverge but that are often interrelated. They allow to partially de-construct different dimensions of the problem, showing how actors with

<sup>35</sup> All transcripts and quotes were translated from Italian to English by the author. Codes used to anonymise interviewees are reported in Annex 1.



different roles and profiles look at flood events and make sense of them. The clustering of framing devices allows identifying five diagnostic frames, which define flood-risk related issues as: (i) a structural problem; (ii) a territorial problem; (iii) a governance problem; (iv) a maintenance problem; or as (v) a “biblical curse”.

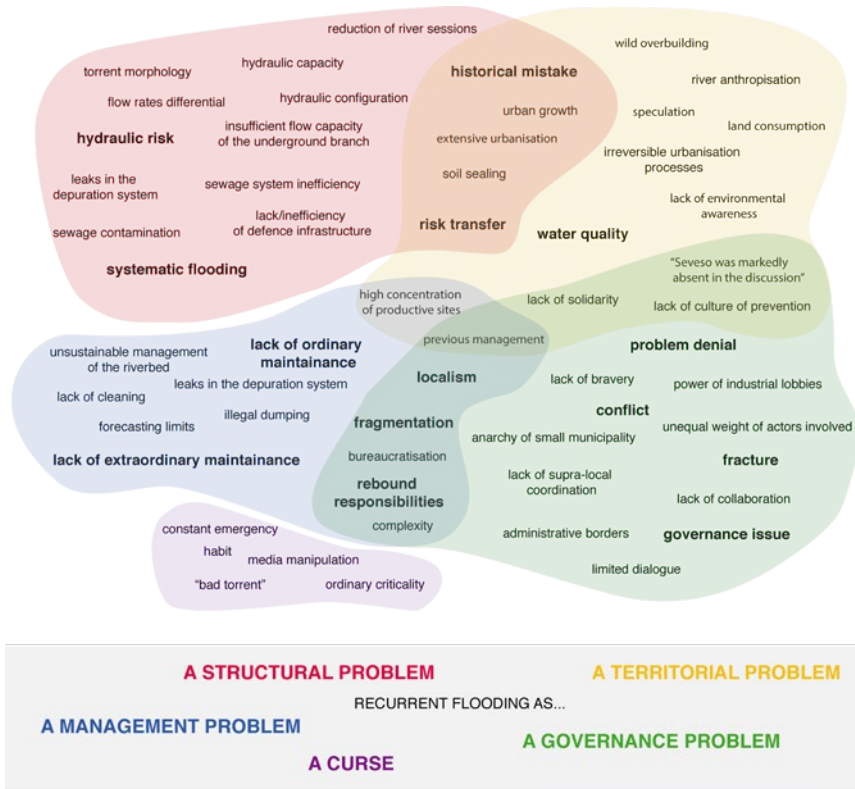


FIGURE 6.1 – FRAMING DEVICES AND CORE PACKAGES OF DIAGNOSTIC PROBLEM FRAMES. FRAMING DEVICES INCLUDE WORDS USED TO DEFINE THE PROBLEM (IN BOLD) AND ITS CAUSES. (SOURCE: THE AUTHOR).

**Diagnostic frame n. 1: A structural problem**

A first frame defines the problem in structural terms. Mainly relying on technical knowledge, it focuses on the physical dimension of flood risk, and it conceives

floods to be rooted in the Seveso morphology and in its torrential nature.

*«The Seveso has a torrential regime. That is, it passes from zero to flood very quickly. Floods were occurring in the XVIII Century when the basin was not urbanised, and they still occur today. Those events are related to the Seveso morphological characteristics. Of course, soil sealing and overbuilding didn't help.» PA\_P1.*

Also, this understanding refers to the configuration of the hydrographic network and to its limited hydraulic capacity, e.g. considering the insufficient flow capacity of the underground stretch of the Seveso in Milan and the inefficiency of the sewage system.

*«The problem of the Seveso is a structural one. The last branch of the Torrent has been covered; the hydraulic section is insufficient to collect water flows. There is the need to intervene upstream, which unfortunately is difficult.» Franco Gabrielli, Head of the Civil Protection Department, in Il Fatto Quotidiano, 27<sup>th</sup> October 2014.*

*«When we began to study the Seveso, what immediately emerged was the great flows differential, especially at the entrance of the underground stretch of Milan. The hydraulic capacity of the underground channel does not exceed 40m<sup>3</sup>/sec, while flow rates of the most extraordinary events linked to intense meteorological phenomena reach 100m<sup>3</sup>/sec. This differential is the main reason for recurrent flooding in the northern neighbourhood of Milan.» EX\_1.*

While the emphasis has long been put on the lack of defence systems, in the last years the focus has moved towards the inadequacy of structural interventions, and in particular of the CSNO spillway Channel (see Chapter 5).

*«The first cause of risk is the lack of adequate protection and of sufficient drainage channels. [...] There are no adequate embankments and the civil and industrial drainage system is uncontrolled, so that even moderate precipitation exceeds the system's capacity.» Corriere Milanese, 4<sup>th</sup> October 1976.*

*«In Palazzolo, the flow coming from the upstream basin can be discharged into the CNSO, whose disposal capacity, however, is not sufficient to reduce the flow rates within the value compatible with the runoff capacity of the closed section of Milan. Also, flows coming from the drainage network downstream of the CNSO derivation (i.e. discharges from Cusano Milanino, Cormano, Bresso and Cinisello Balsamo) are able alone to saturate the flow capacity of the covered stretch.» ETATEC, Studio Paoletti 2018 (see also AIPO and ETATEC 2011).*

Transformation processes affecting the Seveso sub-basin, e.g. urbanisation and land consumption, are also considered. They are included in the frame without an explicit political connotation, but rather in descriptive and technical terms, in virtue of the effects they produce on the hydraulic network.

*«Today floods occur mainly in minor watercourses (such as the Seveso), which in the last decades have been drastically affected by intense urbanisation. They have been covered, channelled and their sections have been reduced, affecting maintenance. Another fundamental cause is that the water flows increased because of the increase of impervious surfaces related to urbanization processes. Due to the lowered permeability and soil infiltration capacities, rain waters enter directly in the sewage system and, from there, flows into the hydrographic network.» Ugo Majone, Professor of Technical Hydrology at Politecnico di Milano, in Corriere Milanese, 29th September 1981.*

*« Urban development of the Municipalities upstream of Milan has led to the progressive soil sealing, with a consequent increase in the flows discharged in the sewer network, which alone can saturate the flow capacity of the Seveso watercourse also for events with a low return time.» ETATEC, Studio Paoletti 2018.*

Finally, this diagnostic frame also considers water quality, connecting it to leaks in the depuration system. With this, however, it is held that “water quality and quantity, while interacting and being interrelated, are two separate issues, that also affect different time scales” (EX\_1).

### ***Diagnostic frame n. 2: A territorial problem***

A second diagnostic frame stresses the role of territorial dynamics related to irreversible urban development paths and to their effect, e.g. in terms of anthropisation of the watercourse, limited soil infiltration capacity, and “lack of respect” for the river and for its space. These dynamics, which are also acknowledged in the first frame, are here defined following a more critical perspective, as witnessed by the use of negatively connotated words such as “wild over-building”, “speculation” and “fierce urbanization”.

*«Due to the fierce urbanisation of Northern Milan, watercourses have lost their natural retention areas. Rivers overflow anyway, but where there should be nothing, there are the houses.» Geologist, Milano Province, in La Repubblica, 27th November 2002.*

*«Although the problem is complex, its causes are easily identified in the territorial transformations of areas to the north-west of the city. Since the second post-war period, urban development dynamics have profoundly changed the hydraulic balance of the watercourses. The gradual, but increasingly rapid, urbanisation of rural areas led to the continuous reduction of the natural flooding areas of the river.» Gianfranco Becciu, Politecnico di Milano, in Il Corriere di Milano, 23rd July 2014.*

Also, attention is paid to the historical path that led to current risk conditions. Those are described as the result of a “historical mistake” (PA\_C2, PA\_C1), grounded in the lack of environmental awareness and in the priority given to economic growth and urban development objectives from the 1960s onwards. Furthermore, framing devices refer to the absence of a “culture of risk” (PA\_C2, PA\_C3), that contributed to the lack of recognition of watercourses in general, and of the Seveso Torrent in particular. Accordingly, the Seveso has been largely ignored, to the extent that it disappeared both physically – as it was covered and hidden – and symbolically, so that it was not even represented in urban maps (PA\_C1).

*«Before World War II, it was believed that man could win over nature. On this basis, important waterways have been built and covered, including the Redefossi Chanal, that was the natural mouth of the Seveso. After the War, it was thought that nature could be ruled and used to support the*

*flourishing of human activities. Hence the consequent coverage of the rest of the Seveso and the excessive urbanisation of the northern part of the Milanese metropolitan area, where the consequences of soil sealing and narrowing of the waterway were not considered. Today we would define this use of the territory as insane, but then there was no such sensitivity. Roads and infrastructure were needed, there was an economic boom, and we only thought about building.» PA\_C2.*

To this respect, part of the problem today is related to difficulties in managing what has already been done and in dealing with the consequences of choices that “did not respect the territory and the river [...] and that cannot be amended” (PA\_C2).

*«It will not be easy to say now that non-building zones will be set in areas that have undergone a massive building process. This will not work because of a historical mistake.» PA\_C1.*

Framing devices referring to the *territorial* dimension of the problem often highlight the interconnection between flood risk and water quality (PA\_R1). Notably, the fear of environmental damages also resonates with the history of territories crossed by the Seveso Torrent, that before entering in Milan crosses the industrial area of Brianza and that in 1976 was at the centre of one of the main environmental disasters in Italian history (Figure 6.2).



FIGURE 6.2 DIOSSINA PAURA. (SOURCE: CORRIERE MILANESE, 7<sup>TH</sup> OCTOBER 1976).

### ***Diagnostic frame n. 3: A governance problem***

Another interpretation defines the Seveso flooding as a governance problem, emphasizing the fragmentation of competences and the lack of multi-scalar coordination. First, this diagnostic frame highlights how competences on the river courses are distributed among public bodies at different levels and public-private companies (see Figure 5.5, in Chapter 5). Competence on water management, flood risk management, ordinary and extraordinary maintenance, sewage and drainage system management, water service provision, land use management and planning are fragmented across scales and are distributed among public administrations, sectoral public bodies and third sector operators. As previously mentioned (Chapter 5), governance arrangements have been modified both formally, e.g. through voluntary policy tools, and informally, through contractual agreements. The complexity of the governance network and the unclear allocation of competences often lead to a lack of reference points (“about the Seveso, no one knows who to talk to” EX\_2). Also, this results in a “rebound of responsibilities”. This element has been emphasised in particular by media sources, which over the years have often reported reciprocal accusations among actors involved in water and flood management.

In addition, this frame stresses the lack of coordination among municipalities, highlighting how their action depends on local interests that are defined within administrative borders. This dimension emerges in particular in supra-local strategic plans, where it is defined in terms of “localism” (PA\_R2, PA\_R3, EX\_1, EX\_3, PA\_P1) and “lack of river basin solidarity” (PA\_R1).

*«In past decades, municipalities have not teamed up. Each municipality expanded and built. There was no supra-local river management, so that interventions on the watercourses have been carried out without considering the impacts on other municipalities.» PA\_C2.*

*«At the local level, everyone thinks for himself. [...] Concerning flood risk, however, to act locally without a basin-scale vision leads to counter-productive interventions, that often transfer risk from one place to the other.» PA\_R2.*

*«To date, there is a situation of total anarchy on the part of small municipalities.» EX\_2.*

*«At the municipal level, everyone thinks for himself, and build defence works to protect his territory exclusively, without considering the whole river course.» PA\_R2/3.*

*«It is difficult for local administrations to understand the need for river-basin solidarity, also because their urban planning tools only operate within municipal administrative boundaries.» PA\_R1.*

Issues about localism and self-interest emerged about the implementation of defence infrastructures, and led to a controversy about the localisation of water retention areas (see action 20 in Figure 5.6, and Chapter 6.4.1). On the one side, experts and Regional public officials highlight the need to overcome local, administrative spatial boundaries when defining interventions having a supra-local interest. On the other side, municipalities and citizens' associations north of Milan (Bresso, Senago) opposed to the localisation of these infrastructures, claiming that they were not willing to “destroy their territories” in order to “save Milan” from flooding.

*«Water retention areas are to be made in areas where lamination is not required. These infrastructures must be built upstream of where the events then occur. Also, often, they must also be done in other municipalities. From the hydraulic point of view, what counts is the hydraulic basin, not the municipal boundaries.» EX\_1.*

*«To add insult to injury, they build the water retention areas in our city. We did not receive planning fees as we decided not to speculate and to limit soil consumption, and now they build here because ‘there is space enough’, when the Seveso does not even cross our territory.» L. Fois, Senago Major, in La Repubblica, 21st October 2014.*

Another dimension of this diagnostic frame refers to intra-organizational coordination. This issue emerged with respect to a “fracture” (PA\_R1) among Regional Units with specific competencies. Public officials with competences on environmental protection, risk reduction and emergency management have different ways of understanding the problem and therefore often follow different approaches.

#### **Diagnostic frame n. 4: A management problem**

A fourth diagnostic frame stresses the management dimension of the problem, identifying the lack of ordinary and extraordinary maintenance (particularly in the underground stretch of the Seveso Torrent) as one of the main flood causes. This understanding recurs in media reports. They show how it has always been popular among affected citizens, who often accuse local public administrations of negligence.

*«As we know, floods are due to the bad conditions of the riverbed.»  
Corriere Milanese, 22nd May 1978.*

*« “They forgot about it for too long” says the Head of Neighbourhood 9 (Niguarda - Cà Granda Bicocca) Amleto Farina, communist. “Before the big flood of the 3rd of October 1976, the riverbed was never controlled. It has never been dredged nor cleaned. Now we must do everything we can to protect ourselves from new floods, before the end of the spillway channel.”» Corriere Milanese, 19th February 1978.*

*«The flow capacity of the underground section has been reduced by the waste that accumulated over the decades. To clean is impossible and very expensive.» La Repubblica, 8th November 2000.*

*«The problem is that the owners of the streets, starting from the municipalities, do not invest in the maintenance of the drainage and sewage system.» Donzelli, Codacons, Il Corriere di Milano, 6th August 2010.*

This understanding of the problem is also defined in more systemic terms. More specifically, flood risk is led back to shortcomings in the integrated management of the river network in the Milanese urban area.

*«We do not make big plans, and we do not even do the little things [...] The major projects to reorganize the water system around Milan do not even start, stopped for more than 25 years, but neither do the extraordinary maintenance operations on the two rivers, transformed into sewers, and on the Milanese manhole system.» La Repubblica, 22nd November 2003.*



### ***Diagnostic frame n. 5: A “biblical curse”***

Finally, the flooding of the Seveso is perceived by a “biblical curse” by the residents of the Niguarda neighbourhood. They got used to deal with the immediate consequences of flood events, and complain about the lack of institutional action. Even if this understanding of the problem does not emerge from the analysis of institutional actions, it is relevant to the scope of this research, as it affected the perception of inhabitants and their willingness to accept public policy implementation. Discourses underpinning this understanding of the problem are widely reported in local media, that emphasise the recurrence of flooding, regularly using expressions such as “the usual Seveso”, “the usual incognita”, “the same script/movie repeating”, “rainfalls and their automatic consequence”. The Torrent is described as “a monster” (Figure 6.3). Recurrent events are defined as an “ordinary criticality”, a “conditioned reflex”, or as a “nightmare”, since a relatively small amount of rainwater is sufficient for the Northern neighbourhoods of Milan to be flooded. The picture that emerges from a longitudinal analysis of media sources is emotion-based, and includes anger, but also habit and resignation.

*«The inhabitants of the Niguarda district bear a biblical curse. It is not the rain, how someone could think, but the ungrateful destiny of representing the impotence of politics. Even beyond good intentions.» La Repubblica, 27th October 2013.*

*«The people of Niguarda had resigned themselves to living in a state of alert [...] “We have become mud-men - said the butcher - We all keep rubber boots under the bed”.» Corriere Milanese, 20th January 1981.*

*«No one believes in a solution anymore, says the retirees in Piazzale Istria, This will always remain our curse.» La Repubblica, 7th August 2011.*

Similar feelings emerge also in the debate about the above-mentioned conflict for the localisation of infrastructures (see also Chapter 6.4.1). Niguarda citizens complain of being victims of “others’ rains”, and to pay the price of urbanisation processes and of lacking or failing interventions, that should have been implemented upstream (e.g. see Corriere di Milano, 25<sup>th</sup> July 2003). These argumentations have also been adopted by Milanese public officials, which highlighted that:

«The fragility of Seveso system does not depend on the city administration, but it is the responsibility of a much wider area, the northern belt, which is now largely paved, and which fails to absorb rainwater.» Interview to Municipal Councilman, in *Corriere di Milano*, 23<sup>rd</sup> September 2010.



FIGURE 6.3 SEVESO, THE UNDERGROUND MONSTER. (SOURCE: CORRIERE MILANESE, 19<sup>TH</sup> FEBRUARY 1979).

## 6.2.2

### What to do? Prognostic frames and policy discourses

Prognostic frames, i.e. how institutions have framed their attempts to support risk reduction for the Seveso Torrent (see Chapter 4.4), are grounded in the diagnostic frames discussed above. The observation of actions, supported by the analysis of interviews, shows that institutional practices rely on a different and sometimes divergent understandings of “what ought to be done”. Some of them (e.g. the Seveso Plan about the realisation of water retention areas) only focus on structural interventions, which are described as the only possible solutions to deal with recurrent flooding. Others (such as the actions developed under the River Contract umbrella) adopt a more territorial-focused understanding, promoting the implementation of capillary and micro-level interventions. These actions are related to diffuse lamination, to the increase of rainwater infiltration capacity, and to nature-based riverbanks restoration. They seek to change the relation of the city with water in general, and with the Seveso Torrent in particular. Still other actions focus on the governance dimension of the problem, highlighting the need for dialogue and coordinations across scales and sectors.

When transposed into institutional practices, however, these frames blur, as also witnessed by the overlapping among ideal-typical categorisations of sub-systems of actions represented in Figure 5.6 (see Chapter 5). Rather than being based on the “what ought to be done?” question, official policy documents guiding flood risk reduction for the Seveso seems to consider “what can (still) be done”. This predominant prognostic frame is based on three pillars.

***Prognostic frame n.1 “Beyond localism” - strengthening supra-local coordination***

The first pillar focuses on the governance dimension of the problem. It stresses the need for coordination across administrative levels, highlighting the importance of dialogue and communication, as well as the need to overcome governance fragmentation along the whole risk reduction cycle. This attention is mainly witnessed by the role played by Voluntary Agreements in the rearrangement of the governance network (e.g. see the Planning Agreement for the Hydraulic Safeguard of the City of Milan and following modifications; the Seveso River Contract Agreement; and the Agreement for Risk Reduction between the Lombardy Region and the Ministry of Environment. See actions 3, 9 and 10 in Annex 2). The importance attributed to supra-local coordination is also highlighted by the development of *ad hoc* decision support systems (see action 4 in Annex 2) and by the creation of bridging bodies (see actions 7 and 21 in Annex 2), aimed specifically at promoting prompt communication in the response phase. Also, this coordination effort led to the development of tools seeking to facilitate knowledge transfer and promote the acquisition of technical and procedural knowledge by local decision-makers (e.g., see the guidelines and handbooks developed under the Seveso River Contract Agreements, action 28 in Annex 2). Interviewees also confirm the importance of supra-local coordination for risk reduction:

*«We need a direction that goes beyond municipalities. Teamwork is required. The Seveso crosses multiple territories, and its management requires coordinated action.» PA\_C2.*

*«Waters force you to talk to different people [...] There are actors who act under stringent statutes, so surely language is THE problem. The relevance of the Strategic Project for the Seveso Sub-basin is defined by its capacity to become a catalyst between subjects that traditionally do not speak to each other.» EX\_2.*

***Prognostic frame n.2 “With all possible means” - diversified flood risk management strategies***

Institutional-led efforts to support risk reduction display increasing attention towards risk mitigation and the adoption of diversified flood risk management strategies. Within this pillar, exemplified in particular by the Flood Risk Management Plan, actions coping with the structural and the territorial dimension of risk coexist and –despite relying on a different and sometimes divergent understanding of the problem– are conceived as complementary. Actors in charge of water and risk management recognise the importance of micro-interventions, e.g. promoted by the Regional Regulation on Hydraulic Invariance (see action 33 in Annex 2). Furthermore, they generally agree that there is not a single solution (PA\_R2, PA\_R4, PA\_P1, PA\_C1, PA\_C2) also due to time constraints, implementation problems, and path-dependency (e.g. related to high urbanisation patterns). In this view, water retention areas are either supported without conditions (e.g. PA\_R3, PA\_R4) or defined as a “necessary evil” (PA\_P1, PA\_C1), that is “needed but not sufficient” (EX\_2, PA\_R2) to effectively reduce risk.

*«No single measure can be decisive at this point. We must do many things simultaneously, including accepting that the water will come out.» PA\_R2.*

*«We did some analysis before writing the Regional Regulation on Hydraulic Invariance. They showed that even if we had applied the invariance principle on the 10% of the current urbanised area (which is a lot), the effect on the Seveso flooding would have been almost negligible, because of the high percentage of urbanized areas.» PA\_R3.*

*«In order to reduce the frequency and extent of the Seveso flooding, it is necessary to intervene in two aspects: the increase in hydraulic capacity and the reduction of water flows. In this perspective, current interventions seek to increase in the maximum capacity of the CSNO, which diverts a part of the Seveso stream towards the Ticino, and to realise expansion areas. However useful all these interventions are, they are not sufficient to solve the problem and their effectiveness will decrease over time if no action is taken to reduce the flow rates and the water volumes from urban areas. These waters are the real cause of the hydraulic imbalance of the system. Actions needed to achieve a restoration of this balance include*

*the conversion of paved areas, the creation of green roofs, the infiltration of unpolluted rainwater and the accumulation of polluted rainwater upstream.» Gianfranco Becciu, Politecnico di Milano, in Il Corriere di Milano, 23rd July 2014.*

Finally, it is held that integrated water and risk management requires competent authorities to use all the normative, management and planning tools available, and not to wait for the development of “an *ad hoc* measure that will magically solve all the problems” (PA\_C1).

### **Prognostic frame n.3 “From now on” - combining short- and long-term actions**

In line with the previous pillar, different solutions are considered as all valid and necessary also based on the need to address flood risk at different time scales (PA\_C2, PA\_R2, PA\_R3). In this respect, flood control –to be possibly achieved only through the implementation of water retention areas (PA\_C2, PA\_R3) – is defined as the only solution capable of reducing risk in the short-term. Flood control needs to be complemented in the medium-run by strategies seeking to give space (back) to the river, and by interventions having longer-term impacts, such as the one foreseen by the Regional Regulation on Hydraulic Invariance, whose effects will possibly be visible only in 15-20 years from the implementation, that is yet to come (PA\_C2).

## **6.3 What triggers public (in-)action? Drivers to stability and change**

Following the analytical framework, (Chapter 4), this section identifies process drivers that played a role in triggering action and reflection along the development of risk reduction attempts. In light of the results of the previous steps, *drivers to inaction* hindering risk reduction are also considered. Based on the classification proposed by Solecki et al. (2017), the analysis identified root-drivers related to path-dependency, contextual drivers and proximity drivers (Chapter 4.4.5). The analysis of actions, supported by the results of content analysis of media reports and transcript interviews, allowed identifying the drivers reported in Table 6.1.

TABLE 6.1 – DRIVERS TO REFLECTION AND (IN-)ACTION.

	To action	To in-action	To reflection
<b>Contextual drivers</b>	<ul style="list-style-type: none"> <li>• Local floods events → political pressure → risk awareness</li> <li>• Economic damages</li> </ul>	<ul style="list-style-type: none"> <li>• Recurrence → habit and resignation → inertia</li> <li>• Local opposition</li> </ul>	<ul style="list-style-type: none"> <li>• Local flood events</li> <li>• Local opposition</li> </ul>
<b>Roots drivers</b>		<ul style="list-style-type: none"> <li>• Problem denial</li> <li>• “It is too late!”</li> </ul>	<ul style="list-style-type: none"> <li>• Intractability</li> </ul>
<b>Proximity drivers</b>	<ul style="list-style-type: none"> <li>• Change in normative framework (EU water and Flood Directive)</li> <li>• Change in hydraulic engineering culture</li> <li>• Other floods events (Genova 2011)</li> <li>• EXPO 2015</li> </ul>	<ul style="list-style-type: none"> <li>• Fragmentation of water and risk governance structure → rebound of responsibilities</li> </ul>	<ul style="list-style-type: none"> <li>• Change in normative framework (EU water and Flood Directive)</li> <li>• Change in hydraulic engineering culture</li> <li>• Other floods events (Genova 2011)</li> </ul>

### 6.3.1

#### **Contextual drivers: Recurrent local flood events, political pressure and economic damage**

The first trigger for public action is recurrent flooding. While in the absence of significant events “almost nothing has been done” (EX\_1), severe floods in 2010 and 2014 marked a “turning point” (PA\_C2), increasing the political pressure for institutional action (PA\_R1). This political pressure first came from higher-level institutions. The head of the Governmental Unit for Risk Reduction, for example, declared that “the new flood does not leave any room for doubt on the urgency to intervene” (E. De Angelis, in *Il Corriere Della Sera*, 27<sup>th</sup> July 2014), and that “after years of immobility, the moment to run has come” (in *La Repubblica*, 29<sup>th</sup> July 2014). Also, pressure for prompt action was exercised by representatives of the Milan Municipality, worried about floods’ political (and electoral) repercussion. After 2014, however, the absence of significant events reduced political pressures, and the process for the approval and implementation of the water retention areas slowed down again.

*«Events pushed institutional action forward and changed how actors involved in water and risk management frame the problem.» PA\_R4.*

*«If there had been another important event during the Senago works (after 2014), I am sure there would not have been all these delays.» EX\_1.*

Economic damages and the awareness of economic losses caused by recurrent flooding also worked as a leverage on action in the water and risk management field. Damage assessment after major floods in 2010 and 2014 (approx. 200M Euro) contributed, for example, to speeding up the design and approval iter of the Seveso Plan, also leading to the allocation of national funds (Chapter 6.4.1).

*«We got a number down on paper, so that we could ask [to the State] for funds. This helped us to take a decision and to get the money to finance the interventions.» PA\_R3.*

*«Given the great importance of the event, I feel able to guarantee that every expense will be covered.» E. De Angelis, Head of the Government Unit for Risk Reduction, in La Repubblica, 15th July 2014.*

Event recurrence worked as a driver for political action, especially in the last phases of the electoral cycle, and led to the emergence of self-protection and adaptive practices at the household level. At the same time, however, it also contributed to inaction, both at the institutional and the household level. For what concerns the former, the problem has been considered to be wicked and therefore intractable, or more specifically beyond the sphere of action of a single public body (see Chapter 6.3.2). Concerning the latter, media records show the resignation of residents and retailers from Niguarda. This feeling is coupled with a general distrust in the capacity for action of local institutions (and, more specifically, of the Municipality of Milan).

*«They solve it. The flooding Seveso lives on a clock. For 25 years!» La Repubblica, 20th September 2010.*

*«Look, I was born here 45 years ago, and I have lived with the Seveso mud for 45 years –explains the baker in Piazza Spotorno. No mayor can solve the problem. Those who live in other neighbourhoods do not even imagine*

*what is going on here whenever there is a strong storm.» La Repubblica, 7th August 2011.*

*«Now, I do not even get up from bed when I hear it coming. It is like a river flowing, but water flows in the street and makes a noise. And then you look out of the window and see the mud, feel the stench, and then you think: Here we go again! You know, once every few months it happens again –says Mariagrazia Zanetti, who lived 25 of her 60 years in the neighbourhood excavated by Seves– What can be done? Nothing! We can roll up our sleeves and go to empty the cellars. Ah, but tonight I didn't even look out the window.» La Repubblica, 7th August 2011.*

For what concerns drivers to reflection, local events led to an update of the previous Hydraulic Study (see action 14 in Annex 2). Also, interviews show that after the 2010 and 2014 events, Milanese citizens, including the ones not living in affected areas (PA\_R4), became more aware about flood risk and about the need to consider the river as as “an essential part of the territory” (PA\_P1), and more willing to pro-actively intervene in the response phase (PA\_C4). Finally, it is worth mentioning that contentious dynamics about the implementation of structural interventions (see chapter 6.4.1) worked as an input to reflection, as they led to *ad hoc* studies and inquiries.

### 6.3.2

#### **Root drivers to inaction: Problem denial and the issue of intractability**

Current difficulties to intervene to reduce risk are rooted in lack of attention paid to the Seveso Torrent, which for long has not been included neither in river basin planning nor in urban planning documents. Institutional actors at different scales did not agree about the need for coordinated action, and the problem has been faced *ex post*, without a reflection on risk causes.

*«We are facing a denial of the problem, with buildings that have been erected close to the river course.» PA\_P1.*

*«The Seveso is the great absent. It has never been considered in the River Basin Planning (until the 2016 Flood Risk Management Plan). It has never been considered in urban planning. With the new Milan Urban Plan, we*



*are now considering River Basin Planning prescriptions. However, the Seveso has always been missing, considered only in the emergency phase following the floods.» PA\_C1.*

Irreversible urban development processes and infrastructural interventions, such as the underground channelling of the Seveso Torrent in Milan, also acted as a driver to inaction, *de facto* resulting in resistance to adaptive change. Institutional actors often refer to the impossibility to intervene on a situation that is already compromised, and that can not be tackled due to the lack of available space and to the difficulty to change land use and property allocation. Also, experts (e.g. see Stefano Calzolari, Order of Engineers of Milan, in *Il Corriere Della Sera*, 27<sup>th</sup> July 2014) highlight that the problem can be “contained”, but not “solved”. The issue of intractability also acted as an obstacle to reflection, as it led to the adoption of a pragmatic, technical-based and problem-solving attitude leaving limited space for discussion about alternative solutions.

*«The problem was created many decades ago, when the Seveso river was intubated and transformed into a covered channel in order to build entire new neighbourhoods. Now it has become an unresolvable endemic problem, because the only serious way to solve it would be to break down entire neighbourhoods.» Il Fatto Quotidiano, 8th July 2014.*

*«For years it was taken for granted that it was not possible to address the issue within the municipal boundaries of Milan because everything had already been built. [...] Now we have to intervene in a situation that is already highly compromised. » PA\_C1*

*«The situation is compromised. It is too late, and the possibility to achieve specific objectives is limited. To increase the hydraulic capacity of the covered part of the Seveso Torrent is impossible. It would be necessary to create a new riverbed. Also, it is not possible to intervene on the urban fabric in Milan. In some streets, the underground channel passes below the buildings. There is not even the physical space to double its section. We can only try to keep this stretch functional.» EX\_1*

*«Concerning the Seveso, in Milan, the situation is compromised. Milan can only act on the ‘outside’. The situation is realistically unmanageable.» EX\_2*

### 6.3.3 Proximity drivers: External inputs

First, the need to comply with EU legislation (Water Directive 2000/60/EC, Flood Directive 2007/60/EC) has pushed supra-local institutions involved in river and flood risk management to formally shift towards an integrated approach to water management at the river basin scale. This shift led to the development of strategic tools for integrated flood risk management, and to the mainstreaming of strategic goals into existing policy, planning and management tools (PA\_R1). Also, the introduction of new standards about risk and water quality contributed to improve the knowledge base of planning documents (PA\_R2). At the same time, however, the fragmented and overlapping allocation of competences defined by the current normative framework contributed to the previously discussed “paralysis of action” (La Repubblica, 22<sup>nd</sup> November 2003).

Second, a double shift occurred in the conception of structural interventions for risk reduction (ASS\_1, EX\_1). A first change occurred *within* the hydraulic engineering field (PA\_C2, EX\_1). Until the beginning of the 2000s, the idea was to reduce risk in one basin by transferring river flows from one watercourse to another. This understanding was at the base of the spillway channels projects, including the CSNO and the North-East Channel (that was not realized, see Chapter 5). This way of addressing the problem *de facto* transfers risk from one area to the other, also contributing to spread water pollution. The new approach prompted by EU and national legislation attempts to “control river flows *within* each waterway, and foresees the realisation of lamination areas where the flood wave can be temporarily stored, to be then returned to the river” (EX\_1, emphasis added). This approach, in turn, has been criticised as it ignores place-specific dynamics and does not support the realisation of integrated, multi-functional solutions (PA\_P1).

Finally, specific events that took place over the last decade in other cities catalysed public action, triggering resilience building attempts at the institutional and territorial level. For what concerns emergency management, the tragic events that took place in Genova in 2011 highlighted the need to establish clear procedures for real-time risk management and to set clear *ex ante* rules for real-time risk response. These procedures are meant to speed up the response and make it more efficient. Normative changes introduced after the Genova event also affected the Milanese case, explicitly contributing to trigger actions

in the subsystem of action n. 1 “Respond Quickly” (see Figure 5.6, in Chapter 5). Another event that contributed to speed up the decision-making processes was the EXPO 2015 exhibition (hosted in Milan), that had a global media echo and that took place within a high flood-risk area. Safety planning foreseen for this event has sped up regulatory changes in real-time risk management, also easing the allocation of funds to finance the Seveso Plan that, however, has not been realized yet.

*«It was important that all these procedures were approved and therefore applicable before the launch of EXPO 2015.» PA\_R4.*

*«Milan, which will represent Italy in front of the world next year, cannot afford to show the spectacle of these floods.» E. De Angelis, in La Repubblica, 17th November 2014.*

#### **6.4 Observing obstacles and enablers: A process perspective**

Elaborating on the results of the previous parts and on the observation of actions (Annex 2), this section looks at reorganisation dynamics from a process perspective (Level 4 – enablers and obstacles, see Chapter 4). In doing so, it focuses on the most relevant attempts to support risk reduction that have been developed in order to “protect the citizens” and to “respect the river” and its space (see subsystem of action n. 2 and 3, Chapter 5). For the former, the so-called Seveso Plan is considered. As for the latter, particular attention is paid to the Seveso River Contract Process, to the Regional Law on Hydraulic Invariance<sup>36</sup> and – to a lesser extent – to the update of the Milan Urban Plan. In particular, the analysis focuses on the *iter* through which relevant policy actions have been conceived, designed, approved and (eventually) implemented. In line with the explanatory categories proposed by Dieperink et al. 2016, obstacles and enablers to reflection and action consider: governance structures and actors relations; problem framing; knowledge and capacities; norms and rules; material resources.

<sup>36</sup> The principle of hydraulic invariance affirms that the transformation of an area (e.g. through restoration of new construction) must take place without increasing the flood flow of the water body or the drainage network receiving the outflows originating from the area itself.

### 6.4.1

#### Protect the citizens! Water retention areas and related conflicts

The main operative action developed to “protect citizens from waters” consists of the so-called Seveso Plan (action 19, in Annex 2). Despite its name, this is not a plan, but it rather consists of a set of projects foreseeing the realisation of water retention areas along the Seveso river course (Table 6.2). AIPO developed these projects based on hydraulic studies carried out by external consultants (i.e. ETATEC/Studio Paoletti, Metropolitane Milanesi). Presented as a mitigation-oriented set of measures (PA\_R3, EX\_1, AdBPo and Regione Lombardia 2017), the Seveso Plan seeks to “keep water away from people” (Hegger et al. 2016), thus adopting a defence-oriented approach. Due to the “urgent need for action related to flood recurrence in Niguarda” (AdBPo and Regione Lombardia 2017: 5), the Plan development followed an anomalous planning process, which did not respect all the phases usually foreseen for a plan definition, design and approval. In 2014, the Seveso Plan was included among the projects financed by the National Government and listed among the “Strategic Projects of National Relevance”. Besides providing funds to (co-) finance the implementation of the infrastructures, the intervention of the Governmental Unit legitimised the Plan to the eyes of competent local authorities. Also, it ensured a “legislative safe-conduct” (EX\_2) for the approval of the Plan. After being ratified by the signatories of the Agreement for the Hydraulic Safeguard of Milan (action 3, in Annex 2), feasibility studies “have been launched as priority functional interventions, in order to ensure a timely provision of the financial resources necessary to mitigate flood risk along the Seveso Torrent” (AdBPo and Regione Lombardia 2017: 5). In 2014, the Seveso Plan was included in the Action Programme of the Seveso River Contract and in the Po River Flood Risk Management Plan (see AdBPo 2016, AdBPo and Regione Lombardia 2017).

TABLE 6.2 THE SEVESO PLAN.

Water retention areas in the Municipalities of Carimate, Vertemate con Minoprio and Cantù. Preliminary Project (2015), Final Project (2017), Executive Project (2019). (National Funds: 12.000.000 Euro.

Water retention area in the Municipality of Lentate sul Seveso. Preliminary Project (2015), Final Project (2016), Executive Project (ongoing). (National Funds: 16.000.000 Euro.

Water retention area in the Municipalities of Paderno Dugnano, Varedo e Bovisio Masciago. Preliminary Project (2015), Final Project (2017), Executive Project (ongoing). Funds: 44.000.000 Euro.

Water retention area in the Municipality of Senago. Final Project (2015), Executive Project (2017). Works have not started yet. Funds: 30.000.000 (co-funded)

Water retention Area in the Municipality of Milan (Bresso). Final Project (2015), Executive Project (2017). Contestation still ongoing. Funds: 30.000.000 (co-funded)

Despite this accelerated planning process, at the time of writing<sup>37</sup>, works have not started yet. Several conflictual dynamics emerged in the design and approval *iter*. Some of them are rooted in tensions among different ways of understanding, conceptualising and approaching the Seveso flooding. Others are more prosaically related to micro-conflicts among actors that took place in the implementation phase<sup>38</sup>. This research focuses on the former. First, a conflict emerged about the localisation of water retention areas, particularly for the interventions planned in the Municipalities of Senago and Bresso. Besides supra-local bodies in charge for water and risk management (i.e. Governmental Unit #ItaliaSicura, Lombardy Region - General Directorates Territory and Civil Protection, AIPO, AdBPo), the realisation of these infrastructures is supported by the Municipality of Milan and by Niguarda Citizens Associations (e.g. by the Local Committee “Stop Esonda Seveso”). Municipalities that are expected to host the infrastructures, as well as citizens associations from the Northern Milanese Area (e.g. “Associazione Amici del Parco Nord”) strongly oppose the water retention areas and describe them as “useless” and “dangerous for public health” (ASS\_1). Interviews show a third category of actors that, despite ideally embracing more integrated interventions, finally support the Seveso Plan arguing that in this case “there is no alternative” (e.g. PA\_P1, PA\_C1, PA\_R2, see Chapter 6.2.2).

<sup>37</sup> October 2019

<sup>38</sup> This is the case of the water retention area in Senago. Despite the executive project had been approved and the funds fully covered, in 2018 the works were suspended due to a litigation related to the quality of excavation materials, that determined the resolution of the contract between AIPO and the ATI Bergamasca, in charge for the works implementation.

On the one hand, the Plan's proponents state that the infrastructures are necessary to avoid transferring risk from one watercourse to another, and that they were localised in the only areas that were close to the Torrent and big enough (EX\_1), i.e. (for what concerns the contested cases) in Parco Delle Groane (Senago) and in Parco Nord (Bresso). Forms of local opposition have been labelled by institutional actors as symptomatic of a NIMBY<sup>39</sup> syndrome (e.g. PA\_R2, PA\_R3, PA\_R4, PA\_C2) or, in slightly more favourable terms, as the sign of a lack of "river basin solidarity" (PA\_R1). On the other hand, local institutional actors from Senago and Bresso, together with citizens associations, have exercised their opposition through legal appeals to the Council of Ministries<sup>40</sup> and to the Court of Auditors. Also, they presented formal observations to the Plan and to the single projects' Environmental Impact Assessments in order to slow down approval procedure. These actors reverse the NIMBYsm accusation and blame flood risk management authorities for having a "Milano-centric approach" (in Italian: "concezione madonnino-centrica", ASS\_1), that asks them to "sacrifice" portions of their territory - that paradoxically had been "strenuously defended" by "wild soil consumption" in the previous decades - in order to avoid floods in Milan.

Notably, this argument resonates with another one, advanced by local associations and inhabitants of Niguarda to achieve the opposite goal. Despite being in favour of the water retention areas, they have accused the Municipality of Milan of flooding their neighbourhood "on purpose" to avoid Central areas in Milan to be damaged (ASS\_1, EX\_3). To this respect, a judicial inquiry was launched in 2018 by the Milan Prosecutor's Office about the June 2014 flood. The accusation of "failure to act" was addressed to representatives of the Municipality of Milan and of the Lombardy Region, that were accused of not having ensured the implementation of flood prevention measures (including the water retention areas) and not carrying out extraordinary maintenance for the underground Seveso stretch.

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39 NIMBY - Not In My Back Yard.

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40 In 2017, the Municipality of Bresso lodged an appeal to the Council of Ministers against the lamination infrastructure in Parco Nord, on grounds of "public health" reasons. The appeal was rejected in September 2018, with the motivation that "public health" is not among the competences of Bresso Municipality.

Going back to the local opponents from Senago and Bresso, they also complain about the lack of legitimacy and transparency of the Seveso Plan policy *iter*, which has been based on a top-down decision-making process, accelerated by the #Italiasicura intervention. Furthermore, they denounce the lack of debate about the design of defence infrastructures, arguing that “institutions were not able to open a space for dialogue” (ASS\_1, see also Calaminici 2019 a,b). In addition, members of the local associations highlighted that during meetings with political representatives “no one was ready to take the political responsibility for the choice, stating that «it is too late», that «projects have been approved and financed already», and that «it is not possible to go back».” (Calaminici 2019 a, b).

Conflictual dynamics about the Seveso Plan, however, cannot only be attributed to opposing local interests. Different positions in the debate seem to be grounded in different ways of imagining and perceiving the infrastructure itself. On the one hand, experts involved in the design of the lamination areas describe them as “green areas with gentle slopes”, that will be sealed to avoid contamination of underground waters, but that will be covered by 50 cm of soil covered by grass (EX\_1). Other public officials label this definition as a “green maquillage” operation (PA\_R1) that will not contribute to integrating the infrastructures (aesthetically nor functionally) with the surrounding environment. On the other extreme, local associations opposing these infrastructures describe them as “open sewers” (ASS\_1).

This last point reveals another contentious object, related to the validity of data and information about water quality. Community associations describe the waters of the Seveso Torrent as dirty, polluted, full of garbage, and stinky (ASS\_1, Calaminici 2019 a, b). According to public offices involved in environmental monitoring, “this description is unrealistic [...], and it does not correspond to the results of biological and chemical analyses” (PA\_P1). They argue that “the issue of the Seveso waters pollution is enormously magnified” (PA\_R3) and that citizens did not perceive water quality improvement, but are still living with an imaginary that goes back to decades ago, when some municipalities did not have sewage networks (PA\_R2). This attitude underlines that opponents to the projects do not trust public bodies in charge of water and flood risk management, nor do they trust their data: “we can bring any information and show any document that proves they are wrong, but you can’t get it back again. The situation got out of hand” (PA\_R3). Interviews with Regional-level

public officials show that the causes of this “distorted perception” about water pollution among citizens are attributed to “ideological stubbornness” (PA\_R3), but also to the incapacity of actors having technical information about water pollution to “translate it” and to “make it accessible for a general public” (PA\_R4).

*«If information spreads and becomes accessible, citizens understand it, and perhaps it turns out that not all of Seveso is toxic. [...] The communication needs to be carried out by local intermediary bodies, that have the skills to understand and interpret technical data, that know the territory and that can transfer information through campaigns that directly involve the population.» (PA\_R4)*

*«At the population level, there is still an issue of knowledge. It is difficult for us to convey what we are doing, what we would like to do, and what are the consequences of doing and not doing.» PA\_C2.*

Also, flood forecasts and hydraulic models used to highlight the usefulness of the Seveso Plan have been contested. On the one hand, members of groups opposing to the infrastructure claimed: “with the implementation of the water retention infrastructures, only 4 out of the 11 floods that affected Milan between 2010 and 2014 would have been avoided” (Giuseppe Viscomi, “Gruppo Vasche di Laminazione Senago”, in *Il Fatto Quotidiano*, 27<sup>th</sup> October 2014). On the other hand, experts and public officials questioned the hydraulic approach upon which the Seveso Plan is grounded, arguing that this is rooted in an “old-fashioned” understanding of hydraulic risk, which: (i) does not consider the river as part of a complex territory that is increasingly subjected to Climate Change effects (PA\_C1); (ii) does not address the need for integrated and multifunctional interventions (PA\_P1, PA\_R4); and (iii) ignores the existence of alternative approaches based on capillary interventions, e.g. on soil de-sealing and diffused lamination (PA\_R1).

#### **6.4.2**

#### **Respect the River! Capillary interventions and governance innovation attempts**

In parallel to the development of the Seveso Plan, many actions have been carried out over the last decade to reduce risk by promoting diffused and



capillary interventions. They are mostly rooted in a territorial and governance understanding of the problem (see Chapter 6.2). Those include actions to be implemented in the northern bell of the Milanese Metropolitan Area, in order to give space back to the river, e.g. enabling diffused water lamination; promoting nature-based riverbanks restoration and soil de-waterproofing, as well as enhancing flood risk prevention. The Seveso River Contract process (action 9, in Annex 2)<sup>41</sup> proposes itself as a strategic “umbrella” providing technical and financial support to local public officials and associations interested in the development of integrated, river-centred measures. Also, it seeks to promote governance innovation and knowledge sharing by enhancing dialogue among actors that, historically, have not had a shared space for communication. Another step towards this direction is represented by the Regional Laws on soil consumption and Hydraulic Invariance (actions 32 and 33, in Annex 2). In line with this approach, also the update of the 2019 Milan Urban Plan seeks to support an integrated approach that does not only “impose” new urban planning constraints, but that introduces the topic as “a cross-cutting theme to be addressed by several projects and to be supported through the application of different planning tools” (PA\_C1). While these actions reveal growing attention towards risk mitigation, prevention and preparedness, the implementation of measures seeking to promote alternative approaches to water flood risk management is still limited. For example, stakeholder engagement in the Seveso River Contract process is weak (PA\_R1), and its efficacy is questioned. Also, the Regional Hydraulic Invariance Regulation has been barely applied<sup>42</sup>.

A first set of obstacles is rooted in place-based political, organisational and procedural dynamics affecting the willingness and the capacity of local stakeholders (and particularly decision-makers) to engage in small-scale projects and initiatives. For local decision-makers, constraints to integrated action are brought back to the lack of physical space, of financial and human resources, and to the limited support provided by higher-level institutions with direct competences in water and risk management. A first obstacle to the design

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41 Unlike other forms of River Contracts around Europe, the Seveso River Contract is not the result of a bottom-up process, but is rather an institution-led voluntary agreement launched by the Lombardy Region to promote an integrated and cross-scalar approach to water and flood risk management.

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42 Currently, i.e. in October 2019, it is only applied to new constructions.

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and implementation of measures seeking to “give space back” to the Seveso Torrent lays in the lack of available space in the municipalities north of Milan (see Chapter 6.3.2). It is highlighted that these interventions would mainly be possible in brownfield sites or fallow-lands, whose acquisition would require expensive and unpopular procedures (e.g. expropriations) or time-demanding negotiation processes with private owners. Also, former industrial areas must be reclaimed (PA\_C2), and fund availability is limited (if any). Lack of funds is attributed to the general scarcity of municipal financial resources, but also to the limited financial support provided by supra-local bodies (and specifically the Lombardy Region) and third-sector operators (ASS\_1). Connected with the previous point is also the limited availability of human resources. Particularly critical in small municipalities with low budgets, this issue is also highlighted by public officials working in the Milan Municipality: “the management of the whole water network within the Milanese Municipality is entirely on our shoulders. We are four people, one of whom is working part-time” (PA\_C2). The same obstacles are interpreted in a specular yet diverging way by Regional actors with competences in water and flood risk management. They argue that inaction is mainly due to the “unwillingness of local public bodies to pro-actively engage and support actions that do not produce a direct return in terms of images or fundings” (PA\_R3). Also, they refer to the incapacity of local actors to work autonomously and to the limited skills and competences of public officials and technicians. For what concerns “unwillingness to act”, forms of resistance by local actors are traced back to the relationship between urban planning and private interest, and to the dependence of local administrations from incomes coming from public-private constructions and negotiation processes:

*«Many municipalities see prevention activities as a constraint, an impediment to implementing their urban transformations. [...] When talking with municipal technicians and administrators, we see that they perceive the identification of floodable areas and as impediment to urban development, and not as something that could help them to reduce flood risk in their territory. They are only concerned about not being able to carry out their development plans. This perception has not changed after many years. We talked to all the interested municipalities, and there are few enlightened administrators.» PA\_R2.*

Similar resistance is also reported concerning the involvement of non-institutional stakeholder:

*«When it comes to talking about ‘philosophy’ in conferences, all the private and third-sector operators are full of good intentions. When we start writing the rules, then the situation changes.» PA\_C1.*

Also, local unwillingness to pro-actively engage in prevention and mitigation is associated to representative mechanisms, as local municipalities respond to their own voters and are asked to represent specific local interests, which rarely coincide with risk reduction and water quality improvement objectives. Accordingly, local representatives often prefer to tackle the local impacts generated by issues that would, instead, require collaboration among public bodies at different scales. This lack of interest is particularly strong for municipalities that never experienced floods, and therefore do not perceive hydraulic risk as *their own* problem. Also, local willingness to engage into actions that follow a “river-basin” perspective (see the EU Water Framework Directive and the Flood Directive) suffers from the rigidity of planning and sectoral tools, whose sphere of competence and application is defined by municipal administrative boundaries (PA\_P1).

*«Everyone thinks of eliminating his problem by transferring it to someone else.» PA\_R2.*

*«The other classic sentence we hear, or we read in the observations from municipalities is: “I was born here, and I’ve never seen a flood.” The memory is very short, and the references to direct experience recur again and again.» PA\_R3.*

Also, the lack of engagement of local municipalities is interpreted as a result of their limited capacity to act. The availability of resources mentioned above constrains this capacity, that results in a “low autonomy of local public bodies” (PA\_R1), that financially depend on private or supra-local funding. Also, the capacity for action is related to the limited competences and skills of public officials and technicians. Due to the scarcity of human resources mentioned above, municipalities often externalise knowledge production (e.g. for the update of planning knowledge base or the development of projects and measures). Not being part of a team, consultants do not discuss nor attempt to exchange data and information (PA\_R2). The externalisation of competences, therefore, hinders cross-sectoral knowledge exchange and integration. Also, it does not favour forms of capacity-building of local public officers, e.g.

concerning their technical skills, so that sometimes are “not even ready to acquire information” produced at higher levels (PA\_R1):

*«We gave them a GIS map showing the cumulative distribution of critical issues related to water quality and flood risk, and we asked them if this information was useful to improve the knowledge base of their local planning and policy tools. They answered that they only work in PDF format.» PA\_R1.*

Barriers to cross-sectoral knowledge integration also persist in more complex organisational structures, such as big municipalities (i.e. Milan) or the Lombardy Region itself. In these cases, internal operative and working units are organised on the base of sectoral competences, so that – despite coordination attempts and the goodwill of single public officers – knowledge integration is limited (PA\_C1). Notably, interviews often highlight how everything is delegated to the “sensitivity” and to the technical “individual championship” of a single officer or technicians (PA\_R2), that can contribute to enhancing awareness of local institutions about the need to deal with the problem (PA\_C1).

Besides contextual obstacles that limit capacity for action, the analysis highlights other barriers to integrated interventions adopting a *territorial* perspective towards risk reduction. Those concern, for example, the allocation of national funds. The Ministerial #Italiasicura Unit bounded the allocation of national fundings to the realisation of water retention areas (see Chapter 6.4.1), and therefore indirectly deterred regional and local stakeholders from searching for alternative solutions:

*«They came with the bank transfer. When someone says: “I have the money to solve the problem of the Seveso hydraulic risk in Milan, and I want to solve it in this way” everything else disappears. In this way, all the processes that had been started with difficulty on the territory are cut out.» PA\_R1.*

Also, rigid and time-consuming administrative procedures that are required to transpose strategic objectives into local policy and planning measures or to initiate new projects are maintained to discourage proactive action and to hinder policy implementation (PA\_R1, PA\_C2). Furthermore, time-demanding organizational routines are accused of contributing to the permanence of a reactive,

emergency-focussed approach, where funds and normative enablers to action intervene *ex post* and are justified by the “urgent need for intervention”.

*«If the system is too rigid, things will remain as they are. Even if we write 20 norms, no one will ever implement them.» PA\_C1.*

Finally, interviews highlight constraints related to the tools employed to support risk reduction, focussing in particular on the Seveso River Contract and related strategies. A central issue is represented by their lack of prescriptive value, which is due to the voluntary nature of the agreement. Even if interviewed people from the operative unit responsible for the River Contract process states that “coercive approaches do not work, as it is always possible to bypass a prescription” (PA\_R1), the lack of prescriptive value has been generally identified as a relevant constraint to the effectiveness of the tool, and as the main limit to the implementation of measures proposed by the River Contract Action Plan and by the Strategic Programme for the Seveso Sub-basin (PA\_R2, PA\_C2, PA\_P1, PA\_C1, PA\_R4, EX\_2, EX\_3).

*«The Strategic Project for the Seveso Sub-Basin is not binding. It is a collection of good intentions that are raised only by people having goodwill (which is a minority). [...] It is a rigid tool since it is orchestrated by the Lombardy Region. At the same time, it produces feeble effects, as it is not capable of seriously interacting with the territory.» EX\_2.*

*« The River Contract tool is interesting, as it brings together all the administrations crossed by the Seveso. Nevertheless, it has an original defect, related to its non-binding nature: it does not incentivise nor oblige municipalities to take action, but it delegates everything to a sort of voluntarism which is not effective.» PA\_P1.*

From the point of view of local actors, despite its participatory nature, the River Contract is perceived as a “Regional tool”, that often supports “the ratification of pre-defined strategies and projects from local institutions or from the Region itself” (EX\_2), attempting to align them with pre-existing strategic and political objectives. As happened for the Learning and Action Alliance in Leeds, the River Contract has been perceived by some local institutional and civil society actors as “a vehicle for imparting information to others rather than as a means for co-learning and the evolution of shared innovative responses to flood risk” (see

Dudley 2013: 17, in Chapter 3). Accordingly, rather than as a tool supporting dialogue and cooperation, it is often viewed as possible access to funding channels. Also, the formal support to the Seveso Plan, which was included in the Action Programme in 2014, determined a loss of credibility in the eyes of stakeholders opposing to the implementation of water retention areas, that organised a parallel, informal discussion table.

## 6.5 Concluding remarks

In line with the analytical structure proposed, this chapter observed the evolution of the main risk-reduction oriented actions. Selected planning and policy initiatives have been analysed through different (yet overlapping) lenses, that focused on the knowledge they are built upon, the policy frames they adopt, as well as the contextual and process-related factors that affected their design, approval and implementation.

In summary, the results show that something has changed in the way in which institutional actors at different levels conceive and address the recurrent flooding of the Seveso Torrent. For what concerns problem understanding, the complex territorial and historically-rooted dimension in which the issue is grounded is increasingly recognised. In line with European and National regulations, the approach formally adopted by policymakers acknowledges the need to pursue flood mitigation and to enhance preparedness, thus overcoming – at least in its declared intentions – “old-school” defence-dominated approaches. Furthermore, independently from the different and sometimes conflicting ways of conceiving the problem and its constitutive elements, public officials show a higher degree of attention to the issue. These changes are made clear e.g. by the update of planning and policy knowledge bases, by the inclusion of the Seveso Torrent into river basin and urban planning tools, by the launch of *ad hoc* voluntary agreements and strategic programmes seeking to support cross-scalar cooperation in the Seveso sub-basin, by the approval and financing of a Seveso Plan and by normative changes attempting to mainstream risk reduction objectives in different policy domains, including land use and urban planning, water management, and real-time risk management.

Nevertheless, the analysis allowed identifying political, organisational and normative obstacles. Those constraints shrink the space for shared reflection and coordinated action, make the translation of strategic and sectoral objectives

into structural and non-structural measures problematic and ultimately lead to a reflective and operative deadlock. Overall, the discussion highlights two main groups of obstacles to reflection and action. The first one is related to path-dependency. It refers to the “impossibility” to act following an integrated, river-centred approach (or to act at all) due to “historical mistakes” in decision-making and to the irreversible outcomes they generated, e.g. in terms of wild urbanisation or to the anthropisation of the riverbed. Path-dependency is also evoked for the governance network configuration and to the rigidity of structural and procedural mechanisms, which feed contentious dynamics and leave little space to governance innovation. A second set of obstacles refers to spatial, discursive and governance fragmentation. It characterises ways of understanding, interpreting and approaching the problem, as well as types and modes of knowledge acquisition and utilisation. Also, fragmentation of competences and roles within the governance network contributes to institutional inaction, and constrains the space for action and learning, resulting in attempts to support risk reduction that do not seem to move towards the same direction, and that are not translated into action on the ground. The results presented in this chapter will be further discussed in Chapter 7, where context-related and process-dependent variables affecting the capacity for reflection and action will be further interpreted with the support of the learning loop theoretical framework.

# 7

## Discussion and concluding remarks



## ABSTRACT

*This last discussion Chapter further reflects upon the nexus between resilience building, learning and policy change. To do so, it first explicitly connects findings from the Milanese case study with the learning dimension, with the support of the learning-loop model. It then goes back to the initial research questions and hypothesis, and proposes some methodological reflections about the investigation of complex post-event reorganisation processes. Finally, the chapter identifies some limitations of the current study and indicates directions for future research.*

### 7.1 Learning and resilience building processes in the Seveso case (Milan)

The “eternal flooding” of the Seveso Torrent has affected the Northern neighbourhoods of Milan for decades, with over 100 events recorded after 1976. While flooding recurrence and intensity have increased over the last years, several actions have been recently developed to pursue risk reduction in the whole Lambro-Olona River Basin and in the Seveso sub-basin (Chapter 5, Annex 2). As previously discussed, institutional attempts to support flood risk reduction are heterogeneous in terms of scale, underlying assumptions and intended scopes. They include: changes and updates in municipal and regional regulations; modification of river-basin planning documents; *ad hoc* plans and programmes; voluntary agreements; participatory processes seeking to support risk governance innovation; small-scale interventions aiming to “give space back” to the Torrent or to reduce water inflows. These actions witness a formal shift in flood risk management that – in line with EU and national prescriptions – increasingly emphasises the need for mitigation and preparedness, thus overcoming (at least in the declared intention) defence-dominated and emergency focused approaches.

Nevertheless, the analysis carried out shows that the space for shared reflection and coordinated action opened up along the development of these actions is limited. Also, it highlights the existence of a gap in the translation of a political rethorics (e.g. related to inclusive policy-making and integrated water and flood risk management) into changes at the operative level. Furthermore, the analysis shows that despite the claims of participation, inclusiveness, multi-scalarity and trans-disciplinarity advanced by the majority of decision-makers, the

substance of the actions undertaken and the policy-making approaches adopted do not reflect the heterogeneity of frames, knowledge types and perspectives of the actors involved. In sum, the analysis shows that, despite the successful implementation of some of the actions analysed, the reorganisation process *as a whole* did succeed not in developing reflective actions, grounded in social or organisational learning processes.

In the previous chapter, the main obstacles to the development of reflective action have been traced back to “historical mistakes” in decision-making and to the irreversible outcomes they generated, as well as to patterns of spatial, discursive and governance fragmentation. In order to explicitly connect these findings with the learning dimension explored in this thesis, results from the Milanese case study are further discussed with the support of the loop-learning model (Argyris and Schön 1978 and following modifications, see Chapter 2, Figure 2.4). As illustrated in the theoretical background of the thesis, loop-learning theory connects reflection to changes into action strategies, governing variables and – in following theorisations – systems structures and processes. In particular, these changes are conceptualised as learning loops based on different degrees of critical reflection. Those involve: improving through trial and error (single-loop), reframing by questioning the governing variables (double-loop) and transforming through systemic change (triple-loop).

Figure 7.1 shows how previously identified dynamics affect different degrees of change and critical reflection. Besides barriers to reflection and action (in red), it represents factors and dynamics that potentially enabled reflective action at different levels (in green). Also, the scheme shows – in blue – contextual and proximity factors that contributed to the development of action in the absence of (reflective) learning (see Mezirow 1990, in Chapter 4).

Starting from the latter, actions in terms of policy formulation was mainly triggered by proximity drivers, without implying a reflective process by the actors involved in policy-making. Those factors are related to normative, relational and material constraints. They include pre-established collaboration among supra-local authorities (e.g. AdBPo, Lombardy Region, national Government), the urgent need for action brought to light by recurrent flood events and by flood damages, the availability of national funds, and the need to comply with changes in national legislation on water and risk management. As highlighted in Chapter 6, some endogenous and context-specific *drivers to inaction* couple

those triggers, including: problem denial, local opposition against specific risk mitigation measures and the fragmentation of competence within existing water and risk management governance networks.

*(a) Single – loop learning: Improving actions?*

For what concerns single-loop learning, incremental improvement was supported by studies and monitoring activities and by additional inquiries carried out over the last years (see the back-loop). Those contributed to a general improvement of the (technical) knowledge base of policy and planning documents. At the same time, the formulation of context-aware actions for risk-reduction was hindered by limited (skilled) human resources; by a lack of synthesis that makes the knowledge base of the plans and policy knowledge not “usable” and therefore often not utilised (PA\_C1); and by the fact that data and information have been questioned and contested. To this regard, an important role was also played by a general lack of trust (i) in the willingness and the capacity of institutional action to face the problem and (ii) in the effectiveness of processes launched to promote knowledge exchange and cross-scalar coordination (see the Seveso River Contract example case, in Chapter 6.4.2).

Also, the analysis makes clear that the implementation of different types of risk-reduction oriented measures is particularly problematic (see the front-loop). This *implementation stalemate* affects both the transposition of strategic objectives into existing local policy and planning tools and the realisation of planned flood risk reduction measures. This is the case of the Seveso Plan that, despite the allocation of national funds and the definition of public co-financing schemes, was obstructed by the emergence of contentious dynamics (Chapter 6.4.1). Policy implementation was also hampered by the multi-scalar dimension of the problem and by the unclear allocation of competences, which led to a continuous rebound of responsibilities across actors having different positions in the governance network. This fragmentation, together with the limited availability of funds for non-structural interventions, *de facto* also hindered the emergence of measures pursuing a different approach, based on diffused and capillary risk mitigation interventions (Chapter 6.4.2).

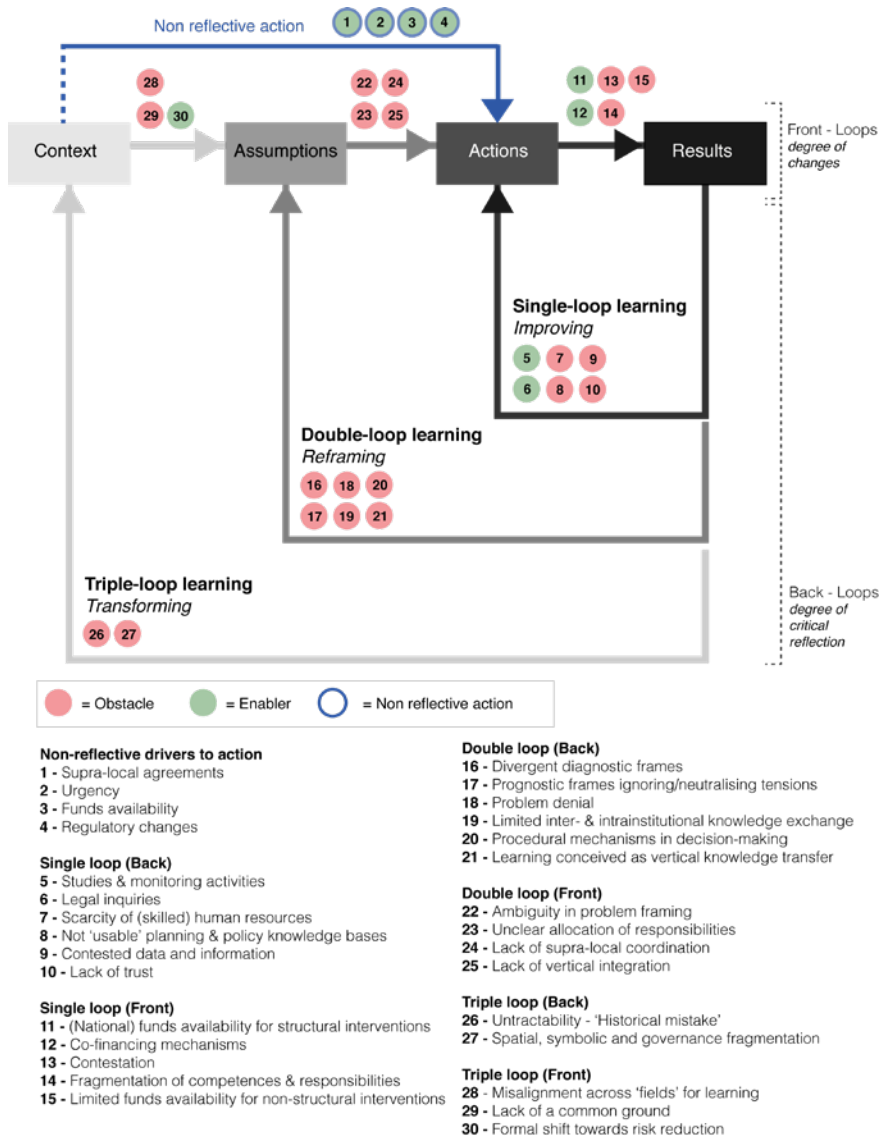


FIGURE 7.1 LEARNING LOOPS AND OBSTACLES TO REFLECTION AND ACTION IN THE CASE OF THE SEVESO.

(b) *Double – loop learning: Reflecting on assumptions?*

Also, reflection on assumptions is very limited, as highlighted by the results of the analysis of knowledge and framing dynamics. Actions are mainly based on the plain transfer of information, i.e. in the acquisition of knowledge under the form of products, procedures, regulations or problem solutions. For what concerns *reframing*, a first relevant point of discussion concerns ambiguity (Renn and Klinke 2013: 2038ff., Brugnach and Ingram 2012, Brugnach 2008) and the way it was tackled along the reorganisation process observed. On the one hand, the institutional actions analysed are based on different – yet partially overlapping – diagnostic frames (see Chapter 6.2.1). Those frames reflect discrepancies in how actors make sense of the problem and interpret a specific situation (see Weick 1995). Interestingly enough, they are not clearly separated in different groups (e.g. experts, decision-makers, technical staff, associations), but often co-exist within the same groups or institutions. As the thematic content analysis of interviews revealed, often the same actor uses arguments from more than one frame, sometimes in a contradictory way. On the other hand, the analysis of prognostic frames (see Chapter 6.2.2) allows reflecting on how institutional actors involved in urban planning, water and risk management do (or do not) handle this ambiguity. In sum, it shows that policy solutions tend to ignore or neutralise tensions related to different ways of understanding the problem, different technical approaches, and different perspectives towards flood risk management. Referring to different action strategies for handling ambiguity (see Bouwden 2006, in Brugnach et al. 2011: 79ff.), institutional actors mainly adopt a “rational problem-solving approach”, invoking a certain technical-scientific frame (e.g. based on a structural understanding of the problem) as the correct one. As this technical-scientific frame has been contested, the same institutions adopt an “oppositional” action model, using technical knowledge “symbolically” (Dunlop and Radaelli 2013) in order to legitimise pre-defined policy objectives and measures, arguing that “there is not an alternative”. Furthermore, the lack of a shared reflection on values, beliefs and problem frames also depends on limited forms of knowledge exchange within and among institutions at different scales, as well as between institutions and local communities. This limited space for reflection, in turn, is affected by the configuration of the governance network, which is extremely fragmented; the procedural mechanism underlying the design of decision-making processes; and by the attitude towards learning displayed by most public officers. Concerning this last point, it is worth mentioning how all the institutional actors interviewed

insisted about the need to “educate” citizens, implicitly referring to the urgency to enhance a vertical knowledge transfer.

Obstacles related to ambiguity in problem framing, to a great deal of political wrangling over who exactly is responsible for the current situation, and to limits in both supra-local coordination and vertical integration also hamper the definition of reflective policy formulations. Furthermore, despite a general agreement about the need for a cultural shift in understanding the city-river relation, most of the institutional actors still do not perceive the recurrent flooding as *their* problem or *their* responsibility.

(c) *Triple-loop learning: Systemic change?*

Institutional attempts to support risk reduction did not result in a modification of system structures and processes. Looking at the back-loop of triple-loop learning, the inductive investigation of the Seveso case allowed the identification of some relevant political, organisational and normative constraints that led to the current reflective and operative deadlock. These constraints are mostly rooted into the impossibility to amend “historical mistakes” (PA\_C1, PA\_C2) made in urban and river management, as well as into patterns of spatial, discursive and governance fragmentation. As discussed in the previous paragraph, the analysis carried out shows significant divergences in how experts, policymakers and third parties involved in decision-making understand, frame and finally tackle the problem of recurrent flooding. Also, it highlights how decisions about flood risk mitigation progressively became a contested issue, where the objects of contestation include the risk root causes, the knowledge base, the allocation of funds and responsibilities, as well as the legitimacy and effectiveness of specific actions.

Notably, how these obstacles are understood and described reflects actors’ perspectives, which in turn are determined by their role and position within the governance network. To this regard, it is worth considering that conflicts over the meaning of policy situations are rooted “not just in different views of the issue at stake, [... but] might also be located in policy-relevant actors’ senses of their own and other actors’ identities and the relation between and among them” (van Hulst and Yanow 2016: 101). In the case of the Seveso, the analysis highlights a misalignment across *fields for learning*, i.e. across those spaces where learning can develop through shared reflection, can be embedded into

institutional action at different levels and into practices carried out to support risk reduction. This misalignment results from a combination of factors, already highlighted in the discussion above. They include:

- The role and power of different actors, as well as the positions they have in the governance network;
- Their capacity to act within structural, procedural and administrative constraints;
- Their capacity to learn (see Bodin et al. 2006), which in turn is shaped by beliefs, as well as by previous knowledge and experiences;
- Their exposure to learning, i.e. the possibility opened along the evolution of post-flood reorganisation attempts for dialogue and knowledge exchange and integration.

In the case of the Seveso, attempts to support risk reduction and governance innovation not only move *towards different directions*, but also act *on different dimensions*, so that they do not mutually recognise nor legitimise each other. It seems that tensions among different approaches and perspectives do not allow for the identification of a boundary area, i.e. of a common ground to be recognised by all the actors involved as an open space where capacities can be enhanced, and learning can be supported and situated in practice. Due to the fragmentation of approaches, competencies, experiences, interests and knowledge, actors do not engage into “dialogic learning”, that would require “interactive process of mutual understanding and the creation of shared or connected frames” (Brugnach et al. 2011: 80). As a result, ambiguity results in a polarisation of the debate, interfering with the enhancement of flood risk mitigation and preparedness. Also, learning does not take place at a system level. This is rather crucial, as building resilience requires –by definition– systemic learning to take place and capacity building to be enhanced at all levels.

## **7.2 Learning, resilience building and policy change**

The thesis takes a social process perspective approach towards flood risk reduction. It looks at post-flood institutional reorganisation processes from a resilience-building perspective and through a learning sensitive lens, investigating whether learning dynamics emerge and how they affect institutional practices and their results in terms of risk reduction. In doing so, the research

explicitly addresses open-ended questions related to conceptual, operative and methodological issues about the relation between learning processes, learning outcomes and institutional actions undertaken to reduce flood risk and its material manifestations. The study, therefore, provides an in-depth insight into the learning-resilience nexus and into the role and meaning of learning in the making of risk-reduction strategies and actions. Also, the thesis proposes and tests an analytical framework to inductively disentangle post-flood reorganisation processes (see Chapter 4). This work, therefore, contributes to the literature on both urban resilience and risk governance, as it provides a theoretical background and some methodological insights for investigating risk-reduction attempts in their interplay with framing and knowledge-related dynamics, as well as with broader relational, discursive and regulatory factors. Also, the research provides interesting insights in the field of policy analysis. In particular, the analytical framework represents a valuable base for the investigation of reflective and operative dynamics occurring along policy-making processes developed to tackle risk in contexts characterised by high levels of complexity, uncertainty, and political pressure.

A first contribution of this work concerns the conceptualisation both of resilience building and of institutionally-driven post-event reorganisation processes. In line with the assumptions drafted in the introduction, the thesis confirms the need to acknowledge that resilience building processes are not linear, knowable, ordered paths that can be supported by the plain implementation of specific policy measures. On the contrary, this dissertation claims for the adoption of a systemic and context-aware envisioning, that conceives post-event reorganisation attempts as embedded into a set of complex, multi-dimensional and non-linear processes, whose success depends on the interplay among social, organisational and physical dynamics. In the framework of this research, resilience-building processes are therefore conceived as situational, accumulated and (co-)produced through practice, while also being constrained by structural system configurations (e.g. related to normative, organisational, relational or discursive variables governing a system's behaviours). Also, this research defines resilience building as grounded in the development of a set of interrelated capacities, that all contribute to enhancing the "inherent conditions that allow the system to absorb impacts and cope with an event, as well as post-event, adaptive processes that facilitate the ability of the social system to re-organise, change, and learn in response to a threat" (Cutter et al. 2008: 599). Finally, the research argues that resilience-building processes require learning



processes to take place and learning outcomes to be situated into action at different scales and in different policy areas. In this, this dissertation acknowledges that the effectiveness of social learning for risk reduction might change depending on the system boundaries and by the time-horizon adopted, changing “if the aim is to modify immediate habits in line with building resilience, compared to creating long-term lifestyle alteration or perhaps a value change” (Pelling et al. 2015: 29).

### 7.2.1

#### **The learning-resilience building nexus in the context of risk reduction**

This work discussed the meaning and role of learning in the context of (risk) resilience, which has been vaguely defined by (urban) resilience and risk governance literature. As discussed in Chapter 2, resilience and risk reduction literature mainly refers to social learning (Reed et al. 2010, McCarthy et al. 2011). This is often implicitly identified as an ideal-typical mechanism for resilience building, based on knowledge exchange and production ideally rooted in critical reflection; developed through interactions taking place in more or less formal actors’ networks; and performed (Weber and Khademian 2008: 339), i.e. situated into changes in behaviours, attitudes, values or norms. Hereby the author claims that social learning does not *automatically* enhance the resilience of a system, but that it might rather facilitate the improvement of risk mitigation and preparedness. This study contributes to the debate reflecting on (i) what does learning entail in the context of risk reduction and (ii) under which conditions does it develop and support (flood) risk mitigation and preparedness.

##### *(i) What does ‘learning’ entail*

Learning encompasses both a cognitive and a behavioural component (see Chapter 4). Concerning the cognitive one, for social learning to develop and to be effective in terms of risk reduction, the creation of new knowledge or the plain transfer of “objective” knowledge is not enough. Equally, the improvement of the (often technical) knowledge base of specific policy documents does not *per sé* facilitate reflection and reflective action, but it can instead lead to the permanence of procedural approaches grounded on idealised design principles (Pahl-Wostl et al. 2012) and exclude from the process actors having different views and knowledge. Accordingly, learning in the context of risk reduction

requires not only the integration of different *types of knowledge* (as highlighted by Adaptive Governance literature) but also the interaction among different *ways of knowing*, which implies acknowledging and tackling issues of interpretative and normative ambiguity (Renn and Klinke 2013: 2038ff., Brugnach and Ingram 2012). For what concerns the behavioural dimension, resilience building requires learning to be situated into actions and, ultimately, to modify *what* actors do to tackle flood risk and events, but also *how* do they develop these actions and *with whom* they interact in the design and implementation of risk-reduction measures and practices.

*(ii) Under which conditions does it develop and support (flood) risk mitigation and preparedness*

The acknowledgement of these two interrelated dimensions has relevant implications for the conceptualisation of (risk) resilience-building dynamics within complex policy settings. Social learning does not require that all the actors involved share a common understanding of specific situations, nor that they agree about what the problem is about or how it could be addressed. What social learning needs is rather the recognition that “actors can differ about how to understand the system, e.g., about where to put the boundaries of the system or what and whom to put as the focus of attention, or they can differ in the way in which the information about the system is interpreted, e.g., about what the most urgent problems are” (van der Hoek et al. 2014: 375). Accordingly, building resilience requires tackling the political dimension of flood risk reduction. Considering the discussion presented in Chapter 7.1, the thesis argues that it is crucial to define which is the system whose resilience is to be enhanced, and to reflect on the implications that different strategies could have for different actors involved in the process. As the Seveso example made clear, attempts to neutralise tensions and divergencies do not allow for a shared, in-context understanding of risk-related dynamics, and *de facto* hinder the development of both inherent and adaptive resilience. In other words, social learning for resilience building requires the existence of a communicative space, a common ground where actors with different interests, perspectives and knowledge can reflect and discuss about the roots of risk and the direction towards which flood risk management strategies can move. The existence of this space, in turn, depends on structural constraints related to path dependency, as well as by immanent relational dynamics that emerge along the development of actions seeking to support risk reduction. On a more operative level, the research claims

that risk reduction cannot be fostered only by the design and implementation of dedicated risk management plans. In line with an integrated approach to risk reduction, the thesis rather argues that risk reduction objectives need to be mainstreamed in different policy domains, including e.g. urban and spatial planning, integrated water management, emergency management.

### 7.2.2

#### **Back to the analytical framework**

A significant research challenge consists in “capturing” learning processes, and in connecting cognitive and behavioural dynamics with the material dimension associated to social and physical vulnerability patterns, as well as to the implementation of specific policy interventions. The analytical framework illustrated in this work contributes to this debate. In order to reveal learning dynamics, it proposes to observe reorganisation processes through four interconnected levels, i.e. *context, actions, framing and knowledge dynamics* and endogenous and exogenous *process dynamics* affecting a system governing variables. Furthermore, it provides some tentative methodological indications. Even if somehow redundant, the framework allowed to look at risk reduction attempts through different lenses, thus generally contributing to reveal some relevant dynamics underlying the process observed. Also, it succeeded in identifying contextual and structural dynamics affecting the capacity of institutional actors to reflect and to act in the face of risk and of its (recurrent) manifestations. Considering the empirical results discussed throughout the thesis (see Chapters 3, 5 and 6), some general considerations can also be formulated.

For what concerns the approach, the adoption of a time-sensitive perspective made it possible to observe the temporal unfolding of institutional actions and policy discourses. This approach allowed detecting dynamics related to path-dependence, and looking at how they shaped the space for reflection and action in the examples analysed (e.g. see the role of flooding recurrence, the de-industrialisation and economic decay processes in Hull, or references to the “historical mistake” in the Milanese case). A longitudinal analysis also allowed discussing the temporal articulation and unfolding of discourses about flooding and risk management, which –in turn– were crucial for the identification and interpretation of diagnostic and prognostic frames (see Chapter 6). In line with the conceptualisation of reorganisation processes discussed above (see Chapter 7.2), the choice to undertake an open-ended and exploratory analysis allowed

observing reorganisation processes by looking at the big picture. Even if this broad perspective involved missing details about specific actions or dynamics, it allowed focussing on the interactions among analytical levels and objects. Furthermore, this approach enabled to recognise complexity, while limiting reductionist or deterministic biases that often occur in the attempt to “identify and quantify causal links between a multitude of potential candidates and specific adverse effects” (Renn and Klinke 2013: 2038).

Besides, the analytical framework proposes to disentangle post-flood reorganisation processes inductively, i.e. through the actions undertaken in the attempt to reduce risk. Starting from the acknowledgement that a process is more than the sum of its parts, and that “many existing attempts to assess social learning fail to disentangle the effects on intervention from other mechanisms through which learning may have occurred” (Reed et al. 2010: 3), the analysis of (institutional) actions is held to be a relevant entry point for the investigation of complex reorganisation paths. Actions can, indeed, be “fruits of learning”, but also an expression of the degree to which actors are able to anticipate through learning and foresight, and to act under bounded rationality conditions. As emerged in the framework development and testing phases, however, the relation between learning and action is not bi-univocal. If learning is always blurred into action, action is not always reflective. There are therefore limitations in seeing reflection and “cognitive learning” as a pre-requisite for behavioural change, as “not all behavioural changes are brought about by learning and [...] changes in beliefs, attitudes and intentions do not necessarily lead to change in behaviour” (Muro and Jeffrey 2008: 338). Accordingly, the observation of actions needs to be embedded into a broader framework and to be complemented by an examination of the frames actions implicitly adopt, of the knowledge they (re)produce and of other process dynamics affecting their development. The identification of interlinked and mutual-dependent levels and objects of analysis represents a valuable contribution to the discussion about both the conceptual and methodological problems identified in Chapter 1.

In addition, disentangling the learning-resilience nexus requires a careful examination of place-specific spatial and organisational characteristics. As the development of pro-active resilience-oriented behaviours depends on the structural characteristics of the governance network, those deserve attention. Concerning knowledge dynamics, the need emerges to put them in context, and to explore their relationship with actions, but also with the frames that are

used by different actors in order to make sense of the problem and to envision possible (re)solutions. In particular, while the analysis of explicit knowledge is relevant to analyse single actions, it is the investigation of modes of knowledge acquisition and utilisation that allows reflecting on how different types and modes of knowledge are included in the policy-making process and are eventually situated in practice. Concerning the analysis of frames, interpretative problem frame analysis was crucial to reveal issues of ambiguity, that are critical to disentangle the different dimensions of the processes observed and to investigate reframing dynamics (see Chapter 7.1). Also, the investigation of frames is relevant, as risk means different things to different actors. How they conceptualise and perceive risk affects their motivation to act, as well as their willingness to design, implement or accept formal policies and to pro-actively engage in the reorganisation process. Furthermore, frames reflect actors' exposition to learning, which depends on their direct experiences with floods, their set of beliefs, their previous knowledge, the degree to which they will be affected by flood risk mitigation strategies and the position they have in the governance network.

Finally, hereby it is maintained that the identification and analysis of the different dimensions embedded in complex post-event reorganisation processes require recognising the dialectic relation between agency and structural constraints that affect capacity development (Giddens 1984). The analytical framework proposed encompasses these dimensions, as it looks at normative, procedural, material and discursive factors that support or hampered reflection and action in specific contexts. The taxonomy of drivers, barriers and enablers adopted by this study (which draws on previous works of Dieperink et al. 2016 and Solecki et al. 2017) was useful in guiding the observation for the cases analysed.

### **7.3 Research challenges, limitations and future research perspectives**

The investigation of complex processes (i.e. institutional/reorganisation and learning processes), taking place in complex, open systems (i.e. socio-territorial ones) to tackle what is traditionally defined as a “wicked” problem (i.e. flooding) has involved some major challenges. The main one relates to the precariousness I have perceived while working at the intersection among different disciplinary areas. Research questions are formulated and investigated

starting from the need to explore the conceptual, operative and methodological dimensions of a relevant problem, i.e. the nexus between learning and risk reduction in fragile, flood-prone contexts. The exploration of these open-ended research questions required working at the interface among different fields of study, that often associate different meaning to the same concept or adopt different (and sometimes irreconcilable) perspectives in observing the same phenomena. The need to work following a transdisciplinary perspective led to a continuous attempt to (re)define, classify and contextualise relevant concepts. Accordingly, special consideration was dedicated to the exploration of some key terms, such as resilience, risk-reduction and (social) learning. Also, a synthesis effort was required to put these concepts, perspectives, approaches and methods together. This challenge was particularly relevant in the development of the analytical framework, which was built through methodological bricolage, i.e. using tools and materials at-hand (Chapter 4). This effort is reflected in the structure of the framework, which is somehow redundant, as it seeks to look at the same objects through different lenses of observation.

While the thesis contributed to the conceptualisation of the resilience-learning nexus in relation to risk (Chapter 7.2.1), provided methodological insights for the learning sensitive observation of post-flood reorganisation processes (Chapter 7.2.2) and offered insights into the understanding of specific examples (mainly the Milanese one, in Chapter 7.1), some limitations can be highlighted.

For what concerns the general scope of the research, it only focuses on formal decision-making processes and policy outputs. The study thus mainly looks at the institutional dimension of post-flood reorganisation attempts. Limited attention is paid to actions carried out by different types of actors (e.g. third-sectors operators, civil society organisations, affected people), which are only tangentially discussed in the thesis. Also, the research only partially examines the interplay between policy change and not institutional-led actions seeking to promote resilience to flood, which would merit further attention. Further studies could examine, for example, how institutional actions for risk reduction affect or modify other types of practices (e.g. including technical procedures, third party projects, community practices and individual self-defence or adaptive measures). Also, further research would be needed to investigate the extent to which institutional actions for risk reduction succeed in supporting the preparedness of actors affected by the events, e.g. in terms of awareness, capacity building or behavioural change.

The adoption of a broader perspective would imply expanding the theoretical background of this work. Insights related to knowledge co-production (Jasanoff 2004) might support a further investigation about how knowledge-making is incorporated into governance practices. Also, given the previously highlighted centrality of governance networks, relevant theoretical insights could be provided by the adoption of a network perspective (see Granovetter 1973, Burt 2000), and by an in-depth examination of how social capital structures affect learning across governance levels (see Newig et al. 2010). With this respect, a further study could consider the role actors' power and position have in the actors' network; the degree of vertical and horizontal coordination among actors; and the existence and role of actors having a bridging function across levels, policy domains and knowledge types (see Pahl-Wostl et al. 2013). For what concerns the framework, such a perspective would require the examination of different analytical objects. Types of actions to be analysed could include – for example – individual practices, neighbourhood initiatives, educational campaigns, or forms of social mobilisation. Also, enlarging the research scope would require the definition of appropriate inquiry schemes, including specific modes of observations and methodological tools. Stakeholder Network Analysis (see Prell et al. 2008), for example, could be integrated into the framework to investigate the evolution of bridging, bonding, and linking social capital relations along the reorganisation process. On these bases, a further empirical investigation could be conducted on the Seveso example. This would require the collection and analysis of further data, to be possibly retrieved, e.g. through a systematic review of materials produced by civil society associations (media, initiatives, reports), interviews with spokespeople of involved groups and associations and with citizens affected by the floods.

A second limitation concerns research methods. The research scoped the potential relevance of different methodological tools and inquiry techniques (see Chapter 4), without exploring their potential application fully. A natural progression of this work is to test further the suitability of the methodological tools employed and to complement them with other research methods. Besides Stakeholder Network Analysis, discourse analysis (see for example the methodological frameworks proposed by Dryzek 2005 and Hajer 2006) could be used to disentangle tensions among diagnostic and prognostic frames and to explore further how the production of risk-related discourses intertwines with structural and emergent constraints to reflection and action.

Finally, a further limitation of the current study is determined by the limited generalisation capacity of the research outputs. Even if the choice to develop the observation tool through examples from a specific context (UK) and to test it on a different context (the Italian one) was meant precisely to widen the potential applicability of the framework, this would require further testing. A first option would be to apply the tool to the observation of other flood-prone cities. A comparative analysis exploring different examples would allow better understanding the role of drivers, enablers and obstacles to reflective action in the context of risk reduction, possibly leading to the formulation of some generalisation hypotheses. Besides this, the framework could be further tested by modifying some of the variables upon which the selection criteria were defined, e.g. changing the type of risk/event (i.e. not only flood events), the degree of severity of the events itself (i.e. considering major events), or the spatial and temporal scale of the impacts produced. Considering the urgent need to support the integration between disaster risk reduction and climate change adaptation, future studies could also consider processes developed to face other types of climate-related hazards (such as drought, fires and heat waves). The exploration of learning and governance dynamics in contexts that are vulnerable to climatic risk would possibly benefit from the use of conceptual and interpretative models developed in transition literature (see Geels and Schot 2007, Geels 2005) and transformative environmental governance (see e.g. Chaffin et al. 2016). Furthermore, the analysis shows that some of the obstacles to reflection and action can be traced back to conflicting interests and to contested frames and knowledge. Further research might, therefore, explore the suitability of the framework for the investigation of the learning dimension embedded in other types of environmental and urban conflicts.





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**Annex 1****Milan Case Study: Materials**

TABLE A1.1 – PROFILE OF THE INTERVIEWEES AND IDENTIFICATION CODES.

Organization	Role	Identification code
ERSAF (Ente Regionale Per i Servizi all'Agricoltura e all'Ambiente) - Team Tecnico Contratti di Fiume di Regione Lombardia.	Environmental Protection, Water management.	PA_R1
Regione Lombardia - Direzione Territorio, Unità Operativa Pianificazione Territoriale e Urbana	Urban Planning, Spatial Planning, River Basin Planning, Risk Prevention	PA_R2
Regione Lombardia - Direzione Territorio, Unità Operativa Difesa del Suolo	River Basin Planning, Water Governance, Risk Prevention	PA_R3
Regione Lombardia - Protezione Civile	Real time risk management, Monitoring, Warning, Post-event management.	PA_R4
Comune di Milano - Area Pianificazione Generale	Urban Planning	PA_C1
Comune di Milano - Area Ambiente e Energia, Unità Gestione e Tutela delle Risorse Idriche	Integrated Water Management, Risk prevention	PA_C2
Comune di Milano - Area Sicurezza Integrata e Protezione Civile	Real time risk management, Monitoring, Warning, Post-event management, Municipal Emergency Planning.	PA_C3
Ente Parco Nord	River Management, Park Management	PA_P1
ETATEC	Feasibility Studies and Design of flood defences	EX_1
Politecnico Di Milano	Consultancy (Urban Planning)	EX_2
Politecnico Di Milano	Consultancy (Urban Planning)	EX_3
Associazione Amici del Parco Nord	Opposition to defence infrastructures	ASS_1

TABLE A1.2 STRUCTURE OF THE INTERVIEW.

**1 - Organizzazione**

– Quali sono le specifiche aree di interesse e le competenze specifiche della sua area/organizzazione rispetto a gestione delle risorse idriche e riduzione del rischio alluvionale del Torrente Seveso?

**2 - Definizione e inquadramento del Problema**

– Come definirebbe la ‘questione seveso’? Quali sono a Vostro avviso gli aspetti più problematici legati alla gestione del torrente e alle esondazioni che colpiscono da anni i quartieri nord di Milano?

– Ad oggi, quali sono i punti critici su cui è necessario intervenire, e con quali tipologie di intervento?

**3 - Azioni**

– Quali sono le azioni o le attività più importanti portati avanti dalla sua Area in relazione alle esondazioni del Seveso?

– La vostra associazione si occupa/ si è occupata di promuovere attività di interesse per il torrente seveso e per la riduzione del rischio idraulico? Se sì, quali? Con quali obiettivi?

– Con quali attori avete collaborato nel portare avanti tali attività?

– Quadri conoscitivi di riferimento - Su quali dati, informazioni e conoscenze avete fatto affidamento nella definizione di tali azioni (es: esperienza diretta, dati ambientali, studi tecnici, stime economiche, etc.)? Come le avete acquisite (consulenze, processi partecipativi)?

– Al di là del contributo specifico della sua Area, secondo Lei, quali sono state le azioni più importanti intraprese per ridurre il rischio esondazioni del Seveso (in particolare nell’area nord di Milano)?

**4 - Processo**

– Secondo Lei negli ultimi venti anni c’è stato un cambiamento nel modo in cui gli attori istituzionali coinvolti a diversi livelli nella gestione del rischio idraulico si sono posti rispetto alla gestione del rischio esondazioni del Seveso?

– Se sì, in cosa consiste questo miglioramento? (Si prega di specificare in quale ambito è avvenuto, es: capacità di prendere decisioni, capacità di collaborare, capacità di attrarre fondi, capacità di acquisire informazioni da diverse fonti, etc.)

– In base alle informazioni in suo possesso, sono state portate avanti azioni volte a migliorare la capacità degli attori colpiti dalle esondazioni di far fronte agli eventi? Se sì, quali?

**4.1 - Drivers**

– Quali elementi hanno contribuito a ‘innescare’ l’azione di attori istituzionali in diversi campi legati alla riduzione del rischio? (es: esondazioni ricorrenti, pressioni dell’opinione pubblica, cambio del quadro normativo nazionale/sovrannazionale, stima dei danni, etc.)

#### 4.2 - Dinamiche

- Quali fattori influiscono positivamente sulla capacità degli attori preposti di portare avanti attività ed azioni (anche micro) legate alla riduzione del rischio? (es: nuove conoscenze, scambio con altri attori, interazione con comunità locali, più supporto da istituzioni nazionali, etc.)
- In quale misura i cambiamenti previsti da politiche e piani sono stati tradotti in azioni sul campo?
- Da oltre 50 anni, le esondazioni del Seveso colpiscono sistematicamente i quartieri nord di Milano. In base alla sua esperienza, cosa non ha funzionato fino ad ora?

#### 5 - Conclusioni

- Ha qualche altro commento?
  - Suggestimenti su altri attori da contattare?
-



TABLE A1.3 – LIST OF IDENTIFIED MEDIA SOURCES.

Year	Newspaper	Title	Author
09/11/1951	Corriere Milanese	Straripano i fiumi intorno alla città	Redazione
04/06/1966	Corriere Milanese	Nuovo Tronco del Canale che eviterà gli allagamenti	Redazione
05/11/1966	Corriere Milanese	Straripano il Seveso e la Martesana allagando strade e piazze cittadine	Redazione
06/11/1966	Corriere Milanese	Finalmente! - Per evitare gli allagamenti sarà prestoalzata la strada per Torino	Redazione
11/09/1969	Corriere Milanese	I Paesi dell'eterna alluvione	Redazione
04/02/1974	Corriere Milanese	Numerosi allagamenti in città	Redazione
04/10/1976	Corriere Milanese	Un metro d'acqua in viale Zara e a Niguarda auto bloccate, allagati negozi e scantinati	Redazione
04/10/1976	Corriere Milanese	Perché l'alluvione è arrivata in città?	Redazione
05/10/1976	Corriere Milanese	Allarme I fiumi Scoppiano	Redazione
07/10/1976	Corriere Milanese	Paura Diossina. Le acque del Seveso in piena hanno trasportato il veleno?	Dario Fertilio
30/10/1976	Corriere Milanese	A Milano in Barca	Ferruccio De Bortoli, Leo Grigliè, Ottavio Rossani
27/08/1977	Corriere Milanese	Strade dissestate, Seveso, Redefossi primi malanni che la città deve curare	Redazione
30/08/1977	Corriere Milanese	ACQUA, FANGO E PAURA SI SFIORA IL DISASTRO	Ferruccio De Bortoli
30/08/1977	Corriere Milanese	Strade come torrenti e abitazioni allagate dopo sessanta minuti di violento nubifragio	Redazione
31/08/1977	La Stampa	Il Maltempo rende tragica l'estate al nord	Redazione
08/10/1977	Corriere Milanese	Redefossi e Seveso in Piena	Redazione
19/02/1978	Corriere Milanese	Seveso, il mostro sotterraneo - Il Torrente Incubo per gli abitanti di Niguarda	Redazione
27/02/1978	Corriere Milanese	La pioggia fa nuovamente saltare i tombini del Seveso	Redazione
22/05/1978	Corriere Milanese	Il Seveso Stratipa	
14/09/1979	Corriere Milanese	Sono bastati 26 millimetri di pioggia: il Seveso ha inondato di nuovo Niguarda	Redazione
22/09/1979	Corriere Milanese	S'inaugura la stagione delle piogge La zona nord inondata da due fiumi	Redazione
02/11/1979	Corriere Milanese	Il Seveso In Casa	Raimondo Boggia
18/08/1980	Corriere Milanese	A settembre lo scolmatore: dopo 25 anni il Seveso dovrà restare nel suo letto	Redazione

18/10/1980	Corriere Milanese	Mezza città è stata allagata da 10 cm di pioggia	Redazione
20/01/1981	Corriere Milanese	Amarcord degli uomini-fango nel Seveso il fiume perverso uscito ventinove volte	Redazione
01/09/1981	Corriere Milanese	Labirinto di lavori in corso attorno alle acque sporche ma i finanziamenti si ottengono sempre con il contagocce	Maurizio Andriolo
25/09/1981	Informazione Milano	Milano annega in mezzo metro d'acqua Lo scolmatore non ha retto alla piena	Redazione
29/09/1981	Corriere Milanese	Urbanizzazione selvaggia e costruzioni sulle rive fanno straripare i fiumi	Ugo Majone
25/08/1987	La Repubblica	Un diluvio a Milano: Emergenza al Nord	Fabrizio Ravelli
26/08/1987	Corriere della Sera	E ora un diluvio di polemiche	Claudio Schirinzi
26/08/1987	Corriere della Sera	A Niguarda esplode la rabbia «Altro che scolmatore, è una vergogna!»	Luciano Visentin
04/09/1987	Corriere della Sera	Ogni acquazzone è un incubo: La pioggia dell'altra notte ha di nuovo paralizzato la città	Edoardo Stucchi
13/10/1988	Corriere Milanese	Straripa il Seveso, Milano allagata	Rodolfo Grassi
25/05/1990	Corriere Milanese	Una cascata d'acqua e la città si spegne	Redazione
11/09/1992	Corriere Milanese	Sott'acqua mezza città	Redazione
06/09/1998	La Repubblica	I nubifragi flagellano il Nord Italia	Stefano Rossi
28/08/1999	Corriere Milanese	Acqua alta, 75 strade bloccate	Claudio Schirinzi
11/07/2000	La Repubblica	Milano in Mezzo al Guado	Anna Cirillo
29/08/2000	La Repubblica	Solo Promesse Contro il Seveso	Giuseppina Piano
07/11/2000	Corriere della Sera	Caos anche a Milano: Sgomberata la comunità di Don Mazzi	Redazione
08/11/2000	La Repubblica	Troppe precipitazioni in poche giornate e lo scolmatore non c'è	Stefano Rossi
19/11/2000	La Repubblica	Acqua alta e burocrazia un'odissea per centomila	Stefano Rossi
21/11/2000	La Repubblica	Noi, ostaggi dei capricci del Seveso'	Stefano Rossi
26/05/2002	La Repubblica	Temporale Violento, Esce il Seveso	Redazione
26/11/2002	Corriere della Sera	Il Nord è sott'acqua: mai così tanta pioggia in 25 anni	Redazione
27/11/2002	La Repubblica	Tre fiumi abbandonati Ecco perché fanno paura'	Stefano Rossi
27/11/2002	La Repubblica	Milano si arrende al diluvio	Zita Dazzi
27/11/2002	Corriere Milanese	Strade come torrenti, mezza Milano bloccata	Redazione
27/11/2002	Corriere Milanese	Tra i prigionieri del Seveso «Da cinquant'anni con gli stivali	Gian Guido Vecchi
27/11/2002	Corriere Milanese	Un ingorgo di acqua e fango Viale Zara diventa una laguna	Elisabetta Soglio

27/11/2002	Corriere Milanese	Non si vola in alto con i piedi bagnati	Gaspare Barbiellini Amedei
29/11/2002	La Repubblica	Fiumi da pulire e argini da rifare'	Giuseppina Piano
03/12/2002	Il Corriere di Milano	Il Diluvio sulle Imprese	Aldo Bonomi
24/07/2003	La Repubblica	Temporalmente su tutto il Nord: Il Seveso Spaventa Milano	Redazione
25/07/2003	La Repubblica	Cocchiaro: 'Le fogne sono sporche è il Comune che deve intervenire'	Luigi Pastore
25/07/2003	Corriere di Milano	E alla prima pioggia il Seveso invade di Nuovo Milano	Elisabetta Soglio
25/07/2003	La Repubblica	Un pezzo di città va sott' acqua	Luigi Bolognini
25/07/2003	Il Corriere di Milano	Straripa il Seveso, Scontro tra Provincia e Comune	Rita Querzè
26/07/2003	La Repubblica	Con quattro laghi artificiali il Seveso non farà più disastri'	Oriana Liso
27/07/2003	La Repubblica	Seveso, un allarme di 5 mesi	Caterina Pasolini
01/08/2003	La Repubblica	Seveso: La cura anti-alluvione	Stefano Rossi
03/08/2003	La Repubblica	Un commissario Anti-Seveso	Andrea Montanari
18/11/2003	Il Corriere di Milano	Il Raddoppio dello scolmatore, "argine" del Seveso	Francesco Sanfilippo
22/11/2003	La Repubblica	Si Rischia un'altra alluvione	Luca Fazzo; Marco Mensurati
26/11/2003	La Repubblica	Passerelle contro l'acqua alta	Paolo Berizzi
26/11/2003	La Repubblica	Colpa dell'invasione del cemento se Seveso e Lambro creano guai'	Stefano Rossi
27/01/2004	La Repubblica	La folle visione della politica che fa spettacolo	Luca Beltrami Gadola
05/10/2005	Corriere della Sera	"Basta allagamenti. Pronti Fondi per Lambro e Seveso"	Leila Codecasa
18/09/2007	La Repubblica	Ecco perché Milano va Sott'acqua	Sandro De Riccardis
19/05/2008	La Repubblica	Piove, il Seveso non perdona	Oriana Liso
09/10/2009	La Repubblica	Troppo Cemento sui Fiumi: 'Expo e rischio alluvioni'	Lucia Landoni
04/05/2010	Il Corriere di Milano	Esonda il Seveso, Traffico il tilt a Niguarda	Redazione
04/05/2010	La Repubblica	Esonda il fiume Seveso viale Fulvio Testi bloccato	Redazione
23/05/2010	La Repubblica	La lunga onda nera che attraversa Milano	Gabriele Cereda; Giorgia Rametta
06/08/2010	Il Corriere di Milano	Mattina con temporali Due ore di pioggia e Milano va in crisi	Federica Cadavini
06/08/2010	Il Corriere di Milano	Straripa il Seveso, negozi allagati e traffico nel caos	Federica Cadavini
07/08/2010	La Repubblica	Seveso, nuovo scolmatore per produrre anche energia	Anna Cirillo
07/08/2010	Il Corriere di Milano	Seveso, incompiuta la "diga" che doveva fermare le piene	Andrea Senesi

13/08/2010	La Repubblica	Nel Nord esondazioni e nubifragi mai tanta pioggia a Milano dal 1900	Tiziana De Giorgio; Luca De Vito
13/08/2010	La Repubblica - Milano	“Fiumi strozzati dal cemento: ora servono vasche di sfogo”	Teresa Monesterioli
02/09/2010	La Repubblica - Milano	Torna la pioggia, si va sott’acqua caos e danni per Seveso e Lambro	Gabriele Cereda, Teresa Monesterioli
19/09/2010	La Repubblica - Milano	Nubifragio a Milano, straripa il Seveso	Redazione
20/09/2010	La Repubblica	A Niguarda, 30 anni con i piedi a mollo	Sandro De Riccardis
21/09/2010	La Repubblica	L’ infinito canale salva-alluvioni che la città aspetta da 25 anni	Tiziana De Giorgio; Massimo Pisa
21/09/2010	La Repubblica - Milano	Seveso, è l’ora dello scaricabarile: “Il governo ci ha bloccato i fondi”	Oriana Liso
22/09/2010	La Repubblica	Là sotto ci sono trecentomila tonnellate d’ acqua	Ilaria Carra
23/09/2010	La Repubblica - Milano	Seveso, danni per oltre 40 milioni: altri 10 giorni per riaprire il metrò	Oriana Liso
23/09/2010	La Repubblica	I 150 Milioni Finiti nel Nulla	Davide Carlucci
23/09/2010	La Repubblica	L’emergenza prevedibile	Maurizio Bono
23/09/2010	Il Corriere di Milano	Moratti: stato di calamità per il Seveso	Elisabetta Soglio
24/09/2010	Il Corriere di Milano	«Poteri straordinari contro le piene del Seveso»	Rossella Verga
24/09/2010	Il Corriere di Milano	Gli ex sindaci: con noi mai un disastro simile Albertini: il mio piano era pronto, ripartirei da lì → 稟	Armando Stella
26/09/2010	La Repubblica	Un canale per domare il Seveso	Oriana Liso
26/09/2010	Il Corriere di Milano	«Seveso, ritardi e difficoltà negli interventi»	Gianni Santucci
26/09/2010	Il Corriere di Milano	I guardiani del fiume «invisibile» Una notte a vigilare i tombini	Gianni Santucci
26/09/2010	Il Corriere di Milano	Hinterland Sindaci contro Milano	Ferdinando Baron
07/10/2010	La Repubblica - Milano	Seveso, niente fondi per lo scolmatore solo interventi tampone contro le piene	Luca De Vito
07/10/2010	Il Corriere di Milano	Perché il Seveso Allaga Milano	Gianni Santucci, Armando Stella
01/11/2010	Il Fatto Quotidiano	Pioggia in Lombardia: il Lambro e il Seveso esondano di nuovo	Redazione
01/11/2010	Il Corriere di Milano	Seveso, Torna l’incubo esondazione	Armando Stella
30/11/2010	Il Corriere di Milano	Esondazione del Seveso, 20 Milioni di danni	Armando Stella
03/08/2011	La Repubblica	Volontari allertati dal Comune via sms per prevenire le esondazioni del Seveso	Alessandra Corica
03/08/2011	La Repubblica - Milano	Volontari per prevenire le esondazioni del Seveso	Alessandro Corica
07/08/2011	La Repubblica	Seveso, basta un temporale zona Niguarda torna sott’ acqua	Anna Cirillo
07/08/2011	La Repubblica	Questa è la nostra maledizione	Zita Dazzi

07/08/2011	Il Corriere di Milano	Ritorna l'incubo Seveso. "Ora le opere anti-piene".	Armando Stella
22/10/2011	La Repubblica - Milano	Seveso, spuntano 68 milioni per realizzare lo scolmatore	Oriana Liso
30/05/2012	La Repubblica	Fiumi e canali soffocati dai rifiuti resta il mistero su chi deve salvarli	Redazione
12/09/2012	La Repubblica - Milano	La pioggia fa esondare il Seveso: allagamenti nell'area di Niguarda	Alessandro Bartolini, Ilaria Carra
13/09/2012	Il Corriere di Milano	Il Seveso allaga Niguarda dopo un'ora di nubifragio	Cesare Giuzzi
04/12/2012	La Repubblica	Torna la paura del Seveso (e la vasca anti-piena non c'è)	Ilaria Carra
23/10/2013	La Repubblica	Esonda il Seveso, allagamenti a Milano. Allerta maltempo al centro-nord	Redazione
27/10/2013	La Repubblica	La Ferita del Seveso che punisce Niguarda	Ivan Berni
26/06/2014	La Repubblica	Il Seveso non perdona Niguarda va sott'acqua rabbia tra gli abitanti	Laura Fugnoli
26/06/2014	Corriere della Sera	Di Simine: «La vera priorità è il riassetto idraulico»	Redazione
27/06/2014	Corriere della Sera	Nubifragio, nuovo allarme per il Seveso È la tredicesima esondazione in 4 anni	Gianni Santucci
08/07/2014	La Repubblica - Milano	Maltempo, Milano in ginocchio: esonda il Seveso, allagata anche l'Isola. Scontro Comune-Regione	Redazione
08/07/2014	Il Fatto Quotidiano	Seveso esondazione a Milano: allagati quartieri di Isola e Niguarda	Redazione
09/07/2014	La Repubblica	Pisapia chiede scusa alla città "Ma nessuno ha dato l'allarme"	Redazione
09/07/2014	La Repubblica	Fango, danni e rabbia la piena del Seveso da Niguarda all'Isola	Franco Vanni
09/07/2014	Il Corriere di Milano	Le Colpevoli Inadempienze	Giangiaco Schiavi
10/07/2010	Il Corriere di Milano	Dopo l'esondazione del Seveso fondare un servizio meteo nazionale	Ricardo Franco Levi
10/07/2010	Il Corriere di Milano	La Propaganda sull'Acqua Alta	Claudio Schirinzi
12/07/2014	La Repubblica	Danni del Seveso Pisapia vuole rimborsi lampo "Risposte rapide"	Alessia Gallione
15/07/2014	La Repubblica	Seveso, ok alle vasche "A Senago via ai lavori all'inizio del 2015"	Redazione
15/07/2014	La Repubblica	"Così non servono e rovinano il territorio avanti con i ricorsi"	Redazione
15/07/2014	Il Corriere di Milano	Seveso, poteri speciali a Maroni «Opere inserite nel piano Expo»	Paola D'amico
17/07/2014	La Repubblica	Seveso, esposto dei consumatori: "Anni di errori"	Redazione
23/07/2014	Il Corriere di Milano	Una Soluzione per il Seveso	Gianfranco Becciu
24/07/2014	Il Corriere di Milano	Seveso, esposto contro la vasca anti-piene	Pierpaolo Lio

26/07/2014	Il Fatto Quotidiano	Maltempo Milano, Seveso esonda ancora: allagamenti. Voragine in centro città	Redazione
27/07/2014	La Repubblica	Milano allagata, voragine in pieno centro	Ilaria Carra
27/07/2014	Il Corriere di Milano	L'ESONDAZIONE DELL'EFFETTO «NIMBY» (IN ATTESA DELLE AREE METROPOLITANE)	Ugo Savoia
27/07/2014	Il Corriere della Sera	Perchè Milano non regge l'impatto degli acquazzoni?	Pierpaolo Lio, Andrea Senesi
27/07/2014	La Repubblica	E a Niguarda esplode la rabbia "È sempre peggio ora fate qualcosa"	Franco Vanni
27/07/2014	La Repubblica - Milano	Seveso esondato, la Procura indaga per disastro colposo. Nel mirino c'è anche la voragine	Redazione
27/07/2014	La Repubblica	Cemento, falda e cantieri il lungo assedio sotterraneo all'acquedotto gioiello	Franco Vanni
28/07/2014	Il Fatto Quotidiano	Crisi economica, leggi europee e clientele generano progetti di scarsa qualità	Renzo Rosso
28/07/2014	La Repubblica	"Noi e il fiume cattivo per colpa del Seveso abbiamo paura ad andare in ferie"	Franco Vanni
28/07/2014	La Repubblica - Milano	Maltempo, allerta meteo in Lombardia: Milano schiera una squadra per l'emergenza Seveso	Redazione
28/07/2014	Il Corriere di Milano	Seveso e voragine, doppio filone d'indagine	Pierpaolo Lio
28/07/2014	Il Corriere di Milano	Tre vasche e 30 milioni per salvare Milano dal fango	Gianni Santucci
29/07/2014	Il Fatto Quotidiano	Esondazione Seveso a Milano, nella notte alberi caduti e sottopassi allagati	Redazione
29/07/2014	La Repubblica - Milano	Milano, il Seveso esonda ancora nella notte: via al nuovo piano di intervento del Comune	Redazione
29/07/2014	La Repubblica	Senago prepara l'ultima resistenza "Non vogliamo quell'acqua fetida"	Redazione
30/07/2014	La Repubblica	Sirene a Niguarda per avvisare i residenti del rischio allagamenti	Franco Vanni
30/07/2014	Il Corriere di Milano	Seveso, Quinta Esondazione, Nuova voragine a Lorentaggio	Pierpaolo Lio
03/08/2014	La Repubblica	Uomini e cemento così il Seveso è diventato cattivo	Massimo Pisa
04/08/2014	La Repubblica	Esondazione "controllata" per il Seveso pochi i danni	Franco Vanni
05/08/2014	La Repubblica	Seveso, piante e rifiuti lo intasano per il 10% Pulizia da 2 milioni	Redazione
08/08/2014	Il Corriere di Milano	Rami, rifiuti e fango: il «tappo» che blocca il tunnel del Seveso	Gianni Santucci
13/08/2014	La Repubblica	Mille richieste allo sportello per i danni del Seveso	Alessia Gallione
10/10/2014	La Repubblica	Il piano salva-Seveso apre i cantieri	Alessia Gallione
12/10/2014	La Repubblica	Alluvioni, paralizziate otto opere su dieci	Fabio Tonacci
21/10/2014	La Repubblica	"Occasione d'oro per riqualificare il fiume e le aree"	Rossella Rivolta

21/10/2014	La Repubblica	Partono i lavori per fermare il Seveso ma in cassa ci sono 30 milioni su 140	Ilaria Carra
21/10/2014	La Repubblica	“Noi diciamo no per non rovinare un territorio sano”	Redazione
21/10/2014	Il Corriere di Milano	Seveso, vasca anti piena a Milano «I ricorsi non fermeranno i lavori»	Andrea Senesi
23/10/2014	La Repubblica	La colata di cemento che invade e deturpa il bacino del Seveso	Ilaria Carra
27/10/2014	Il Fatto Quotidiano	Seveso, il rischio alluvione scorre sotto Milano. “Lavori? Stanziati 25% dei fondi”	Alessandro Madron
05/11/2014	La Repubblica	La Lega al Senato vota contro i piani di intervento per il Seveso	Ilaria Carra
09/11/2014	Il Fatto Quotidiano	Il Seveso esonda e fa litigare Pisapia e Regione	Redazione
12/11/2014	Il Fatto Quotidiano	Allerta meteo, 2 morti tra Lago Maggiore e Biella. Milano allagata: esonda Seveso	Redazione
13/11/2014	La Repubblica	Esondano Seveso e Lambro evacuate oltre 120 persone chiuse le scuole in Zona 9	Oriana Liso; Matteo Pucciarelli
13/11/2014	Il Corriere di Milano	Il canale anti piene? Solo nel 2016	
13/11/2014	Il Corriere di Milano	La furia del Seveso, chiuse 60 scuole	Cesare Giuzzi
15/11/2014	La Repubblica - Milano	Maltempo, il Seveso esonda ancora: è la nona volta a Milano. “Non usate l’auto e state a casa”	Redazione
16/11/2014	La Repubblica	“Noi, profughi in casa nostra” a Milano esplose la rabbia per le strade come torrenti	Oriana Liso; Massimo Pisa
17/11/2014	La Repubblica	“I lavori sul fiume fino al 2016, per Expo il rischio c’è”	Andrea Montanari
17/11/2014	La Repubblica	Maltempo, nuova allerta. Delrio: “Deroga a patto stabilità per comuni colpiti. In Cdm stato d’emergenza”	Redazione
17/11/2014	La Repubblica - Milano	Maltempo, Delrio conferma: “Per l’emergenza Seveso arriveranno 80 milioni”	Redazione
17/11/2014	Il Corriere della Sera	Scolmatori per le piene e barriere Contro il dissesto 7,6 miliardi	Redazione
18/11/2014	Il Fatto Quotidiano	Milano: vie d’acqua o vie di fango? Il tempo delle scelte, la fine degli alibi	Enrico Fedrighini
18/11/2014	La Repubblica - Milano	Milano, per l’alluvione il Comune promette sconti fiscali per chi ha subito danni	Oriana Liso
18/11/2014	Il Corriere di Milano	Vasche, tunnel e canali Cinquant’anni di progetti nati già vecchi (o inutili)	Redazione
18/11/2014	Il Corriere di Milano	«I soldi delle Vie d’Acqua per il Seveso»	Elisabetta Soglio
20/11/2014	La Repubblica	Il conto dei danni presentato al governo “Tasse da congelare”	Ilaria Carra
21/11/2014	La Repubblica	Il fiume sarà vinto nel 2016 ma i vasconi antipiena potrebbero non bastare	Ilaria Carra
22/12/2014	Il Fatto Quotidiano	Milano: l’acqua in città e il disprezzo per la storia	Renzo Rosso

24/11/2014	La Repubblica	Un'altra settimana per togliere il fango dall'area di Niguarda	Oriana Liso; Matteo Pucciarelli
26/01/2015	La Repubblica	Via fango, rami e rifiuti operazione bonifica per il Seveso interrato	Ilaria Carra
09/02/2015	Il Corriere di Milano	Danni del Seveso, i primi contributi Al Comune 700 richieste dei cittadini	Paola D'Amico
15/02/2015	Il Corriere di Milano	Alluvioni del Seveso La Regione: mancano i fondi del governo	Redazione
26/03/2015	La Repubblica	Il progetto è definito ma sulla vasca anti-Seveso ora monta la protesta	Ilaria Carra
28/03/2015	La Repubblica	Seveso, via il verde arriva un laghetto per fermare le piene	Matteo Pucchiarelli
28/03/2015	Il Corriere di Milano	Seveso, sì alla vasca nel Parco Nord	Maurizio Gianattasio
07/04/2015	Il Corriere di Milano	Seveso esondato, il giudice di pace: «Palazzo Marino risarcisca i danni»	Gianni Santucci
28/04/2015	La Repubblica	Piene del Seveso ok ai cento milioni del piano sicurezza	Andrea Montanari
18/07/2015	La Repubblica	Disastro del Seveso fondi per 1,4 milioni a seicento cittadini	Ilaria Carra
27/07/2015	La Repubblica	Vasca anti-Seveso, pronto il progetto	Ilaria Carra
07/08/2015	Il Corriere di Milano	Seveso, dal governo 122 milioni contro l'emergenza allagamenti	Pierpaolo Lio
20/08/2015	La Repubblica	Seveso, gara lampo sulla vasca anti-piena pronto a partire il cantiere a Senago	Alessia Gallione
10/09/2015	La Repubblica	A Niguarda vittima del Seveso i tombini si colorano d'arte	Redazione
27/10/2015	La Repubblica - Milano	Esondazioni Seveso, mappati tutti gli abusi: costruzioni e oltre 400 scarichi, ecco cosa strozza il fiume	Redazione
28/10/2015	La Repubblica	Cemento e scarichi la mappa degli abusi che strozza il Seveso	Tiziana De Giorgio
28/10/2015	Il Corriere di Milano	Fogne e case abusive, emergenza Seveso	Paola D'Amico
05/03/2016	La Repubblica - Milano	Maltempo, Milano in ginocchio: esonda il Seveso, allagata anche l'Isola. Scontro Comune-Regione	Redazione
05/03/2016	Il Fatto Quotidiano	Milano, il Seveso vicino all'esondazione. E tornano paure e polemiche per la messa in sicurezza	Michelangelo Bonessa
11/03/2015	Il Corriere di Milano	Frane e inondazioni, emergenza Lombardia	Luca Rinaldi
18/03/2016	La Repubblica	"Basta col cemento sulle sponde del Seveso"	Redazione
16/05/2016	La Repubblica	Via alla prima vasca per contenere le acque del Seveso	Ilaria Carra
29/05/2016	Il Corriere di Milano	L'incubo di Pisapia: «Se esonda il Seveso rovina tutto...»	Pierpaolo Lio
20/06/2016	Il Corriere di Milano	A Milano esondazioni evitabili» Inchiesta per disastro colposo	Luigi Ferrarella, Giuseppe Guastella



28/06/2016	Il Corriere di Milano	Progetti, varianti e proteste: 5 anni per sbloccare i cantieri	Paola D'Amico
29/06/2016	Il Corriere di Milano	"Non siamo Cittadini di Serie B"	Redazione
06/08/2016	La Repubblica	Da settembre via ai lavori per la vasca anti-Seveso	Redazione
06/08/2016	La Repubblica	Niguarda allagata e alberi caduti in città Partono a settembre i lavori per il Seveso	Ilaria Carra
10/06/2016	La Repubblica	La Protesta contro la Vasca Antiseveso	Redazione
21/06/2016	Il Corriere di Milano	Si sblocca il «pacchetto Seveso» A settembre i cantieri anti piene	Redazione
14/09/2016	Il Corriere di Milano	Metrò, Expo e welfare: ecco l'agenda 2020 «In due anni fuori dall'emergenza Seveso»	Maurizio Gianattasio
28/08/2016	Il Fatto Quotidiano	Lombardia, 1.420 scarichi abusivi nel Seveso: indagati Maroni, Formigoni e Pisapia per le esondazioni	Redazione
05/09/2016	La Repubblica	Piano Seveso vasca anti-piena e nuovo bosco al Parco Nord	Ilaria Carra
13/09/2016	La Repubblica - Milano	Renzi da Sala per la firma del Patto per Milano. Metrò, militari, periferie Seveso: i punti dell'accordo	Redazione
26/02/2017	La Repubblica	Seveso, stop alla vasca anti-alluvioni dopo il ricorso del Comune di Bresso "Quei lavori rovinano il Parco Nord"	Claudia Zanella
01/03/2017	Il Fatto Quotidiano	Patto per Milano, 18 milioni invece dei miliardi di Renzi	Gianni Barbacetto
12/05/2017	Il Fatto Quotidiano	Esondazione Seveso a Milano, nella notte alberi caduti e sottopassi allagati	Redazione
12/05/2017	La Repubblica - Milano	Maltempo: Nel Milanese notte di allagamenti, esondato il Seveso	Redazione
13/05/2017	La Repubblica	Esonda il Seveso la rabbia di Niguarda "Basta allagamenti"	Alessandro Corica
13/05/2017	Il Corriere di Milano	Gru e bonifiche, il nodo Senago: dopo sei mesi c'è solo un prato	Pierpaolo Lio
07/11/2017	Il Corriere di Milano	Vasca anti-piene a Senago È scontro sul rinvio al 2019	Maurizio Gianattasio
20/06/2018	Il Corriere di Milano	Ricorsi e contratti strappati: bloccate le vasche del Seveso	Redazione
06/07/2018	La Repubblica	Il miraggio delle vasche per fermare il Seveso paralizzate dai ricorsi	Oriana Liso
06/07/2018	Il Corriere di Milano	Il Seveso esonda e le vasche bloccate spaccano la politica «Ostaggi dei veti»	Pierpaolo Lio
06/07/2018	Il Corriere di Milano	«Sacchi pronti in cantina, ansia ogni volta che piove I risarcimenti? Ridicoli»	Elisabetta Andreis
26/08/2018	Il Corriere di Milano	Bomba d'acqua: esonda il Seveso «Sistema fragile»	Luca Rinaldi
26/08/2018	Il Corriere di Milano	Opere anti-piena ancora bloccate Appello a Bresso	Pierpaolo Lio
27/08/2018	La Repubblica	Marco Granelli "Contro il Seveso l'unico argine è la vasca a Bresso"	Alessia Gallione

02/09/2018	La Repubblica	La beffa del Seveso tra cantieri fantasma e canali di cemento	Ilaria Carra
04/09/2018	Il Fatto Quotidiano	Milano, esondazione fiume Seveso del 2014: 8 indagati. Ci sono anche Formigoni e gli ex sindaci Pisapia e Moratti	Redazione
04/09/2018	La Repubblica - Milano	Milano, gli ex sindaci Pisapia e Moratti e l'ex presidente Formigoni indagati per le esondazioni del Seveso	Redazione
05/09/2018	La Repubblica	Le Vere Ragioni dei ritardi sul Piano Salva Niguarda	Associazione Amici del Parco Nord
05/09/2018	La Repubblica	Moratti, Pisapia e Formigoni accusa di disastro per il Seveso	Luca De Vito
05/09/2018	Il Corriere della Sera	Seveso, le accuse alla politica «Niguarda vittima sacrificale»	Luigi Farrarella
15/09/2018	La Repubblica	PER LA VASCA ANTISEVESO OBIETTIVO 2022	Oriana Liso
15/09/2018	La Repubblica	Seveso, riparte il piano anti- alluvioni	Oriana Liso

## **Annex 2**

### **Milan Case Study: Actions**

The annexe provides a list of relevant actions undertaken to support risk reduction in Milan and to address flood risk reduction of the Seveso River.

1. 1998 – Po River Basin Authority includes Milan in the list of ‘flood-risk cities’.
2. 1998 – The Permanent Observatory on Water for Milan and Lombardy Region is funded.
3. 1999 – The Planning Agreement for the Hydraulic Safeguard of the City of Milan is signed by Lombardy Region, Province of Milan, Municipality of Milan, River Basin Authority for the Po River, Po Magistrate. The Agreement seeks to enhance collaboration among public bodies in order to facilitate the implementation of structural measures and the maintenance of existing defence infrastructures. 2009 – Updated and signed by Lombardy Region, Città Metropolitana di Milano, Comune di Milano, AdBPo and AIPO.
4. 1999 – Starting from the experience of the Seveso, the Lombardy Region develops SINERGIE, a decision support system aimed at enhancing coordination among actors with competences in real-time risk management.
5. 2001 – Hydrogeological Plan for the Po River (PAI). The plan is a knowledge-oriented, regulatory and programming tool for the design and implementation of safeguard measures against hydrogeologic risk. Notably, the Plan was not considering the Seveso River as it belonged to the minor hydric network. 2008 - Update of the PAI, including transposition of a feasibility study carried out by the River Po Basin Authority in 2004. 2017 - Update of the PAI, under the umbrella of the PGRA. The PAI include the Seveso Torrent (AdBPO, Regione Lombardia 2017). With this document, “the Seveso ‘appears in River Basin Planning for the first time’” (PA\_C1).

6. 2004 – Regional Law nr. 16/2004: “Testo unico delle disposizioni regionali in materia di protezione civile” - Municipalities are asked to develop emergency plans (art. 2).
  7. 2004 – The Regional Operative Centre for Natural Risk Monitoring is funded. It collects information from 250 stations across Lombardy and releases warning alerts to municipalities. The centre is connected to the Regional Meteorological Centre by ARPA Lombardia, also funded in 2004.
  8. 2004 – AdBPo releases a hydraulic study, which is used to inform risk projects about defence and mitigation infrastructures. The study highlights that the hydraulic capacity of the water network cannot be increased. Accordingly, it states the need to reduce flows through the realisation of water retention areas (Autorità di Bacino del Fiume Po 2004, ETATEC, Studio Paoletti 2018).
  9. 2006 – The Seveso River Contract is a voluntary agreement among public bodies interested in enhancing water and flood risk management. Promoted by the Lombardy Region, it has been signed by 3 Provinces (Como, Monza-Brianza e Milano), 6 Parks, AIPO, AdBPo, ARPA, ATO, and by some municipalities (46, data 2017). It seeks to increase coordination and support actions at different scales in order to reduce water pollution, reduce hydraulic risk, improve environmental and landscape system, improve the quality and accessibility of the river banks, support knowledge exchange and promote environmental education. It includes an Action Plan which is updated every four years.
  10. 2009 – Under the umbrella of the River Contract, the Lombardy Region launches a call to finance projects designed following ‘natural engineering principles’. The next call (2015) finances projects supporting integrated water and risk management for the Seveso River.
  11. 2009-2012 – ‘Progetto Fiumi’ (ARPA Lombardia 2014) is launched. This includes a collection of data about the ecological, chemical and morphological status of Lombardy’s rivers, including the Seveso.
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12. 2010 – A Programme Agreement about the design and financing of priority interventions for hydrogeologic risk mitigation is signed between the Lombardy Region and the Ministry for the Environment (see MATTM, Regione Lombardia 2010). The President of the Lombardy Region is appointed as Government Commissioner. The Agreement finances structural defence infrastructures in high-risk areas, as well as ordinary and extraordinary maintenance interventions. The Agreement has been modified or updated due to changes in budget availability and updates in the list of financed interventions, also including the Water retention area in Senago (see MATTM, Regione Lombardia 2011, 2014, 2016).
13. 2010 – The Lombardy Region anticipates the National legislation concerning the obligation for municipalities to design a Municipal Emergency Plan. (see Delibera Giunta Regionale n. 924/2010).
14. 2011 – AIPo finances a hydraulic study (AIPo, ETATEC 2011) to assess the feasibility of water retention areas, updating previous studies (AdBPo 2004).
15. 2011 – On Behalf of Milan Municipality, MM undertakes a feasibility study about the water retention area in the north of Milan.
16. 2012 – Parco Nord launches ‘La fine del Seveso: Intervento Sperimentale per la riqualificazione fluviale in ambito urbano’. The project, financed by Fondazione Cariplo, promotes re-naturalisation interventions on the Seveso river.
17. 2013-2015 – Under the umbrella of the 2009 Agreement, the Regional Monitoring system is updated, and a Decision Support System to support the assessment of hydraulic risk scenarios is developed.
18. 2014 – Following the 2014 events, the Plan for the design of the water retention areas is revised (ETATEC, Studio Paoletti 2018).
19. 2014 – #ItaliaSicura (National Plan Against Hydrogeological Risk) - the Plan allocates 122M for Milan. The funds are mainly intended to support the realisation of defence infrastructures. It foresees a Governmental unit against hydro-geological risk is established (‘Unità di Missione’). Also,

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flood defence is recognised as a National strategic work. Accordingly, the “Seveso Plan” (including previously designed interventions and foreseeing the realisation of 5 water retention areas for the Seveso River), is approved. The Plan is co-financed by the Government (80 Million), the Lombardy Region and local Municipality. To promote integrated water management, 20% of the funds are to be dedicated to ‘win-win’ measures, addressing both risk reduction and water quality improvement (see also MATTM, Regione Lombardia 2014, 2016). The Unit is dismantled in 2018, with the new Government.

20. 2014 – Start of the legal litigations about the realisation of Water retention areas in Senago and Bresso (Parco Nord). The mayor of Senago presents a judicial statement asking to assess “the possible violation of the principles of reasonableness, proportionality, effectiveness and efficiency of administrative action” (Il Corriere di Milano, 24th July 2014). Senago Municipality lodges an appeal against the Environmental Impact Assessment of the Senago Lamination Work Project to the Water Course (Tribunale delle Acque). At the same time, the Milan Prosecutor’s Office opens an investigation for ‘culpable disaster’ for the flooding of 8th July.
  21. 2014 – Municipality of Milan opens a front office to support flood affected citizens that want to ask for compensation from flood damages. In July 2015, the Municipality of Milan allocates 1,4M funds for the compensation of damages from the November 2014 flood. 607 claims are presented (481 from private citizens, 126 from commercial activities). Also, Municipality of Milan opens a mobile operative unite, meant to “support quick action in the emergency phase and to become a reference point for residents” (Granelli, Deputy Safety and Civil Protection, Municipality of Milan, in La Repubblica - Milano, 28th July 2014).
  22. 2014 – MM undertakes an enquiry about the maintenance status of the covered part of the Seveso River crossing Milan. Based on the results, in January 2015 the Municipality of Milan undergoes extraordinary cleaning works.
  23. 2014 – Works for flood defence, identified as strategic works of national relevance (#italiasicura, see above), are included in the EXPO plan.
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24. 2015 – AdBPo releases the Po River Water Management Plan.
  25. 2015 – ‘IL FIUME CHIAMA’ - Cariplo funded project based in Bovisio-Masciago, aimed at supporting flood stewardship, increasing collaboration among citizen. It led to the development of self-protection measures.
  26. 2015 – The Regional Directive on risk warning system is updated (Regione Lombardia 2015) to reallocate competencies and responsibilities across governance levels.
  27. 2008-2015 – Provincial Police Bodies of Milan and Monza-Brianza, together with Forest Rangers, undertake an inquiry about the Seveso environmental and risk ‘critical situations’. The study identifies 37 alleged abusive works, 89 obstructions of the riverbed, over 400 illegal discharges (La Repubblica - Milano, 27th October 2015). These are geo-referenced and documented with visual materials.
  28. 2015 – Lombardy Region and ERSAF launch the “Urban Drainage Handbook” (Gibelli et al. 2015) and “A Regola d’Acqua” (Regione Lombardia, ERSAF 2016), a handbook including guidelines to mainstreamed sustainable water management in urban planning.
  29. 2016 – Fondazione Lombardia per l’Ambiente (FLA) undertakes a study mapping discharges in the Seveso river (ERSAF, Regione Lombardia 2017).
  30. 2016 – AdBPo updates the hydraulic and hydrologic analysis on the Seveso River to support the redesign of the PAI (AdBPo 2017). The update includes information collected in previous studies undertaken by AIPO and MM.
  31. 2016 – The Flood Risk Management Plan 2016-2021 is approved. The document marks a turn in flood risk approach, highlighting that flood risk cannot be “cancelled”, but needs to be managed (PA\_R4).
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32. 2016 – the Regional law on soil consumption is approved (Regional Law nr. 4/2016). It introduces the principle of ‘hydraulic invariance’ (art. 7). Following this law, the Regional Law 12/2005 is updated to include the principle of hydraulic invariance (art 58bis).
  33. 2017 – The Regional Regulation on hydraulic invariance is approved (Reg. No. 7, 23rd November 2017).
  34. 2017 – The Agreement for the management and the use for the Decision Support System for hydraulic risk in the Milan Metropolitan Area is signed by Lombardy Region, ARPA, AIPO, Consorzio Est Ticino Canale Villoresi and Parco Valle Lambro.
  35. 2017 – The Strategic Project for the Seveso River Sub-basin is approved (Lombardy Region, ERSAF 2017). Developed under the umbrella of the River Contract, it consists in a co-design process for the analysis of criticalities and the definition of strategic and operative measures aimed at reducing risk, improve water quality and support the sustainable management of the Seveso basin. Among the measures included, also the five water retention areas.
  36. 2017 – Under the Framework of the Agreement Milan Rural Metropolis ‘Milano Metropoli Rurale’, an action is proposed to reconnect the Seveso, the Martesana Channel and the Roggia Vettabbia (Action 2.1).
  37. 2017 – Lombardy Region approves the Plan for Water Protection, updating the 2006 Plan.
  38. 2018 – An update of Regional Regulation 3/2006 on sewage water is approved.
  39. 2019 – Update of the Urban Municipal Plan of Milan. Despite recurrent flooding, the Plan had never explicitly considered issues related to flood risk and events of the Seveso River (PA\_R2). Even without addressing the issue, the new Plan highlights the need to support sustainable water management, foreseeing a set of incentives (PA\_C1).
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40. 2019 – The Territorial Regional Plan is updated in compliance with the Regional Law no. 31/2014 on soil consumption.
41. Since years, the Lombardy Region promotes the educational campaign 'I do not risk' to support risk preparedness.



# (How) do flood-prone cities build resilience?

## Towards a learning sensitive analytical framework

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Urban resilience is almost unanimously identified as an inherently positive guiding principle in the risk reduction policy field. However, limited attention is paid to the learning dimension of resilience-building. To help bridge the gap, this research explores the interplay of learning processes, learning outcomes, and institutional action and investigates how capacities for reflection and collaboration develop in the face of wicked, risk-related problems.

The study focuses on post-flood reorganisation processes developed in cities repeatedly affected by more or less severe flood events. It proposes and illustrates an analytical framework to capture dynamics affecting policy-making processes that tackle risk in contexts characterised by high complexity, uncertainty, and political pressure. The framework is tested by looking at reorganisation attempts carried out to face the “eternal flooding” of the Seveso Torrent, which has affected the Northern neighbourhoods of Milan for decades, with over 100 events recorded after 1976. Results from the Milanese case highlight the existence of a learning and policy deadlock, where the impossibility to amend “historical mistakes” in decision-making and patterns of spatial, discursive and governance fragmentation hamper (reflective) action and contribute to policy inertia.

This research provides a theoretical background and methodological insights for investigating risk-reduction attempts in their interplay with framing and knowledge-related dynamics and broader relational, discursive, and regulatory factors, thus providing insights into the field of policy analysis.



**Irene Bianchi** (1988) is a Post-Doctoral Research Fellow at Politecnico di Milano, Department of Architecture and Urban Studies (DASU) since 2020. She carried out research activities at the University IUAV of Venice, Department of Design and Planning in Complex Environments (2014-2015); at the Berlin Technical University, Institute for Urban and Regional Planning (2016-2017); at King's College London, Department of Geography (2018); and at the Universitat Internacional de Catalunya, Department of Architecture (2021).

Irene holds a PhD in Urban Planning, Design and Policy (Politecnico di Milano, 2020), a Master Degree in European Planning and Policies for Cities, Environment and Landscape (University IUAV of Venice, University of Girona, 2014), and a Bachelor Degree in Economics and Social Sciences (Free University of Bolzano/Bozen, 2011). She is a member of the Executive Board of URNet – Urban Resilience Network and part of the BIARI Alumni Network (Brown International Advanced Research Institutes - Brown University).