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Can we learn to be resilient?
Institutional constraints for
social learning in heatwave risk
management in London, UK

by Thomas Abeling

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Can we learn to be resilient? Institutional constraints for social learning in heatwave risk management in London, UK

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April 2015

Acknowledgements

I would like to thank my first supervisor Prof. Mark Pelling for his guidance, comments and advice. Discussions with him inspired and motivated me and helped me to significantly develop my academic thinking. I would also like to thank my second supervisor Prof. Jörn Birkmann for his input and guidance, especially in the first phase of this project.

My gratitude goes to the United Nations University and the emBRACE project for funding my research and for providing me with the opportunity to develop and discuss my project. At King's College London and the University of Reading, I would like to thank Zehra Zaidi and Sue Grimmond for their support. At Public Health England, I am very thankful to Virginia Murray and Katie Carmichael. Their support in many ways made this project possible. At WHO Europe, I would like to thank Dr. Tanja Wolf for many fruitful discussions. At the École nationale d'administration publique, I would like to thank Marie-Christine Therrien for providing valuable comments to my work.

Without the efforts of all study participants this research project would not have been possible. I am very thankful to them for taking the time to discuss with me their work. In particular, I would like to thank John-Kolm Murray for providing me with valuable insights into heatwave and cold weather planning in London.

Many colleagues, friends, and my family supported me throughout the research process. Many thanks to Joanna Pardoe, Maria Schwab, Dunja Krause, Nazmul Huq, Siswani Sari, and Gusti Ayu Ketut Surtiari for discussing with me my project. I also thank my colleagues in the emBRACE project, and Tobias Blätgen, Matthias Garschagen, Torsten Welle, Claudia Berchtold and Jan Wolfertz. For proofreading earlier versions of this document, I would like to thank Joanna Pardoe, Pia Lorenz and Julia Karst. I am thankful to my parents, who supported me in my decision to pursue a PhD.

Most importantly, I would like to thank Pia Lorenz. Thank you for the support and the inspiration that helped me finalise this project.

Abstract

This thesis investigates institutional constraints for social learning in organisational heatwave risk management in London, UK. Empirical evidence stems from 49 semi-structured expert interviews with risk planning officials from London local authorities, health and social care organisations. Findings suggest that the interaction of formal and informal institutions has limited social learning in heatwave planning to incremental changes that reinforced the status-quo. Informal networks and trust relationships between risk managers compensated for formal heatwave planning arrangements that were perceived as dysfunctional. This support from informal institutions to formal strategies undermined opportunities for paradigm shifts in risk planning. It suggests that social learning can be associated with rigidity of established risk management strategies, rather than with their change. In the context of heatwave planning in London, missed opportunities for paradigm shifts concerned a consolidation of reactive risk management approaches that focused on the health implications of heat stress. This consolidation undermined the development of preventive risk management approaches that consider social, environmental and technical risk dimensions. The results of the analysis raise questions about the desirability of learning as an adaptive strategy in the context of climate change. The thesis suggests that learning is not necessarily beneficial for transformation if it is enacted through organisational systems that are inertial and resistant to change.

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List of Abbreviations

BRF .... Borough Resilience Forum
CCA .... Civil Contingencies Act
CCG .... Clinical Commissioning Group
CCS .... Civil Contingencies Secretariat
DEFRA .... Department for Environment, Food, and Rural Affairs
DH .... Department of Health
DRR .... Disaster Risk Reduction
EA .... Environment Agency
EEA .... European Environment Agency
EPRRT .... Emergency Preparedness, Resilience and Response Team
GLA .... Greater London Authority
GP .... General Practitioner
HHWS .... Heat Health Warning System
HPA .... Health Protection Agency
HPU .... Health Protection Unit
HSCA .... Health and Social Care Act
HWB .... Health and Well-Being Board
HWS .... Health and Well-Being Strategy
IPCC .... Intergovernmental Panel on Climate Change
JSNA .... Joint Strategic Needs Assessment
LCCP .... London Climate Change Partnership
LLRF .... London Local Resilience Forum
LRP .... London Resilience Partnership
LRT .... London Resilience Team
NASA .... National Aeronautics and Space Administration
NHS .... National Health Service
PCT .... Primary Care Trust
PHE .... Public Health England
SHA .... Strategic Health Authority
SRRF .... Sub-Regional Resilience Forum
UK .... United Kingdom
UNFCCC .... United Nations Framework Convention on Climate Change
WB .... World Bank
WMO .... World Meteorological Organisation

1 Introduction

"Some things must change so that everything remains the same." (Slavoj Žižek)

Against the background of an expected increase in magnitude and frequency of climate change related hazards such as heatwaves (IPCC 2012, 2013; Christidis, Jones and Stott 2014), the capacity of organisations to critically reflect on the appropriateness of established risk management practices for future risk contexts emerges as an important aspect of disaster risk reduction (DRR) (Freire 1969; Pelling 2011). Research suggests that unprecedented events routinely exceed organisational response capacities (Boin and McConnell 2007; Boin and 't Hart 2010; Ödlund 2010; Linnenluecke and Griffiths 2013). International policy on disaster risk reduction consequently recognises the need to build capacity for adaptive risk management. Both the 2007 Hyogo Framework for Action and the 2015 Sendai Framework for Disaster Risk Reduction call for preventive risk reduction approaches that build on learning and address underlying risk factors (UNISDR 2007, 2015). This focus of DRR policy reveals tension between the need to develop strategies for the prevention of future risks, on the one hand, and inertial crisis response plans of public sector organisations, on the other hand. It raises questions about social learning in disaster risk management, and about the ability of organisations to act as agents of climate change adaptation.

In the United Kingdom (UK), the 2013 Assessment Report on the Implementation of the Hyogo Framework calls for a paradigm shift in risk management away from emergency preparedness and response towards preventive risk planning and vulnerability reduction (UNISDR 2013: 12). In the context of heatwave planning, this paradigm shift refers to the development of risk management strategies that consider social, environmental and technical, rather than merely public health dimensions of heatwave vulnerability (Abeling 2015). The National Heatwave Plan for England, the government's strategy for managing heat risk, is perceived by many local risk managers as primarily focused on public health implications of heat (Zaidi and Pelling 2013: 13). It aims to facilitate response capacity of

local government and public health organisations. The ownership of the plan by the UK Department of Health (DH) and its executive agency Public Health England (PHE) seems to reinforce public and professional perceptions of heatwave risk as a health concern. Social learning in local risk planning organisations can provide an opportunity to challenge such perceptions and to support a paradigm shift in risk management. However, social learning might also consolidate the status-quo if it reinforces established perceptions and practices in heatwave planning. This tension between established and alternative approaches of risk management is at the heart of the analysis in this thesis.

1.1 Hypothesis and research questions

Three research questions guide the analysis in this project. They are shown in Figure 1. The research questions focus on formal and informal institutional constraints for social learning in disaster risk management. They are concerned with the prospects and implications of change in the organisational system that delivers heatwave planning in London, UK. The research questions seek to stimulate reflection on the limits of change in existing risk management practices.

Figure 1: Research questions

- *RQ1: How do formal and informal institutions constrain social learning in heatwave risk management in London, UK?*

- *RQ2: What forms of learning can be observed, and what are their implications for local heatwave planning strategies?*

- *RQ3: What is transformation in heatwave planning in London, and how is it constrained?*

Through its focus on institutional aspects of organisational risk management, the study's interest traverses the boundaries between social learning theory, political science, and social geography. The main argument of this study is that an interaction between formal and informal institutions can limit social learning in organisations to incremental changes

that reinforce the status-quo. This interaction contributes to the rigidity of established risk management regimes[1] and undermines opportunities for deep learning processes based on critical reflection (Freire 1969). In the context of heatwave planning in London, missed opportunities for social learning concern, for example, a consolidation of reactive, health-centred heatwave planning strategies in local public sector organisations.

Institutions in this thesis refer to norms, rules, and values (North 1990), and are different from organisations, which are collectives with agency (Pelling et al. 2008). Formal "canonical" institutions (Brown and Duguid 1991) refer to visible and tangible rules, for example risk management plans of organisations. Informal "shadow" institutions (Stacey 1996) are invisible and intangible aspects of social life, for example trust relationships or social networks. The focus on formal and informal institutions (Shaw 1997) as constraints for learning in organisational risk management reveals that informal institutions can support formal organisational heatwave plans to function when they would otherwise be dysfunctional. As the thesis will show, this informal support limited change in local risk planning in London to incremental single loop learning and consolidated health-focused heatwave plans that prioritised response, rather than prevention.

Social learning is a complex and fuzzy process, and usually unfolds in non-linear ways (Armitage, Marschke and Plummer 2008; Cundill 2010; Reed et al. 2010; McCarthy et al. 2011). At the heart of social learning in organisational disaster risk management is a tension between existing and alternative risk planning strategies (Pelling 2011). This tension can be associated with trade-offs between rigidity and change, and between optimisation or revision of established strategies. Learning can be superficial or profound, incremental or comprehensive, slow or fast. This diversity can be grasped analytically through a distinction between different forms and depths of learning. Widely acknowledged is the distinction between single, double, and triple loop learning (Bateson 1972; Argyris and Schön 1978, 1996; Flood and Romm 1996), where single loop learning revises actions, double loop

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[1] "Risk management regime" in this thesis refers to the rules, organisational structures, and actors that shape risk management. In the context of this study, the National Heatwave Plan is considered as a risk management regime for heat stress in the UK, for example. Following Ostrom (1986), risk management regimes can be characterised by the stakeholders involved, their scope in terms of management and decisions, the hierarchy of actors, the information that is available, the conditions that frame decision-making processes, and the way in which individual preferences merge to shape collective decisions (Royal Society 1992: 148-149).

learning revises assumptions, and triple loop learning revises context. This framework is applied, for example, in crisis management literature, where Boin et al. (2008: 16-17) distinguish between fine-tuning, policy reform and paradigm shifts as different forms of organisational learning. Learning in disaster risk management thus extends beyond an improvement of existing planning and response strategies following major events. Such an identification of lessons-learned usually seeks to optimise, rather than challenge established risk planning approaches, and contributes to their consolidation.

In the context of this thesis, single loop learning can be associated with small and incremental improvements of existing heatwave planning strategies, while double and triple loop learning offer opportunities for deep learning processes through the exploration of alternative regimes and technologies. Social learning in heatwave risk management in London concerns tensions between planning "focused on emergency response measures within the health sector" (Zaidi and Pelling 2013: 13), on the one hand, and alternative strategies that emphasise preventive risk management and include social, environmental, and technical risk dimensions, on the other hand. This tension between reactive and preventive risk management strategies is not unique in the context of this study, but is acknowledged as an overarching issue in current discourses on disaster risk management (O'Brien et al. 2010). Social learning is proposed as an approach to facilitate a shift towards preventive risk management approaches (O'Brien et al. 2010), although some authors are sceptical about this (Johannessen and Hahn 2013).

1.2 Contribution and research gap

This thesis contributes to the literature on disaster risk and crisis management through its analysis of institutional constraints for learning. This focus responds to calls to explore in more detail how learning in risk management organisations is constrained. Birkmann et al. (2008: 653), for example, argue that "it seems to be important to ask how learning takes place in organizational structures as well as within single organizations and how opportunities for learning under time pressure [...] can be created". Such a focus on learning in organisational risk management is of particular relevance in the context of

Figure 2: Research gap: interaction between formal and informal institutions
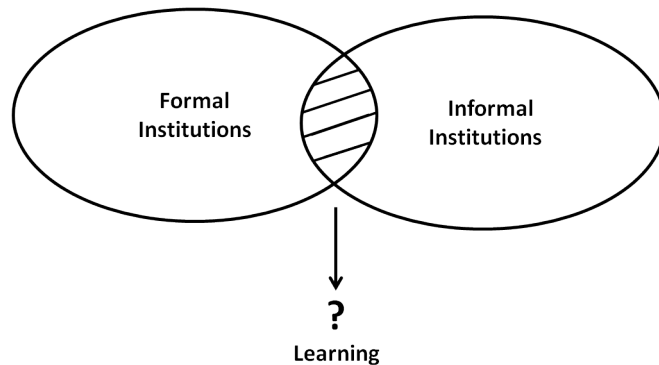
Source: own

climate change because existing risk planning strategies are increasingly ill-equipped to mitigate future hazards (Linnenluecke and Griffiths 2013: 388).

Two shortcomings of the literature on disaster risk and crisis management are of concern for this thesis: first, although learning is a prominent issue in this literature (Kingdon 1995; Stern 1997; Boin, McConnell and t Hart 2008; Smith and Elliott 2007; Moynihan 2008), little attention is paid to its institutional constraints; and second, where institutional constraints are discussed, they are usually treated in isolation of each other. Such an isolated focus lacks nuance because it fails to grasp the complexity of social learning that takes place in spaces where formal organisational structures and informal relationships overlap (Shaw 1997). Figure 2 exemplifies this gap in the literature. The implications of either formal or informal institutions for learning might change when both interact. This study will argue, for example, that informal networks can add flexibility to disaster response, but that this also contributes to the rigidity of existing formal risk management plans, and might thus undermine learning, in the long run. This suggests complexity in the interplay between institutions and learning, and underlines the necessity to consider formal and informal institutions together, rather than separately.

Formal or informal institutions for learning are often discussed in isolation of each other, however. Smith and Elliot (2007), for example, explore a range of barriers to organisational learning. Barriers reviewed in their study include formal and informal institutions,

but the authors do not explicitly acknowledge this, and do not focus on the interaction between both. Similar limitations characterise the study of Stern (1997), whose discussion of barriers to learning (Stern 1997: 77-79) also touches upon both formal and informal institutions without explicitly recognising them as such, and without discussing their interaction. Isolated perspectives on either formal or informal institutional constraints can also be found in contributions of Boin and t'Hart (2010) and Hamra et al. (2012). Boin and t'Hart (2010) identify informal institutions such as leadership, networks, and organisational cultures as drivers of enhanced emergency response. They argue that formal aspects of emergency management are overrated, and that it is the organisational "software" of informal institutions that actually determines the shape and quality of emergency response. Hamra et al. (2012) find that social networks enhance opportunities for learning in emergency management organisations, and argues that informal networks, in particular, are of importance for continuous learning in the organisation.

The lack of attention to the interaction between formal and informal institutions in the literature on learning in disaster risk management organisations can be traced to the organisational change literature. It discusses formal and informal institutions in isolation of each other, and this isolated exploration seems to be perpetuated in crisis management research. Seminal contributions to organisational change literature suggest that rigid beliefs and norms within the shadow system constrain organisational learning (Turner 1976; Argyris and Schön 1978; Kets de Vries and Miller 1984; Pauchant and Mitroff 1988). Smith (2002), for example, showed how the status of doctors within British society as beyond reproach undermined effective controls and contributed to the National Health Service (NHS) regulatory crisis revealed through the Shipman murders. Elsewhere, organisational culture is acknowledged as an informal institutions that constrains learning after crisis events, for example if it censors discussions by rendering issues "undiscussable" (Argyris 1999). Research also identifies tendencies of organisations to disregard information that suggests performance failure (Janis and Mann 1977). This tendency can constrain organisational learning because it limits critical reflection to issues that suit the worldview of the organisation. However, while this contribution identifies important barriers to learn-

ing, it can offer only limited insights into how informal institutions interact with formal organisational structures, and how this might shape their role as determinants of learning.

Formal institutions are acknowledged as constraints for learning in the literature on organisational change. Research suggests, for example, that adherence to formal rules undermines flexibility in crisis situations (Staw, Sandelands and Dutton 1981). This tendency constrains learning by championing a reliance on established procedures and by fostering a centralisation of power during crisis. Lovell (1984) identifies power structures in organisations as formal constraints for learning. He argues that lessons from crisis situations are negotiated, rather than deducted through rational reasoning. Similarly to the arguments of Janis (1977) and Argyris (1999), Lovell suggests that learning can be constrained if lessons that do not fit the power dynamics within the organisation are ignored. Deverell and Olsson (2009) find that decentralised managerial teams compensate for lacking trust in their decision-making ability by creating new formal structures and procedures based on previous experience. The development of such formal procedures can constrain the motivation of the organisation to explore alternative solutions and to learn further (March and Olsen 1976; Nutt 1984). These and similar studies shed light on how formal institutions constrain learning, but do not elaborate on how these formal constraints might be challenged or supported by informal institutions.

This thesis turns to literature that is rooted in complex adaptive systems and critical systems thinking (Brown and Duguid 1991; Stacey 1996; Shaw 1997) to address the lack of attention in disaster risk management literature on the interaction between formal and informal institutions. These studies can add nuance to the analysis of learning in risk management organisations because they provide insights into how the interaction between formal and informal institutions shapes learning in organisations. Contributions from this field suggest that the interaction between formal and informal institutions supports, rather than constrains learning in organisations. This is an important addition to the organisational change literature discussed above because it suggests that separately, formal and informal institutions shape learning in a different way than they do in interaction with each other.

Informal institutions have long been considered as too intangible and complex to research systematically (Pelling et al. 2008: 869). Stacey (1996) and Shaw (1997) responded to this gap. They found that novelty and learning arise at boundaries between formal and informal institutions, where creative energy in the shadow system interacts with the regularity of the formal organisation. Similar arguments were made by Brown and Duguid (1991). Their study suggested that the formal "canonical" structure of an organisation overlaps with and is complemented by the informal networks that cut across the formal structures of the organisation. Griffin et al. (1999: 304) even argue that the shadow and canonical system are "inseparably" related. The close integration of formal and informal institutional systems does not mean, however, that they are too complex to be analytically useful. This thesis will argue that they provide a valuable analytical lens for the study of learning in organisational risk management.

1.3 Scope and terminology

The thesis follows a constructionist, rather than positivist epistemology (Berger and Luckmann 1991; Castree and Braun 2001; Young and Collin 2004). It explores how learning is constrained by institutions that are constructed through social interactions in the specific context of the case study. The study does not seek to uncover an objective reality and derive generalisations about it. Rather, it acknowledges the complexity of social learning and the importance of context. Its findings are based on interpretations of viewpoints of the respondents. Other projects might arrive at different interpretations. The findings of this study are thus tentative and cannot be generalised.

Social learning, in this study, refers to the processes through which ideas and practices unfolds in social collectives such as organisations or organisational networks. Social learning, rather than organisational learning is the phenomenon of interest in this study because it extends the project's focus beyond a particular organisation. While organisational learning is interested in the way that an individual organisation changes its behaviour, beliefs, or values, the focus of this study is on learning in the organisational network of heatwave planning organisations in London. This focus on networks responds to findings that risk

planning takes place through inter-organisational networks, and not through single organisations (Hillyard 2000; Kapucu 2008). It opens the theoretical perspective beyond the organisation and allows for a consideration of literature on networks (Provan and Milward 2001; Provan and Kenis 2007).

"Risk management" in this thesis refers broadly to the process through which organisations plan for and respond to hazards. Risk management has diverse meanings across the literature (Royal Society 1992). The conceptualisation of risk management in this thesis is informed by the definition of the Intergovernmental Panel on Climate Change (IPCC), which emphasises social, rather than merely technical aspects of risk management[2]. "Risk planning" and "heatwave planning" are used as synonyms for "risk management" in this thesis, because this reflects the terminology used by many of the respondents in this study.

The project refers to "risk management" to emphasise its focus on strategic planning and response through public sector organisations. It does not refer to "risk governance" because its focus is not on the political process of designing, implementing and evaluating disaster risk reduction. Although the term "risk management" might imply rationality and linearity, public sector risk planning and response is contested, involves power relations and conflicting interests.

Research for this study was conducted between 2012 and 2014. Ethical approval was obtained from King's College London (REP(GSSHM)/12/13-24). The PhD study took place in the context of the EU FP-7 funded research project "emBRACE - Building Resilience Amongst Communities in Europe" (Grant Agreement 283201).

1.4 Outline of the thesis

The thesis comprises six chapters. The next chapter outlines the analytical framework and contextualises the study in social and organisational theories of learning. The third chapter discusses heatwave risk as a natural hazard in the context of climate change, provides

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[2]The IPCC defines disaster risk management as processes "for designing, implementing, and evaluating strategies, policies, and measures to improve the understanding of disaster risk, foster disaster risk reduction and transfer, and promote continuous improvement in disaster preparedness, response, and recovery practices, with the explicit purpose of increasing human security, well-being, quality of life, and sustainable development" (IPCC 2012: 558)

information on heatwave risk management in the UK, and outlines the organisational architecture of heatwave planning in London. The fourth chapter is concerned with the methodology of the research project. It elaborates on the epistemology, research design, research methods and on the limitations of the study's methodological choices. The fifth chapter provides the empirical analysis of the thesis. It comprises three sections, each of which loosely relates to one of the three research questions. The sixth chapter synthesises key findings from the empirical analysis, reflects on their implications for research and practice, and discusses future research needs.

2 Theory

This chapter develops the framework for the analysis and contextualises the project within theories of learning from various academic disciplines. The aim of this chapter is to unfold the theoretical assumptions that guide the analysis. The framework is interdisciplinary and integrates theoretical thought from social learning theory, political science literature, and social geography. It seeks to facilitate an analysis of institutional constraints for social learning in organisations responsible for disaster risk management.

The focus of the framework is on relationships and interaction as overarching themes for both the conceptualisation of social learning and the formal and informal institutions that constrain it. Relationships and interaction within the analytical framework unfold, for example, between formal and informal institutions and organisational spaces, between individual and collective learning agents, or between incremental and fundamental forms of change. The framework discusses formal and informal institutions (Brown and Duguid 1991; Stacey 1996; Shaw 1997; Pelling et al. 2008), communities of practice (Wenger 1998), groupthink (Janis 1989), epistemic communities (Haas 1992), theories of organisational change (Lewin 1958; Meyer and Rowan 1977; McKelvey 1982; DiMaggio 1983), socio-technical transitions theory (Rip and Kemp 1998; Geels 2002, 2005; Geels and Schot 2007; Markard and Truffer 2008), and the notion of loop learning (Argyris and Schön 1978; Flood and Romm 1996).

The chapter is divided in three sections. The first section discusses behavioural, social, policy, and organisational learning to provide context to the analysis, and to situate the project within existing learning theories. The second section synthesises the discussion of research traditions of learning through a systematisation of learning conceptualisations from these disciplines. The third section develops the analytical framework of the project. It discusses in depth some of the key concepts that guide the empirical analysis in chapter 5. The chapter closes with a brief summary.

2.1 Research traditions of learning

Learning is a highly complex phenomenon that is applied in research from various academic disciplines. The following section outlines research traditions of learning that are of relevance to this study[3]. The objective is not to develop a coherent learning theory, but to contextualise the research project within academic traditions. The order of discussion below loosely corresponds to the chronological course within academia. It acknowledges that early approaches to the study of learning were concerned with the individual, and that the focus of learning research gradually shifted towards social and collective learning.

2.1.1 Behavioural and cognitive approaches

Early theories of learning emerged within the stimulus-response framework of behaviourism (Watson 1967), most prominently represented by Ivan Pavlov's influential work on reflex systems in dogs. Learning is conceptualised in behaviourism as an individual response to a stimulus that occurs in the environment. The probability of repeatedly responding the same way to a stimulus depends on the outcomes associated with this response. This distinction between stimulus and response expressed the conceptual importance that early behaviourist theories assigned to external determinants of learning. Despite its inability to explain how individuals can make sense of complex ideas, behaviourism is influential due to its scientific approach to the study of learning (Jarvis, Holford and Griffin 1998) and its explanations of certain behavioural patters, including the acquisition of information (Shuell 2001).

Criticism of the behavioural school of thought's preoccupation with observable behaviour as the only scientifically valuable expression of learning has given rise to more nuanced explorations of learning. The research focus shifted to psychological determinants of individual learning. The most influential contributions in this field of research came from Jean Piaget. His study of personality development in children highlighted how states of cognitive development shape learning. Piaget's stage theory assumed that an

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[3]The schools of thought discussed below are closely interrelated. They are discussed separately for reasons of argumentative clarity, but are often portrayed as sub-categories of each other elsewhere (Bennett and Howlett 1992; Sommerer 2010).

individual's ability to conceptualise increases with age. Although his work has been criticised for being limited to children and adolescents, it was instrumental in steering research that applied his methodology to young adults and has shown the importance of critical reflection for learning (Jarvis, Holford and Griffin 1998).

2.1.2 Social learning

Research on social learning incorporates two interrelated dimensions of how social relationships shape learning. First, it emphasises the social context of learning and the ways in which the interaction between agents and their social environment facilitates knowledge generation and transfer. Second, it points to the way in which social collectives have capacity for self-led learning and how this learning can be both deficient (Janis 1982) and proficient (Senge 1990; Argyris and Schön 1996; Surowiecki 2004) compared to individual learning.

In its first dimension, social learning research highlights the role of socialisation for learning. This directs attention to the social, historical, and cultural contexts in which learning takes place. These contexts critically determine the role of knowledge and learning in society, as well as the styles and mechanisms through which agents learn (Jarvis, Holford and Griffin 1998). Social learning relates to earlier cognitive theories of learning because it draws on the concept of socialisation (Zimmermann 2001). Socialisation, the lifelong process though which individuals internalise and disseminate societal norms, beliefs, and knowledge, is often seen as a theory of social learning in itself (Jarvis, Holford and Griffin 1998). Social learning theory therefore is closely linked to early sociological studies, and in particular to structural functionalism. This macro-level paradigm perceives human society as a living organism and assumes that, just like for humans, certain interdependent functions are required for a society to survive (Malinowski 1944; Radcliffe-Brown 1950; Parsons 1951; Merton 1957). This analogy underlines the interdependence of societal functions and highlights that changes, for example in cultural segments of a society, determine corresponding changes in other segments (Malinowski 1944: 75-84)[4].

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[4]As Chilcott (1998: 103) points out, this emphasis on the context in which organisations operate is a contribution of structural functionalism that is often overlooked.

Structural functionalism has been criticised for its inability to explain change and dysfunctionality within a society (Chilcott 1998). However, Jarvis, Holford and Griffin (1998:44) see the contribution of this theory precisely in its focus on critical functions and the resulting need for functional adaptation in times of change. Denoting it as as a model of social learning, the authors argue that the theory draws attention to the ways in which societies have to learn adaptation to survive. This sheds light on how individuals learn social roles to find a place within society, and on how failure to adapt results in the downfall of societies and in dysfunctionality for individuals[5].

In the 1970s, the focus of social learning research shifted from children's personality development towards the regulation of learned skills. Bandura's (1977) influential triadic model of social learning highlighted the importance of the reciprocal causal relationships between personal, behavioural, and environmental determinants of learning. His theory underlined that the learning agent is not merely acquiring and receiving knowledge, but that agents shape their social environment through their behaviour, too. Bandura distinguished between four processes of social learning: attention, retention, reproduction and motivation. Attention and retention require a learning agent to pay attention to and remember the modelled behaviour. Reproduction and motivation require the agent to be motivated to and capable of reproducing the modelled behaviour. Bandura's theory of reciprocal determinism reveals that motivation to learn arises or fails to arise in a social context of mutual expectation (Jarvis, Holford and Griffin 1998: 44).

The shifting focus of research on social learning, as expressed in Bandura's theory, came along with a changing perception in academia of knowledge and its acquisition. While early cognitive theories conceptualised learning as a reactive process of the learner, and consequently developed a commodified understanding of knowledge as something to be acquired by an agent, recent contributions perceive of knowledge as a socially constructed phenomenon (Shuell 2001)[6]. This constructivist school of thought emphasises social in-

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[5]Viewing societies as complex systems, structural functionalism continues to inform current research on resilience, which also highlights the necessity for adaptation to maintain system functions (Carpenter and Gunderson 2001; Olsson, Folke and Berkes 2004; Walker, Holling and Carpenter 2004). In the same way that structural functionalism used a biological model to study social behaviour and structure, research on resilience has adopted models rooted in the natural science (often referred to as "engineering resilience") and expanded them to socio-ecological systems (Folke 2006).

[6]Research in this thesis is guided by such a social constructionist epistemology. The epistemology as

teraction as a key determinant of learning of both individuals and groups. It sheds light on the role of social interaction for learning, and thus shifts focus away from the information that is acquired by a learning agent (Jarvis, Holford and Griffin 1998). Social constructivism emphasises the ways in which knowledge is not simply received, but shaped and modelled into meaning by a proactive learning agent. This reciprocal perception of learning reveals the cognitive processes that shape the development of learning, although cognitive processes are not the primary interest of social constructivism (Andrews 2012). As Shuell (2001:8616) points out: "no two people interpret the same information in the same way, no two people end up with the same understanding of the concepts and facts being studied".

A second dimension of social learning theories highlights the capacity of social collectives for self-led learning. The idea of collective learning marks an advancement of earlier studies of learning which were merely focused on the individual. The notion of learning in social collectives can be traced to a variety of academic disciplines and fields. Organisational learning and organisational change are two of these fields and will be discussed below.

Collective learning refers to "learning that is more than the sum of individual learning of the members of the group or organisation" (Jarvis, Holford and Griffin 1998: 51). Internal reflection processes within individuals are a necessary, but not a sufficient condition for collective learning. Beyond individual learning processes, social relationships are important for collective learning. Theories situate learning both within the interaction of individuals and their social environment, on the one hand, and within collective agents (e.g. groups of individuals, within communities and organisations), on the other hand (Jarvis, Holford and Griffin 1998). It is within these relationships that learning processes take place. Only through the relationship between two or more agents can new, marginal ideas and values disseminate and become established. Social learning thus assumes interaction within and between social groups (McCarthy et al. 2011), recognising that elements of social systems are highly interdependent. Through collectivity, the notion of social learning also acknowledges diversity, which is at the heart of the learning process.

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well as terminological differences between "constructivist" and "constructionist" are discussed in more detail in section 4.1.

Without the dichotomy of traditional, dominant ideas and values on the one hand, and innovative but so far underrepresented ones at the other hand, no dissemination can take place.

Collective learning processes can be both deficient and proficient in comparison to individual learning. Janis' (1982) groupthink is a particularly prominent example of the former. Janis has shown how group dynamics can have adverse effects for decision-making when excessive conformity suppresses alternative viewpoints. As a consequence, individuals are incapable of feeding their experience into the group competence. However, in the context of research on organisational learning, collective learning can also yield outcomes that are proficient to individual learning (Argyris and Schön 1996). Social relationships are critical, in this respect, because they make information accessible and thus improve performance of the group (Frey and Brodbbeck 2001).

2.1.3 Policy learning

Research on policy learning asks why policies change (Bennett and Howlett 1992). It explores determinants of policy change. Policy learning research challenged assumptions that public policy is largely shaped by external factors such as social norms and conflicts (Nordlinger 1981). Criticism of this determinism arose in the early 1970s (Walker 1974), and was substantiated by Heclo (1974), who argued that uncertainty is an equally important source of politics. Heclo's focus on uncertainty paved the way for questions on the role of knowledge and learning for policy change. Research on why policies change is predominantly focused on the state as the subject of analysis, and assumes that states reflect on and learn from previous experiences. States can therefore modify current policies based on the evaluation of success or failure of previous policies (Bennett and Howlett 1992).

Studies that explore the diffusion and convergence of policies are a subset of policy learning research[7]. Learning is conceptualised in these studies as an imitation of successful policies by states (Simmons and Elkins 2004; Brooks 2005; Holzinger, Knill and Sommerer 2008; Sommerer 2010). An important contribution of this literature is the focus that it

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[7]Arguments put forward in the following two paragraphs are also included in an internal emBRACE project co-publication of the author (Pelling et al. 2015: 13-16). The document is available at the emBRACE website: http://www.embrace-eu.org/outputs.

puts on the role of transfer processes for learning. It highlights that learning is inevitably inspired by external ideas, values and norms. Individuals and organisations that reflect critically do so in a wider social context of relationships and networks that shape their learning process. Social relationships are thus of critical importance for learning.

A focus on the interplay of external ideas and intrinsic critical reflection is common element between policy learning and organisational learning literature, which is discussed in more detail in section 2.1.4 below. The concept of loop learning and feedback mechanisms (Argyris and Schön 1978), for example, highlights learning cycles which shape the development, adoption, modification or rejection of ideas. This process unfolds in actor networks, for example within organisations, and has implications for the conformity of policy systems. Diffusion literature suggests that policies converge and become homogeneous if models are attractive and subsequently adopted by stakeholders in the system (Sommerer 2010). In contrast, the rejection of new ideas by stakeholders in the system might support diversity of policies.

2.1.4 Organisational learning

Research on organisational learning traditionally resides within management and business research literature, and was informed by the realisation that change is a constant determinant, rather than an exceptional and temporary interlude of organisational performance (Jarvis, Holford and Griffin 1998)[8].

Organisational learning theory is based on the assumption of collective learning. Swieringa and Wierdsma (1992: 33) underline the importance of distinguishing between the individual and the collective in their conceptualisation of organisational learning as a change in organisational behaviour. By characterising a change in organisational behaviour as a collective learning process, the authors identify individual learning as "a necessary but not a sufficient condition for organizational learning" (Swieringa and Wierdsma 1992: 33).

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[8]The same logic can be said to explain the growing interest in learning processes in the context of climate change adaptation. The shifting focus of policy and societal response strategies from climate change mitigation to adaptation, as expressed, for example, in the changing agenda of the United Nations Framework Convention on Climate Change (UNFCCC), might reflect a paradigm shift in the way in which climate change is perceived. The adaptation discourse expresses a growing acceptance of environmental change as a constant in human development. As such, it puts emphasis on learning strategies that allow for accommodating change.

This argument rests on the assumption that the abstract concept of an organisation acquires identity only through the actions that it takes[9]. Learning by individuals within an organisation thus cannot automatically be assumed to mean that the organisation has learned something, too. Organisational learning, according to Swieringa and Wierdsma (1992), only takes place if the sum of individual learning processes cumulates in a changing organisational conduct.

The literature on the learning organisation differentiates between individual and collective learning. Research in this field explores different character types of organisations, and thus differs from organisational learning theory, which explores the processes rather than structures of learning in organisations (Jarvis 2001). Early contributions go back to Pedler, Boydell and Burgoyne (1989), Pedler, Burgoyne and Boydell (1991), and Senge (1990). Defining the learning organisation as "an organisation which facilitates the learning of all of its members and continuously transforms itself" (Pedler, Boydell and Burgoyne 1989: 2), the authors highlight the importance of individual learning for organisational change while also acknowledging agency of the organisation. As Jarvis (2001: 149) points out, a learning organisation is more than simply the institutionalised encouragement of learning of its members.

Roth and Niemi (1996) argue that three themes characterise research on the learning organisation: a) adaptation, change, and environmental alignment, b) different types and levels of learning, and c) interpretation, meaning, and worldview. A learning organisation applies change strategies to seek alignment with its environment. Adaptation, according to Fiol and Lyles (1985), requires learning processes within the organisation. As Levitt and March (1988) point out, this learning process can draw on various sources, ranging from direct experience, the experiences made by other organisations, or the conceptual frameworks and narratives that give meaning to experience.

Theories of organisational learning perceive organisations as systems of knowing and learning (Gherardi 2001). Early references to organisational learning can be found in organisational theory (March and Simon 1958). The concept rose to prominence, however,

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[9]This behaviouralist approach to learning is criticised for failing to account for the importance of internal actions for learning (Pelling et al. 2008).

with the contributions of Argyris and Schön (Argyris and Schön 1978), which explored in detail the mechanisms through which collective learning within organisations takes place. Argyris and Schön referred to organisational learning as a process through which organisational theories of action are tested and reconstructed. A theory of action is "a set of principles aimed at making events come about" (Jarvis, Holford and Griffin 1998: 150). Argyris and Schön distinguish between espoused theory and theory-in-use as two forms of action theory. The former refers to what is conveyed by agents as their actions, reflecting a designed image of the self communicated to others. Theory-in-use denotes the actions actually taken:

> "When someone is asked how he would behave under certain circumstances, the answer he usually gives is his espoused theory of action for that situation. This is the theory of action to which he gives allegiance, and which, upon request, he communicates to others. However, the theory that actually governs his actions is his theory-in-use, which may or may not be compatible with this espoused theory" (Argyris and Schön 1977: 6-7)

These tensions between stated and actual actions shape organisational behaviour, and relate to a distinction between formal and informal institutions in organisations. Formal institutions such as written plans and protocols resemble the espoused theory: they outline how the organisation should behave. In the context of this study, this could refer to organisational heatwave plans, for example. Informal institutions such as networks and trust relationships relate to the theory-in-use: they determine how the organisation actually behaves. For heatwave planning in London, this might refer to the way in which crisis response is organised through informal networks and based on experience, rather than on formal plans. Similar parallels between the theories of action from Argyris and Schön are drawn by Curtis et al. (2012). In their analysis of perceptions about health impacts of urban regeneration impacts, they show how stakeholders in urban change programmes were defensive about potentially negative health effects, and relate this barrier to organisational change to Argyris (1993) research on the defensiveness of many theories-of-use. These similarities between the espoused theory and the theory-in-use, on the one hand, and formal and informal institutions as determinants of governance, on the other hand,

Figure 3: The concept of loop learning
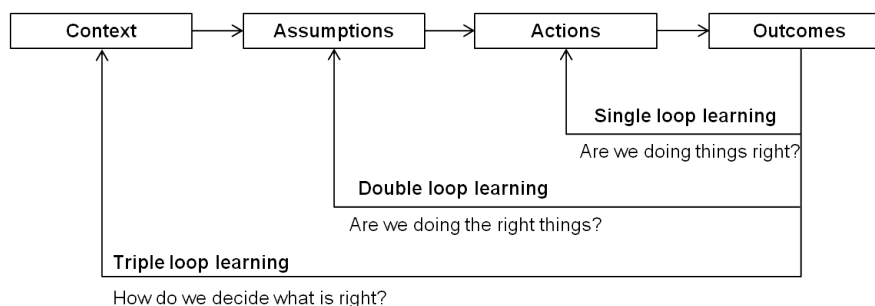
Source: Adapted from Pahl-Wostl (2009) and Flood and Romm (1996)

demonstrate that the framework of this thesis (discussed in section 2.3.6 below) is rooted in both organisational learning theory and social geography.

Arguably the most prominent contribution by Argyris and Schön, however, is the notion of loop learning (Argyris and Schön 1996)[10]. It is visualised in Figure 3. Three different depth of learning are differentiated by the theory of loop learning. Single loop learning aims at a continuation of organisational functioning. It revises strategies, but maintains the goals of the organisation. Double loop learning refers to more profound forms of change, in which organisational goals and values are challenged and revised. Triple loop learning seeks to change the underlying norms and governance structures that provide the context of organisational conduct (Argyris and Schön 1996; Flood and Romm 1996)[11]. Three questions can help to exemplify these different forms of organisational learning: "Are we doing things right?" (single loop learning), "Are we doing the right things" (double loop learning), and "Is rightness buttressed by mightiness and/or mightiness buttressed by rightness?" (Flood and Romm 1996). The concept of loop learning is also discussed as an analytical lens for incremental and fundamental forms of learning in the framework in section 2.3.6.

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[10]The description of the process of loop learning in this paragraph is included in a similar form in an internal emBRACE project co-publication of the author (Pelling et al. 2015: 6). The document is available at the emBRACE website: http://www.embrace-eu.org/outputs.

[11]For a detailed discussion of the origins and conceptualisation of triple loop learning, see Tosey et al. (2011) .

2.2 Conceptualisations of learning

The following section offers a systematisation of different conceptualisations of learning. It aims at synthesising definitions from different disciplines. Such a synthesis is relevant because the review of research traditions of learning above has demonstrated that considerable ambiguity remains as to what exactly learning is. Studies on learning operate with an abundance of different terminologies, ranging from "individual learning", "collective learning", "cognitive learning", "social learning", "policy learning", "organisational learning", "governmental learning", and "rational learning", amongst others.

2.2.1 Learning as change

A point of convergence between different lines of research on learning is their focus on change (Ison et al. 2000; Shuell 2001). The conceptualisation of change varies considerably across research traditions, and has evolved over time. Early behaviourist studies conceptualised learning as a change in behaviour, knowledge, or ability to perform a task (Shuell 2001: 8614). Explicitly excluded from any behaviourist definitions of learning are non-observable changes (Sommerer 2010). Also excluded from early definitions of learning as changes in behaviour are psychological maturation processes or preliminary changes. From a behaviourist point of view, changes in knowledge and the ability to perform tasks would thus need to be "proofed" through observable actions.

Cognitive theories conceptualise learning as changes in "mental processes, knowledge structures, and understanding" (Shuell 2001: 8614). Learning definitions from cognitive theories also acknowledge non-observable changes as learning. In Piaget's work on personality development within children, for example, learning was defined in close relation to changes in mental capabilities of individuals. Social learning research draws on the notion of changes in knowledge, and assumes that these can also occur beyond the individual in social collectives. Reed et al. (2010), for example, suggest a definition of social learning as a change in understanding both within individuals and wider social units or communities of practice. As a consequence of attempting to account for the complex role of the social and cultural environment in learning, definitions of social learning are often very

broad. As Reed et al. (2010: 2) point out, social learning is often implicitly defined as "a process of social change in which people learn from each other". Here, changes in social relationships are only implicitly acknowledged as important drivers of social change.

Change is also a prominent element of learning definitions from the policy learning literature. The conceptualisation of change in policy learning research draws on behavioural, cognitive and social theories of learning. Behavioural elements can be found in the conceptualisation of change as policy change. Definitions of learning from the policy change literature focus on observable and measurable changes, for example the adoption of laws by parliament. This preoccupation with observable manifestations of change is so strong in some studies that policy change is sometimes equated with policy learning (Brody et al. 2009). More nuanced contributions from the policy diffusion and convergence literature assume learning to be determined, for example, by the success of policies, and by the similarity or the physical closeness of states (Volden 2006).

Policy learning research that defines learning as a change in beliefs and preferences (Levy 1994) is influenced by cognitive theories of learning. It acknowledges the active character of learning because it focuses on the interpretation of information through a learning agent. Levy (1994) criticises behavioural conceptualisations of change as too simplistic and underlines the importance of considering alternative explanations. Learning as change in political science research often has a distinct qualitative dimension. In many studies, learning is implicitly perceived as beneficial for achieving particular goals (Levy 1994; Bandelow 2003; Sommerer 2010). Although this assumption closely resembles popular perceptions of learning, it has been criticised for its normative criteria of improvement, and the time periods used for the assessment of improvement (Sommerer 2010).

2.2.2 Learning as interaction

Interaction is a second dimension of learning definitions. Unlike the notion of change, however, interaction has become a prominent element in learning definitions only with the rise of social theories of learning. Earlier cognitive theories implicitly assume that learning relates to the interaction between existing and new knowledge. They conceptualised

learning as an interaction between knowledge systems within individuals. Social learning theories widened this perspective. Their focus goes beyond the individual to networked agents and communities, as well as to the social environment of learning agents. These relational definitions perceive learning to arise from social relationships both between individuals, and between individuals and wider social units (Reed et al. 2010). Learning is defined, for example, as "relations among people in activity in, with and arising from the socially and culturally structured world" (Lave and Wenger 1991: 51).

Interaction between knowledge and belief systems within individuals, on the one hand, and between learning agents, on the other hand, is an important element of learning. Acknowledging the role of interaction for learning puts into focus the dichotomy between established and new ideas, and the formal and informal spaces in which interactions take place. It also sheds light on the formal structure that provides the framework for social interactions.

2.2.3 Learning as construction

The social construction of knowledge and learning is a third theme of learning definitions. It has been shaped, in particular, by the growing awareness of social determinants of learning. Definitions of learning vary according to their expression of how far learning is a socially constructed process. Recent contributions frame learning in the context of the construction of unique mental representations of knowledge within agents (Shuell 2001)[12]. Here, learning is defined as the development of socially appropriate practices for functioning in communities of learners. Greeno, Collins and Resnick (1996:23), for example, argue that when "knowing is viewed as practices of communities and the abilities of individuals to participate in those practices, then learning is the strengthening of those practices and participatory abilities" .

Accepting that learning is a socially constructed process has several implications. First, it requires acknowledgement of the uniqueness of the learning process. Second, it highlights that learning fundamentally depends on the social, historical and cultural context of the

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[12]These approaches contrast with earlier, commodified understandings of knowledge as something to be "passed on".

learner. Third, constructivist definitions of learning point to the role of power, which is an inherent element of both knowledge and relationships (Paechter et al. 2001). Finally, and most importantly, it reveals that the significance of learning arises from the process itself, rather than from its outcome (Jarvis, Holford and Griffin 1998).

2.2.4 Learning as accumulation

The accumulation of knowledge is a fourth theme of learning definitions. Here, learning is conceptualised as a process that is mediated through prior knowledge and experiences. New information interacts with prior knowledge of the learning agent (Rezaei and Katz 1998) to shape the outcomes of the learning process. According to schema theory, the interpretation of new knowledge follows schemas that appear appropriate to the learner (Shuell 2001).

Definitions of learning that consider the accumulation of knowledge are relevant in the context of this project for two reasons. First, they point to the importance of the internal conditions of the learner, and the resulting uniqueness of learned knowledge. Second, they underline some of the difficulties associated with the learning process. If learning is defined as overcoming, amending, or revising prior conceptions, this sheds light on the robustness and path dependency of these conceptions. Cumulative definitions of learning thus help to consider the rigid structure of belief systems and worldviews.

2.3 Analytical Framework

This section describes the analytical framework of the analysis. The aim of the framework is to facilitate an analysis of institutional constraints for social learning in heatwave risk management. The framework takes the shape of a synthesis discussion of existing concepts and theories from social learning theory, political science, and social geography. It does not aim to develop a new theoretical model of learning. It discusses formal and informal institutions (Brown and Duguid 1991; Stacey 1996; Shaw 1997; Pelling et al. 2008), communities of practice (Wenger 1998), groupthink (Janis 1989), epistemic communities (Haas 1992), theories of organisational change (Lewin 1958; Meyer and Rowan 1977; McKelvey

1982; DiMaggio 1983), socio-technical transitions theory (Rip and Kemp 1998; Geels 2002, 2005; Geels and Schot 2007; Markard and Truffer 2008), and the notion of loop learning (Argyris and Schön 1978; Flood and Romm 1996). This selection of concepts is not comprehensive - elsewhere, additional or other concepts will be used to explore social learning and its institutional constraints.

The concepts outlined above were selected because they share a focus on relationships and interaction, for example between formal and informal institutions, between individual and collective learning agents, or between incremental and fundamental forms of change. This focus on relationships relates to metaphors of space in social geography: it reflects on how organisational spaces, both formal and informal, shape capacity for learning, and how learning in turn can create or alter organisational spaces (Bowlby 2001; Pallett and Chilvers 2015). Such a conceptualisation of space as an abstract phenomenon that is produced by the interaction of people was theorised amongst others in Tuan's (1977) seminal contribution to social geographical literature. A focus on the role of organisational spaces for learning capacity sheds light on the messy and contested nature of learning in the social domain, where change unfolds not through rational processes of problem-solving, but incrementally through struggles between individual and collective actors. An overview about the key concepts of the analytical framework and their main contribution is shown in Table 1.

The framework is informed by theories of complexity and complex adaptive systems (Holland 1975; Kauffman 1991; Gell-Mann 1994; Goodwin 1994; Levin 1999). This literature highlights non-linearity, randomness, and uncertainty as characteristics of complex systems. Following Stacey (1996), the framework conceptualises social systems as complex adaptive systems. In the context of this analysis, for example, the hierarchical system of organisations involved in heatwave risk management in the UK can be conceptualised as a complex adaptive system. Complexity theory suggests that learning and change in this system is inherently non-linear, contested and uncertain.

The integration of theories from social learning, political science and social geography in this framework responds to calls for a stronger conceptualisation and acknowledgement of

social dimensions of global environmental change (O'Brien 2010). This includes a recognition of the social interpretation of seemingly objective environmental change contexts identified and analysed by earth system science (Sayer 2000). The framework provides concepts that can help to identify and analyse processes of interpretation, and how they shape social learning in risk management. The discussion of communities of practice, for example, highlights how learning is negotiated between individual and collective agents that share their interpretations of observed phenomena. As O'Brien (2010) points out, this recognition of the multiplicity of perspectives and ontologies is an important contribution of social geography to environmental change research.

Providing concepts and theories for an in-depth analysis of institutional constraints for social learning in disaster risk management, the framework contributes to nuancing research of how innovation and learning can shape future risk contexts. As Robinson (2003) points out, human geography can address limitations of determinism in environmental change research if it focuses on social learning and alternative futures emerging from human behaviour. In the context of this study, the framework highlights the messy and often unpredictable character of learning that depends on the interaction of social actors.

The framework emerged throughout the research process. It was developed inductively based on the data, and remained flexible throughout the project. It was amended to account for emerging themes from the data analysis (Charmaz 2006). Similar sets of theories have been used for the analysis of social learning before, for example in studies on climate change adaptation (Pelling and High 2005; Pelling 2011). This constrains the originality of the framework, but also provides legitimacy, as all concepts of the framework proved to be analytically helpful elsewhere. Originality of the framework stems from the integration of social science theories of learning and change into the analysis of disaster risk management.

2.3.1 Institutional constraints: formal and informal

Formal and informal institutions are at the heart of the analytical framework. Institutions refer to rules that shape social behaviour (North 1990). They are different from organi-

Table 1: Analytical framework: key concepts

Concept / Theory	Focus on	Key Contribution
Formal and informal institutions (Brown and Duguid 1991; Stacey 1996; Shaw 1997; Pelling et al. 2008)	interaction between tangible and intangible aspects of social and organisational life	tension between both institutional systems shapes social learning
Communities of practice (Wenger 1998)	learning in groups and networks	learning is embedded in social relationships
Groupthink (Janis 1989)	constraints on learning in groups	collective learning can be deficient to individual learning
Epistemic Communities (Haas 1992)	expert networks and their influence on policy making	leadership as a key factor for social learning
Theories of organisational change (Lewin 1958; Meyer and Rowan 1977; McKelvey 1982; DiMaggio 1983)	why and how do organisations adapt to new ways of working?	organisations as collective agents can learn on their own right
Socio-technical transitions theory (Rip and Kemp 1998; Geels 2002, 2005; Geels and Schot 2007; Markard and Truffer 2008)	nested analytical scales for social learning	identification of pathways for change, localisation of drivers and barriers of learning across scales
Loop learning (Bateson 1972; Argyris and Schön 1978; Flood and Romm 1996)	different forms and depths of learning	distinction between incremental and fundamental learning and their implications, learning as rigidity rather than change

Source: own

sations, which are conceptualised in this thesis as collectives with agency (Pelling et al. 2008). Institutions can constrain organisational behaviour (Pelling et al. 2008: 869).

Formal institutions refer to the visible and tangible bureaucratic rules and responsibilities through which disaster risk management is delivered by public sector organisations. For heatwave planning in London this includes, for example, the 2004 Civil Contingencies Act and organisational heatwave plans. Formal institutions are canonical (Brown and Duguid 1991) - they are written down and are part of the formal system that governs organisational conduct.

Informal institutions refer to invisible and intangible aspects of social life. These can be values and norms, but also trust relationships between individuals and organisations, as well as informal networks. They form a shadow system (Stacey 1996) of cultural norms, values and actions. Informal relationships and networks are often characterised by high levels of trust. They can provide flexibility to disaster risk management, for example when customary behaviour provides alternatives to the formal bureaucratic rules of conduct.

As part of the analytical framework, the distinction between formal and informal institutions relates to social geographical thought about organisational space, and the way in which it can shape social relationships. In their work on adaptive capacity, Pelling et al. (2008) conceptualised "shadow spaces" as informal organisational spaces that cut across formal organisational structures (Pelling and High 2005). These "shadow spaces of social learning" (Pelling et al. 2008) interact with more formal, canonical systems of learning, manifested in organisational structure, and have potential for adaptive behaviour. This conceptualisation acknowledges tacit activities within informal relationships as learning. Pelling et al. (2008) thus expand more narrow understandings of behaviourist approaches to learning that merely focus on observable, output-oriented organisational behaviour (Swieringa and Wierdsma 1992). Their study acknowledges that individual learning is determined by its social context, and that social collectives have a distinct ability to learn. It goes beyond arguments that situate learning either within individuals or collectives, and highlights the importance of informal relationships and networks as collective spaces of learning.

Shadow spaces are analytically valuable because they go beyond a focus on observable and tangible aspects of social life, and shed light on the hidden and intangible institutions that constrain social learning. They refers to an organisational space that links individuals and organisations both horizontally across organisational sectors or units and vertically across hierarchies. This integrative function of the shadow system is conducive to the dissemination of knowledge. It is of analytical value for the framework because it reveals that the architecture of networks that underpins disaster risk management is more ambiguous and fuzzy than the formal and visible structure of organisations suggests.

Conceptualising a dichotomy between the canonical system of formal institutions on the one hand, and the shadow system of informal institutions on the other hand makes explicit that interactions between both institutional systems shape social learning. It speaks to the theory of Argyris and Schön (1978), which also draws on a tension between espoused theories and theories-in-use (see section 2.1.4). The framework thus points to the contested character of learning in the social domain, where change challenges nested interests and often unfolds through struggles and controversy. Examples of such struggles in the context of heatwave risk management in London are discussed in the empirical analysis, for example in section 5.1.2, which explores how formal rules and responsibilities in heatwave risk management constrained the shadow system of informal institutions and the flexibility that it can provide.

Both the canonical and the shadow system overlap and are closely intertwined (Brown and Duguid 1991; Stacey 1996; Shaw 1997). They can be thought of as being in creative tension - formal rules can constrain informality, but can also provide traction for informal relationships to develop, for example when risk managers meet regularly in institutionalised platforms for emergency planning. At the same time, informal institutions can support formal governance regimes to function, for example when they provide flexibility to inertial rules and regulations. The empirical analysis in section 5.2 explores this complexity by examining how informal networks developed along disaster risk planning platforms in London, and how informal networks supported the formal heatwave planning regime to function.

The ambiguity in the interaction between the canonical and shadow system is valuable for the analytical framework because it directs attention to how formal and informal institutions are closely intertwined, and how this can constrain, rather than facilitate social learning. This thesis argues that if the canonical and shadow system are intertwined, they can stabilise each other. This can consolidate, rather than challenge existing risk management strategies. It is in this focus on rigidity that the framework diverts from the literature that associates informality with innovation, critical reflection, learning and change (Brown and Duguid 1991; Stacey 1996; Gunderson 1999; Nooteboom 2006; Olsson et al. 2006; Pahl-Wostl 2009; Pelling 2011). The framework departs from this assumption to open the analysis to an examination of the constraining effects of informal institutions on social learning.

2.3.2 Definition of learning

Throughout the empirical analysis, different representations of learning will be unpacked. Nevertheless, a conceptualisation of learning is added to the analytical framework as a unifying element that provides common ground for the analysis. The analytical framework's perspective on learning is intentionally kept broad to accommodate different institutional constraints on learning. A narrow definition of learning would risk limiting the analysis of institutional constraints, too, and is thus inappropriate for the explorative character of this study.

In this study, learning refers broadly to processes through which novelty unfolds in social collectives such as organisations or organisational networks. This conceptualisation concerns both individuals and groups, and recognises the social context of individual learning as well as the capacity of social collectives for self-led learning. It places the process of learning within social relationships. The conceptualisation includes both actions and behaviour, although the focus of the analysis is primarily on learning as a process, rather than on learning as an outcome.

The conceptualisation of learning in this study does not imply that every change can be associated with learning, but suggests that learning is always associated with change.

This change might be tangible, for example when actions are revised, or intangible, when learning changes the potential for behaviour of an individual (Pelling et al. 2008: 870) but this potential is not realised or acted upon. On the contrary, changes might occur even if no learning took place. Moreover, if ideas and practices are embraced by individuals but are not manifested in organisational conduct, individuals will have learned, but their organisation did not (Argyris and Schön 1978: 19).

2.3.3 Learning in communities and networks

The framework draws on three concepts that help to substantiate the idea that learning unfolds collectively in groups and networks: Wenger's notion of communities of practice (Wenger 2000), Janis' groupthink (Janis 1982), and Haas' concept of epistemic communities (Haas 1992). This selection is not comprehensive, but analytically valuable because all three concepts speak to the importance of social relationships for learning and change. They highlight the interaction between individual and collective agents as important for social learning. This focus on social learning as embedded in social relationships also informs research on adaptive capacity in the context of climate change (Pelling and High 2005).

The three concepts help to situate learning within relationships between individuals and collective agents. This is a helpful addition to the shadow and canonical systems concept, because it provides another axis along which to explore social learning. Building on the canonical and shadow systems and the three concepts discussed in this section, learning processes can thus be analysed in relation to formal and informal institutional systems, but also within the relationships of individual and collective agents.

A focus on relationships opens the analysis to explore collective learning within groups, communities, or organisations. This is important for the analysis in this study because public sector organisations are agents of disaster risk reduction (Haddow, Bullock and Coppola 2010). A conceptualisation of learning within networks allows for these collective agents to become a unit of analysis without subsuming the role of individuals into a black box. Rather, a focus on relationships for social learning makes explicit the idea

that individual behaviour shapes the processes and actions through which organisations learn (Argyris and Schön 1978). This is analytically valuable in the context of this study because empirical evidence stems from interviews with individuals that reflected on their own conduct in relation to actions and behaviour of their and other organisations, and the constraints for learning and change that arose from this.

2.3.3.1 Communities of practice

Work relating to the concept of communities of practice (Wenger 2000) offers meaningful insights into how relationships between learning agents can facilitate collective learning. This sheds light on the processes, rather than the outcomes, of social learning. A community of practice is a group of people with common interests that "engage in a process of collective learning that creates bonds between them" (Wenger 2001: 2339). The idea of interaction and engagement is central to the concept of communities of practice. Through interaction, individual experiences are shared, and common knowledge, stories and resources are built. For this practice to develop, frequent and repeated interactions over time are important (Wenger 2001). Collective learning arises from the engagement of individual group members with the shared competence of the group. Wenger distinguishes between group competence as the collective knowledge and skills of the group, and the individual experience of group members. Learning takes place if there is a mismatch between both, for example when a new member joins the group.

Communities of practice are conceptualised as building blocks of wider social learning systems, and thus fundamentally shape the ability of social units, including organisations, to learn and to change. Communities are social spaces which hold competence, including common knowledge and practice (Wenger 2000). Social competence is the socially and historically defined and accumulated knowledge of the community as a collective (Wenger 2000: 226). Three elements define competence: joint enterprise (what the community is about), mutuality (the establishment of norms of interaction and engagement), and a shared repertoire of communal resources (e.g. common stories and language) (Wenger 2000: 229). Together, these competences make up the social learning system. For the

analysis of organisational and institutional change, this puts focus on the ability of different communities of practice to connect to each other and to build a network of learning spaces (Wenger 2001).

The notion of learning is conceptualised in research on communities of practice as arising out of the multiple engagements in practice that all members of society form part in. Out of these engagements, informal processes of learning arise, often without explicit awareness of the process on behalf of the learning agent. Wenger defines learning as a constant tension between the shared competence of a community and the experience of each individual member (Wenger 1998). Experience is the individual contribution that each member can make to the community. Whenever there is a mismatch between the two, learning takes place, either on the side of the individual that learns from the shared competence, or on the side of the collective that benefits from the experience an individual member has made (Wenger 2001)[13]. This definition of learning suggests that when learning takes place, both personal and social change come together. The concept of the communities of practice thus speaks to behavioural and social theories of learning.

2.3.3.2 Groupthink

The concept of groupthink (Janis 1989) can add substance to the specification of learning within groups and social collectives. It increases the resolution of the analysis because it reveals that individual experiences can be suppressed by groups to maintain conformity, and that this can result in deficient group performance.

Groupthink suggests that decision-making in groups is strongly biased towards preferable alternatives. As a consequence, relevant information might not be considered. This results in suboptimal decision-making. Several factors contribute to the risk of groupthink: a high level of homogeneity within the group, expressed through the absence of minority or controversial viewpoints, a hierarchical group structure, which allows group leaders to influence decision-making towards their preferable outcomes, and a strong commitment towards specific decision alternatives prior to discussion in the group (Frey and Brodbbeck

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[13]There is no automatism for learning when shared competence of a group and individual experience divert. Janis' (1989) groupthink, for example, demonstrates that contributions of individual experiences can also be suppressed by the group to maintain conformity.

2001). Groupthink manifests itself in a variety of symptoms. Excessive group cohesion and conformity (Hogg 2001) culminates in an overly strong confidence, as lacking alternative viewpoints create the illusion of invulnerability. Groups affected by groupthink further display a willingness to take abnormally high risks, as negative feedback is consistently ignored or downplayed. Members with alternative opinions are perceived as incompetent and are stereotyped. Groupthink also expresses itself in dysfunctional leadership through majority leaders, which value the maintenance of conformity over other aspects of decision-making (Frey and Brodbbeck 2001).

Groupthink problematises the collaborative nature of learning in groups. It adds to the communities of practice literature by pointing out that individual contributions to competence can be suppressed or ignored by the group. Groupthink thus highlights that collective learning can be deficient to individual learning. Collective learning is not necessarily the sum of individual experience (Pelling et al. 2008). The empirical analysis in section 5.1.2.3 provides examples of groupthink in heatwave risk management in London.

2.3.3.3 Epistemic communities

The epistemic community concept (Haas 1992) adds substance to the framework because it sheds light on how actors can influence social learning by pushing or undermining policy innovation. This focus substantiates the notion of learning in networks, as discussed by the literature on communities of practice. It points, in particular, to the role of leadership for social learning. Leadership will be discussed in in the empirical analysis in section 5.2.2.3 and section 5.2.2.4.

The concept of epistemic communities is focused on expert networks and their influence on policy making. It was developed in the international relations literature, and focuses on decision-making in national and international contexts. Epistemic communities are "networks - often transnational - of knowledge based experts with an authoritative claim to policy relevant knowledge within their domain of expertise" (Haas 2001: 11579). What differentiates epistemic communities from other types of groups or networks are their common causal beliefs about the nature of specific problems. Members of an epistemic

community share the same beliefs about what actions are a beneficial solution to a given situation. Further, members of an epistemic community share core assumptions about causality between actions and outcomes, have common criteria for validating knowledge, and agree on a set of practices associated with problems (Haas 2001).

The epistemic communities concept is useful for the analytical framework in that it highlights the messiness of decision-making processes. It challenges the perception that policy is about the application of rationally developed preferences to problems. The influence that epistemic communities can exert on decision-making highlights that policy is rather about ideas and knowledge about the nature of problems, and appropriate responses to them (Haas 2001: 11579). Epistemic communities draw on indecisiveness of policy-makers to shape policy decisions. Research on epistemic communities has been applied, amongst others, to expert networks in international climate change policy (Gough and Shackley 2001) and to economic policies and the liberalisation of capital markets (Chwieroth 2007).

2.3.4 Collective learning

Theories of organisational change (Lewin 1958; Meyer and Rowan 1977; McKelvey 1982; DiMaggio 1983) add to the framework because they make explicit the assumption that learning as change can unfold on a collective level. This body of literature helps to explain why and how organisations as social collectives change.

In its broadest form, the organisational change literature is concerned with the question of why or why not organisations adapt to new ways of working (Dawson 2001). There are three different perspectives (Hannan and Freeman 1984: 150): population ecology theory (Hannan and Freeman 1977; McKelvey 1982) assumes that change in organisations manifests itself through evolutionary processes of the "survival of the fittest"[14], rational adaptation theory holds that change in organisations is driven by designed changes to (often external) pressures (Lewin 1958; Meyer and Rowan 1977; DiMaggio 1983), and

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[14]Theories from the population ecology perspective of organisational change draw on evolutionary theory to explain why structural inertia prevails in many organisations. In contrast to assumptions about the importance of adaptability for survival, these theories explain the high number of organisations that lack flexible structure with advantages that those organisations have in selection processes. These advantages are claimed with reference to the assumption that organisations compete on the basis of the reliability and accountability of their performance, which essentially depend on the capacity to reproduce collective action and structure (Hannan and Freeman 1984: 153-154).

random transformation theory (March and Olsen 1976; Weick 1976) sees organisational change as a largely incremental and uncontrolled process driven by endogenous factors. Together, these theories highlight that not every change in organisational structure or agency is necessarily informed by learning.

Theories of organisational change highlight that organisations as collective agents have capacity for self-led learning[15]. Learning is considered in this literature as an important strategy for survival because organisations compete in a hostile environment that requires adaptation. However, population ecology theories assume that innovation occurs randomly and without specific objectives. As a consequence, change in organisations can be controlled only to a very limited degree (March and Olsen 1976). As Hannan and Freedman (1984: 151) point out: "organizational outcomes may be decoupled from individual intentions; organizations may have lives on their own. In this case it is not enough to ask whether individual humans learn and plan rationally for the future. One must ask whether organizations as collective actors display the same capacities."

A common theme in the literature on organisational change is the antagonistic relationship between initiatives for change and structural resistance on the side of the organisation (March 1981). Initiatives for change might result from individuals, collective agents such as organisational units, or from external pressures. Therefore, the assumption of inertia of structure does not equal the claim that organisations do not change. Rather, inertia is defined in relation to the differences in pace of organisational and environmental change. If uncertainty and complexity drive changes in the environment more quickly than adaptation in the organisation, structures of the latter can be assumed to have inertia (Hannan and Freeman 1984).

2.3.5 Analytical scales for learning

The literature on socio-technical transitions (Rip and Kemp 1998; Geels 2002, 2005; Geels and Schot 2007; Markard and Truffer 2008) is used to conceptualise nested analytical scales

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[15]By acknowledging the autonomy of the collective, theories of organisational change share assumptions with theories of social and organisational learning, which equally highlight the capacity of collectives to learn in their own right. The difference between both strands of theory, however, lies in the focus that is put on structure (organisational change theories) and learning (social learning theories).

for social learning. The socio-technical transitions literature is a valuable addition to the framework because it strengthens its conceptualisation of social space, and thus elaborates on the relationship of the framework to social geographical thought. It locates innovation and change within the analytical scales of niches, regimes, and landscape, and helps to identify how driving or constraining factors across these scales shape social learning.

The socio-technical transitions literature encompasses a broad range of studies from different disciplines. It draws on evolutionary theory and aims to explore transformations that are driven by socio-technical innovation. Innovation in this body of literature is predominantly framed as socio-technical innovation, but can also include less tangible forms of innovation relating to knowledge, cognition, and communication. Transitions are framed as "shifts from one stable socio-technical regime to another" (O'Brien et al. 2012: 468).

The framework draws on the multi-level heuristic of socio-technical innovations, in particular (Geels 2002; Geels and Schot 2007; Markard and Truffer 2008). The multi-level heuristic puts into focus how novelty and innovation interact with constraining factors at interrelated analytical scales. It provides useful metaphors about interrelated spaces, and the way in which they shape the development of novelty. Geels (2005) specifies three analytical levels of system innovation and change: at the micro-level, technological niches provide protected spaces for learning and innovation. Niches allow personal relationships, social capital and social networks to flourish and thus facilitate socio-technical innovation. At the meso-level, socio-technical regimes define the rules and norms, governance structures and knowledge bases which apply to local niches. At the macro-level, socio-technical landscapes set the context for change and innovation processes. Landscapes refer to fundamental societal phenomena and norms like globalisation, and environmental and cultural changes (Geels 2005: 683-684). Landscapes are instrumental in facilitating the breakout of innovations from their protected niches by destabilising existing regimes and the control that they exert over niches (O'Brien et al. 2012: 468). The three analytical scales are different from administrative scales (individual, local, regional, national etc.).

The multi-level heuristic offers analytically valuable metaphors about cross-scalar nested

spaces for change and innovation, and the phenomena and processes that facilitate or constrain transitions in this system. This identification of pathways for change is what Pelling (2011: 74) considers as one of the useful contributions of the socio-technical transitions literature. The heuristic's focus on the interaction between analytical scales fits well with the other relational concepts specified in this framework, whose main contributions also lie within their focus on dynamic interactions, both between the shadow and canonical system and between individual and collective learning agents.

Recent contributions to the socio-technical transitions literature suggested that innovation is not necessarily confined to the level of niches, but that novelty can also emerge at the level of regimes or landscapes (Seyfang and Smith 2007). The analytical framework follows this argument and acknowledges that innovation can also originate at the meso-level or macro-level. Used as an analytical lens in section 5.3, the socio-technical transitions literature helps to unpack, for example, the 2012 Health and Social Care Act (HSCA) as a transformation of the public health system in the UK that emerged at the regime-level. It also explores a shift towards preventive risk planning that considers social, environmental and technical dimensions of heat stress as an incremental niche-level transition.

The socio-technical transitions literature has been criticised for its failure to distinguish conceptually between transition and transformation (Pelling 2011: 73-74). Pelling argues that transition refers to incremental changes that fall short of overturning existing regimes, and transformation to fundamental changes that alter or overturn dominant regimes. The framework acknowledges this lack of clarity of the socio-technical transitions literature. It draws on the notion of loop learning (Argyris and Schön 1978), and not on the socio-technical transitions literature to distinguish between different depths of learning.

2.3.6 Incremental vs. fundamental learning

The concept of loop learning (Argyris and Schön 1978) adds to the analytical framework because it helps to distinguish between different depths of learning. Loop learning adds conceptual clarity to the distinction between incremental and fundamental learning raised by the socio-technical transitions literature. As pointed out above, this body of literature

is criticised for failing to differentiate clearly between transition as incremental, and trans-
formation as fundamental change (Pelling 2011: 73-74). Here, loop learning can provide
a sharper analytical lens than the socio-technical transitions literature.

Loop learning sheds light on inertia that follows from incremental learning processes.
When learning unfolds as the optimisation of actions, it can help to reproduce existing
risk planning regimes and support their rigidity. Single loop learning thus suggests that
learning can be about stability, rather than change (Bateson 1972). It is through this focus
on learning for rigidity that the concept contributes to the main argument of this study.
For example, the analysis in section 5.2 explores how incremental learning processes helped
to consolidate existing strategies at the local level, and how this undermined change in
heatwave risk management in London.

Different forms of learning are distinguishing in loop learning theory according to the
depth of critical reflection that they trigger[16]. Single loop learning revises strategies to
pursue existing organisational goals. These goals are challenged by double loop learning.
It revises organisational values and policies and can induce fundamental changes to organi-
sational behaviour (Argyris and Schön 1996). Triple loop learning (Flood and Romm 1996;
King and Jiggins 2002; Keen 2005) concerns underlying governance norms and protocols
that provide the framework for single and double loop learning. It points to the political
and power relations that underpin social learning processes (McCarthy et al. 2011). When
social learning unfolds as fundamental change that challenges existing regimes, it is likely
to provoke resistance from interests that are supportive of the status-quo. This points
to the contested nature of learning in the context of climate change, and highlights that
learning can be shaped by leadership, hierarchy, and line management. Power dynamics in
triple loop learning will be discussed in section 5.2.2.3 and section 5.2.2.4 of the empirical
analysis.

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[16]The description of the process of loop learning in this paragraph is included in a similar form in an
internal emBRACE project co-publication of the author (Pelling et al. 2015: 6). The document is
available at the emBRACE website: http://www.embrace-eu.org/outputs.

2.4 Summary

This chapter developed the analytical framework of the project. It aimed at unfolding the theoretical assumptions that guide the analysis. The chapter contextualised the study in research traditions of learning from various academic disciplines and systematised different conceptualisations of learning along four dimensions. The framework developed in this chapter facilitates the analysis of institutional constraints for social learning in disaster risk management in chapter 5. The focus of the framework is on relationships and interaction. Key concepts of the analytical framework include formal and informal institutions (Brown and Duguid 1991; Stacey 1996; Shaw 1997; Pelling et al. 2008), communities of practice (Wenger 1998), groupthink (Janis 1989), epistemic communities (Haas 1992), theories of organisational change (Lewin 1958; Meyer and Rowan 1977; McKelvey 1982; DiMaggio 1983), socio-technical transitions theory (Rip and Kemp 1998; Geels 2002, 2005; Geels and Schot 2007; Markard and Truffer 2008), and the notion of loop learning (Argyris and Schön 1978; Flood and Romm 1996).

The key contribution of the framework is its integration of theories and concepts from social learning theory, political science and social geography. The study does not develop a new heuristic of learning, but integrates existing theories into a framework that facilitates a relational analysis of social learning and its institutional constraints. The next chapter introduces the empirical subject area of this thesis.

3 Empirical Subject Area

This chapter discusses the empirical subject area of the study. The aim of this chapter is to provide background information for the empirical analysis. It discusses heatwave risk in the context of climate change, the National Heatwave Plan for England and the organisational architecture of heatwave planning in London. The discussion in this chapter highlights key aspects and stakeholders and is predominantly descriptive, rather than analytical. Many of the risk planning arrangements described in this chapter are not specific to heat risk, but apply to UK contingency planning in general.

Heatwave planning in the UK compromises a diverse range of policy areas, organisations, and responsibilities and unfolds in the context of risk planning for other hazards. There is no coherent system of heatwave risk management across local government organisations in the UK. Although the National Heatwave Plan provides advice on a core set of risk planning arrangements, local organisations are free to divert from it. Specific planning approaches for heat thus vary across planning organisations and across scales. Some strategies go beyond the advice provided by the National Heatwave Plan while others fall short of it. This chapter aims at acknowledging this complexity while providing some structure to the fuzzy set of roles and responsibilities involved.

The chapter is comprised of three sections. The first section reflects on heatwaves as a natural hazard in the context of climate change. It acknowledges that there is no common definition of heatwaves, highlights selected meteorological, epidemiological and social aspects of heat stress, and considers strategies to address adverse effects of heatwaves. The second section elaborates in more detail on heatwave planning in the UK. It discusses the organisational, legal, and policy framework for heatwave planning. A particular focus is put on the National Heatwave Plan as the central planning regime for heat risk in the UK. The third section outlines the organisational architecture of heatwave planning in London. It focuses on London's 33 local authorities and on organisations from the NHS, and characterises the organisational networks and platforms that support risk management of these organisations. The chapter closes with a brief summary.

3.1 Heatwaves in the context of climate change

This section reflects on heatwaves as a natural hazard in the context of climate change. It discusses the lack of a common definition for heatwaves, meteorological, epidemiological and social aspects of heat stress, and strategies to plan for and respond to heat risk.

3.1.1 Definitions of heatwaves

Definitions of heatwaves are inconsistent, and this constrains predictions about the frequency and magnitude of future heat stress (Robinson 2001; Souch and Grimmond 2004; Zaidi and Pelling 2013). The World Meteorological Organisation (WMO) defines a heatwave as a period of time "when the daily maximum temperature of more than five consecutive days exceeds the average maximum temperature by 5 °C" (Met Office 2014*a*: 1). The UK Met Office acknowledges that there is no official definition of a heatwave in the UK. Instead, the National Heatwave Plan outlines temperature thresholds for different parts of the country that indicate a heatwave (shown in Table 2). Elsewhere, methods to assess heat stress and thermal comfort go beyond maximum daytime temperatures and consider, amongst others, physiological (Spagnolo and de Dear 2003) and environmental aspects such as humidity (Sparks, Changnon and Starke 2002) and air pollution (Rooney et al. 1998).

In this thesis, a heatwave is defined as an extended period of unusually high heat stress that generates a social response (Robinson 2001; McGregor et al. 2007). The study applies a broad definition because it is primarily interested in the social strategies to plan for and respond to heatwaves, and the way in which these are constrained institutionally. The definition emphasises that a heatwave is inherently linked to the affected population, and thus goes beyond meteorological aspects to include social dimensions of heat risk.

3.1.2 Meteorological, epidemiological and social risk factors

There is strong scientific evidence that heatwaves are likely to increase in frequency, length and magnitude in the context of climate change (EEA 2012; WorldBank 2012; IPCC 2012, 2013; Christidis, Jones and Stott 2014). 2014 was the warmest year on record, according

to the National Aeronautics and Space Administration (NASA) (NASA 2015). Major heatwaves have affected many parts of the world in the past decade, including Europe in 2003 (Robine et al. 2007; WHO 2009), Russia in 2010 (Revich 2011), the United States in 2012 (Peterson et al. 2013), China in 2013 (Sun et al. 2014) and Australia in 2014 (BoM 2014). Climate change projections for Europe find that temperatures similar to the European heatwave in 2003 are within average expected temperatures by 2050, and cooler than average summer temperatures towards the end of the century (Stott, Stone and Allen 2004). In a recent study, Sun et al. (2014) suggest that even under conservative CO_2 emission scenarios, summer temperatures comparable to the 2013 heatwave in China will be observed every second year within two decades. In the UK, heat-related deaths are expected to increase by up to 250% until 2050 (Hajat et al. 2014).

Heat has significant adverse effects on human health (Kovats and Hajat 2008; WHO 2011). Adverse effects of heat on health include heat stroke, heat exhaustion and heat syncope (Kilbourne 1997). A person suffering a heat stroke has a core body temperature of 40,6 °C or higher. Heat strokes can cause organ failure, and can ultimately result in death. As Kovats (2013) points out, the case-mortality ratio for heat stroke is substantial. However, most deaths attributed to heat are statistically calculated based on observed temperature-mortality relationships, for example by calculating the observed number of deaths during a heatwave compared to expected mortality levels. Methods for estimating health implications of heat are often not standardised, and this constrains a comparison of figures across countries (Kovats and Kristie 2006).

The 2003 European heatwave is associated with 45,000-70,000 deaths across Europe (Robine et al. 2007), and 54,000 people died due to the heatwave in Russia in 2010 (Revich 2011). In the United States, most deaths caused by all natural hazards are attributed to heatwaves (NOAA 2013)[17]. Epidemiological studies suggest that vulnerability characteristics for heatwaves are diverse. The at-risk group includes elderly and infants (Flynn, McGreevy and Mulkerrin 2005; Kovats and Hajat 2008; Kenny et al. 2010), acute or chron-

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[17]Perspective to these figures is gained through a consideration of excess winter mortality, which is consistently higher than for heat (Wolf, Adger and Lorenzoni 2010). In the UK, winter mortality in 2012/2013 was 31,100 and 24,200 in the winter of 2011/2012 (ONS 2013). The use of excess winter deaths as a measure for weather-related mortality is contested, however (Staddon, Montgomery and Depledge 2014; Hajat and Kovats 2014).

ically ill (e.g. respiratory and cardiovascular) (Fouillet et al. 2006; Stafoggia et al. 2008), people on medication (Hajat, O'Connor and Kosatsky 2010), people being confined to bed (Bouchama, Dehbi and Chaves-Carballo 2007), socially isolated people (Klinenberg 2003; Kovats and Hajat 2008), people with low socio-economic status (Basu 2002; Flynn, McGreevy and Mulkerrin 2005), those living in in poor housing conditions (Kovats and Hajat 2008), and elderly in care homes and hospitals (Kovats, Johnson and Griffith 2006). Urban areas subject to high air pollution are particularly affected by the adverse effects of heat (Ren et al. 2008; Smargiassi et al. 2009).

Scientific evidence suggests that social factors are co-productive of heatwave vulnerability (Klinenberg 2003; McGregor et al. 2007; Wolf and McGregor 2013). This line of research adds to the body of literature that focuses on epidemiological aspects of heatwave risk and vulnerability (Johnson, Kovats and McGregor 2005; Hajat, Kovats and Lachowycz 2007; Schifano et al. 2009). It sheds light on the way in which vulnerability to heatwaves is produced through social dynamics. For example, the role of social networks in mediating heatwave vulnerability is discussed controversially within this body of literature. Klinenberg (1999) finds that social isolation was a crucial factor contributing to the significant impact of the 1995 Chicago heatwave, particularly in socio-economically deprived urban areas. In contrast, Wolf et al. (2010) suggest that strong bonding networks might actually exacerbate heat vulnerability by reinforcing narratives about coping capacities among at-risk people.

Research on the implications of heat risk also focuses on issues such as building design (Wilby 2007; NHBC 2012), urban climate (Lindberg and Grimmond 2011; Thorsson et al. 2011), infrastructure systems, including energy (Walsh 2011) and transport (Doll, Papanikolaou and Maurer 2014), biodiversity (Garrabou et al. 2009), and crime (Cohn 1990; Field 1992), amongst others. This literature is acknowledged here, but lies beyond the scope of this study. It suggests that adverse effects of heat are diverse and extend well beyond implications for human health. Nevertheless, public response strategies to heat risk seem to be shaped primarily by concerns for health-related aspects of heatwave risk, and are focused in particular on the dissemination of alerts and warning to risk plan-

ning organisations and vulnerable groups. This suggests that current response strategies selectively address particular adverse effects of heatwave risk.

3.1.3 Addressing adverse effects of heat

The heatwave of 2003 revealed that many European governments underestimated the adverse effects of heat on health. Previous to the event, heatwave warning systems only existed sporadically and were limited to particular cities, for example in Lisbon and Rome (Pascal et al. 2006; Nogueira and Paixão 2008). The impact of the 2003 heatwave shed light on the need for more systematic heatwave planning of public sector organisations. Consequently, heatwave risk management systems were developed across Europe, and in the UK. This development followed recommendations of WHO Europe, which after a review of the implications of the 2003 heatwave urged governments to develop heat health warning systems (HHWS) (WHO 2003: 10-11). Member states were asked to systematically integrate considerations of heatwave risk into their national and local scale emergency planning.

Although heatwave risk management is often carried out by public sector organisations (Bernard and McGeehin 2004; Lowe, Ebi and Forsberg 2011; Martinez, Imai and Masumo 2011), little attention is paid in the literature to the organisational and institutional architecture that underpins heatwave risk management regimes. Rather, studies discuss methodological improvements for HHWS (Nogueira and Paixão 2008; Michelozzi et al. 2010; Chebana et al. 2013), review their development and implementation (Pascal et al. 2006) or their effectiveness in triggering behavioural change (Kalkstein and Sheridan 2007). This study aims to address this gap in the literature by focusing on institutional constraints for social learning in organisational heatwave risk management.

HHWS aim to reduce the adverse effects of heat through alert messages to public authorities, emergency services, and to the public (WHO 2009). They draw on meteorological data and scientific evidence to forecast extreme heat and to provide advice and information on how to respond to heat stress. The 1995 HHWS developed in Philadelphia is considered as one of the first sophisticated warning systems (Sheridan and Kalkstein 1998; Lass

et al. 2011). It included a range of meteorological variables beyond temperature measures to forecast the risk of adverse effects of heat on health. Interventions included media announcements, home visits by representatives from health organisations, and the provision of cooling centres (Kalkstein et al. 1996). In Europe, HHWS have been developed on a large scale only after the heatwave in 2003. Estimates about the number of operational HHWS in Europe vary considerably. Liukaityte and Koppe (2009 - cited in Lass (2011: 4-5) suggest that there were 28 operational HHWS in 2009. Lowe, Ebi, and Forsberg (2011) suggest that there are only 12 operational HHWS in Europe. They find that typical features of European HHWS are timely heat warnings, communication of alert levels to specific stakeholders, advice on avoidance strategies to particularly vulnerable groups, as well as advice for the public (Lowe, Ebi and Forsberg 2011: 4645).

Heatwave early warning systems are often embedded in strategies that provide advice to local organisations on how to plan for and respond to heat stress (Kovats and Kristie 2006). This highlights that many heatwave warning systems are implemented locally, and that they vary with regard to their institutional architecture. This also holds for the National Heatwave Plan for England, which will be discussed in more detail below. A common element between heatwave plans across Europe is their organisational ownership by national health departments and the meteorological service, according to Lass et al. (2011). This indicates that heatwave risk and vulnerability are predominantly perceived as a public health problem, and suggests that social, environmental, and technical aspects of heat risk are not yet reflected systematically in heatwave response strategies in Europe.

3.2 Heatwave planning in the UK

This section discusses the organisational, legal, and policy framework for heatwave planning in the UK. In particular, it reflects on the National Heatwave Plan for England as the risk planning regime in the UK.

3.2.1 Heatwave risk in the UK

The UK national risk register suggests that there is a 1 in 20 to 1 in 2 risk of a heatwave occurring within the next five years, and estimates a medium impact score[18] for the event (Cabinet Office 2013a: 10). The country was affected by a series of heatwaves over the last decade. The most notable impact can be attributed to the 2003 heatwave, which is associated with about 2,000 deaths in the UK (Johnson, Kovats and McGregor 2005; Kovats, Johnson and Griffith 2006), compared to about 15,000 in France (Fouillet et al. 2006). The 2003 heatwave helped to put focus in the UK on the health impacts of climate change (WHO and WMO 2012). Further heatwave events in the UK took place in 2006 (680 excess deaths) (PHE 2014), 2009 (300 excess deaths) (PHE 2014), and 2011 (367 excess deaths) (Green et al. 2012).

A level three (maximum warning level: four) heatwave alert was issued in July 2013 for parts of the UK, including London. Temperatures in the country exceeded 30 °C for seven consecutive days. According to the Met Office, July 2013 marked the third warmest July since 1910, and was considered to be the most notable heatwave since 2006 (Met Office 2013). A map displaying UK mean maximum temperatures in July 2013 is shown in Figure 4. It shows that the July 2013 heatwave concerned South East England, in particular. The map also illustrates that during the heatwave, London had the highest mean maximum temperatures in the UK. A recent study found that syndromic surveillance data showed a minor health impact of the July 2013 heatwave in the UK (Elliot et al. 2014). Informed statements about how far this minor impact of the heatwave can be attributed to heatwave risk management in the UK are not possible at the moment, but this question might be of interest to future research on the subject.

3.2.2 Organisational framework

Heatwave risk management in the UK unfolds through a hierarchical and bureaucratic system of public sector organisations. Local authorities and NHS organisations are key

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[18]The impact score of the National Risk Register is calculated by an assessment of the expected consequences of a particular event considering fatalities, illness or injury, social disruption, economic harm, and psychological impact. These categories are scored on a scale of 0-5, and the overall score is calculated as the mean of all five individual scores (Cabinet Office 2013a: 4).

Figure 4: UK mean maximum temperatures, July 2013
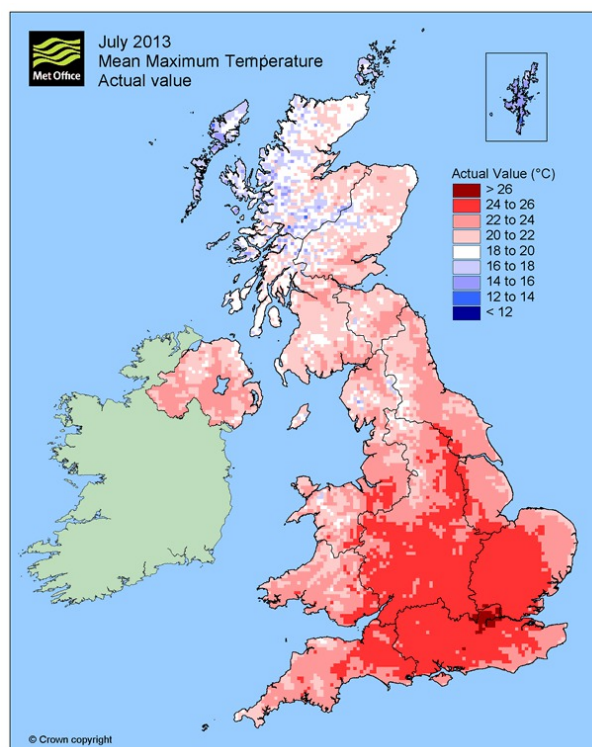
Source: Met Office (2014a)

stakeholders in heat risk management in the UK. Local authorities and NHS trusts are category 1 responders under the 2004 Civil Contingencies Act (CCA): they have a primary responsibility to plan for and respond to emergencies (LESLP 2012). Category 1 responders also include the emergency services. The CCA further differentiates Category 2 responders, which are usually not directly involved in risk planning, but can play an important role in emergency response. Category 2 responders include utility companies and public transport organisations, amongst others.

Risk planning of category 1 responders in the UK is guided by national, regional, and local risk assessments. Risk registers at the national and London scale include heatwaves (Cabinet Office 2013a; GLA 2014). Within local authorities, heatwave planning is usually lead by the emergency planning team. Depending on the organisational context, it also includes public health teams, adult social services, housing and planning, and environment and sustainability teams. In case of a severe heatwave, emergency responders like the fire brigade, the ambulance service and the police, as well as category 2 responders such

as utility and public transport companies would also be involved in response measures. Moreover, the voluntary sector can be involved in local risk planning arrangements.

Risk planning of different organisations or organisational units is coordinated at the local level in Borough Resilience Forums (BRFs). These forums are multi-agency platforms for coordinating emergency planning at the local level. They convene all category 1 responders, but might also involve category 2 responders and other organisations that are of relevance to emergency planning (Cabinet Office 2013c). Borough Resilience Forums are supplemented in London by six non-statutory Sub-Regional Resilience Forums (SRRFs) and a pan-London Resilience Forum. This structure is unique to London.

3.2.3 Legal framework

The legal framework for heat risk management in the UK is primarily set by the 2004 Civil Contingencies Act and the 2012 Health and Social Care Act. The discussion of both parliamentary acts in this section briefly highlights those aspects that are most important to heatwave planning. It does not offer a comprehensive overview about the scope of both acts and their significance[19]. Both acts provide an institutional structure in which heatwave planning unfolds. The National Heatwave Plan is not a legally binding policy but a non-statutory advice to local organisations. The plan thus informs planning within the structures defined by both parliamentary acts.

3.2.3.1 2004 Civil Contingencies Act

The 2004 Civil Contingencies Act provides a framework for civil protection in the UK. It outlines a leading responsibility for local authorities in emergency planning and response in the UK (Cabinet Office 2013b). The CCA is important for heatwave planning because it provides the legal mandate for contingency planning at the local level. It replaced the 1948 Civil Defence Act.

As part of a regular review process, the 2010 Enhancement Programme introduced some legislative changes to the Civil Contingencies Act (Cabinet Office 2009). These affected,

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[19]For further information on the role of the CCA in UK emergency preparedness, see O'Brien (2006), for further information on the Health and Social Care Act, see DH (2012b).

amongst others, the organisational architecture of risk planning at the local level. In London, responsibilities of local resilience forums were both down- and up-scaled. Prior to the 2010 Enhancement Programme, there used to be six statutory Sub-Regional Resilience Forums in London, corresponding to six police districts. Sub-Regional Resilience Forums were hosted by the London Fire Brigade. After the 2010 Enhancement Programme, Sub-Regional Resilience Forums lost their statutory character. Instead, responsibilities were downscaled to the borough level, as Borough Resilience Forums became statutory. Additionally, a pan-London Resilience Forum was established. Sub-Regional Resilience Forums continue to exist on an informal basis, and as an institutional link between Borough Resilience Forums at the local, and the London Resilience Forum on the regional scale (LRT 2013). Provisions for contingency planning of the 2004 CCA are reinforced in London by the "Minimum Standards for London", a policy of the Greater London Authority that outlines particular risks that local authorities need to plan for.

3.2.3.2 2012 Health and Social Care Act

The 2012 Health and Social Care Act reorganised the public health system in the UK (DH 2012b). It is of importance to heat risk management because it amended large parts of the organisational system through which heatwave planning is delivered, and because it redefined roles and responsibilities of healthcare organisations directly involved in heatwave planning. During the time of data collection for this thesis in 2013, the 2012 HSCA had recently been implemented, and many respondents struggled with adjusting to new roles and responsibilities[20].

The HSCA aimed to strengthen the role of local authorities in healthcare (DH 2013). It created two new bodies at the local level: the Clinical Commissioning Groups (CCG) and the Health and Well-being Boards (HWB) (DH 2012a). Both bodies are supported by a public health team in the local authority. This system replaced provisions that saw public health commissioning and provision entirely within the NHS, and therefore separate from local authorities. CCGs and HWBs replaced NHS Primary Care Trusts (PCTs) and Strategic Health Authorities (SHAs), which lead public health provision prior to 2012.

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[20]The implications of this unique situation for the findings of this thesis are discussed in section 4.5.4.

Figure 5: Overview of health and social care structures in the 2012 HSCA
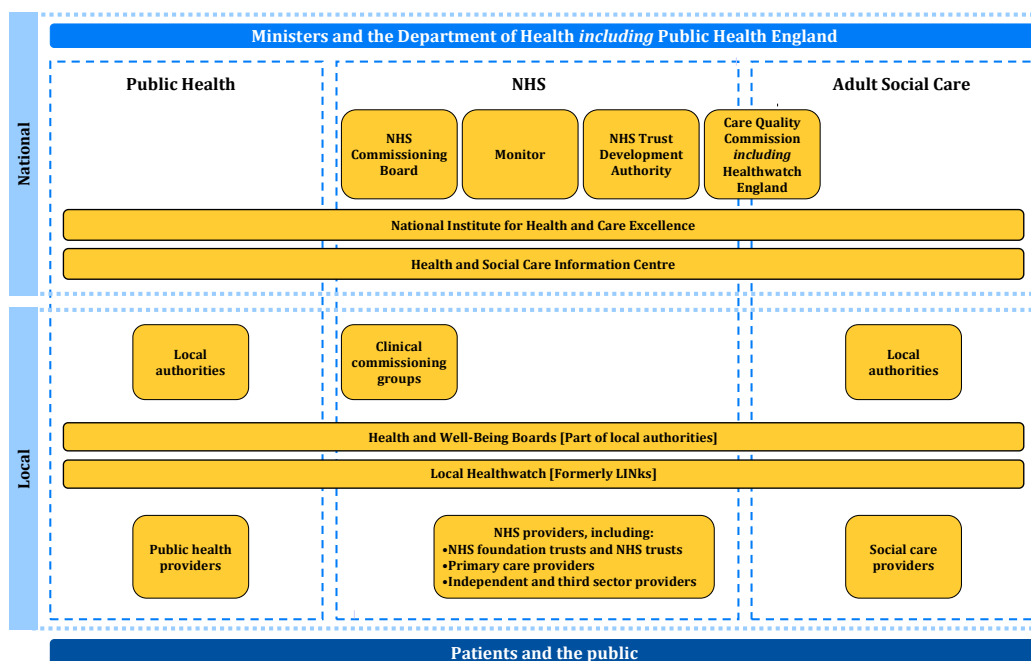
Source: DH (2012a: 16)

An overview about health and social care structures implemented by the 2012 HSCA is shown in Figure 5. It indicates that local authorities and Clinical Commissioning Groups are stakeholders at the local level that shape public health commissioning and provision. This is important for this thesis because the empirical analysis reflects viewpoints on the relationship between the CCGs and local authorities, and how this relationship is constrained institutionally. Figure 5 shows that Clinical Commissioning Group have a central position at the local level. CCGs are clinically-led commissioning bodies for healthcare - they bring together General Practitioners (GPs) from a geographical area. Geographical areas for CCGs mostly overlap with those of local authorities in the UK. Health and Well-Being Boards cut across the NHS and local authorities at the local level. They bring together local stakeholders in healthcare, including commissioners, and aim at better integrating public health provision at the local level. HWBs produce, amongst others, Joint Strategic Needs Assessments and Joint Health and Well-Being Strategies as tools to assess and prioritise healthcare needs.

3.2.4 Policy framework: National Heatwave Plan for England

The National Heatwave Plan is at the heart of heat risk management in England. It is a non-statutory document that provides advice and guidance on how to plan for heat risk. The plan is targeted at a broad audience, including healthcare organisations, local authorities, the voluntary sector, and professionals involved in heatwave planning (PHE 2014). The heatwave plan is issued annually by Public Health England, an executive agency of the UK Department of Health. It was first developed in 2004 in response to the impact of the 2003 heatwave in UK. In contrast to cold weather planning, which has a long-standing tradition in the UK, public policy on heat risk is thus a relatively recent phenomenon (Wolf, Adger and Lorenzoni 2010). Since 2004, the plan is reviewed and updated on an annual basis. Public Health England revises the plan based on stakeholder feedback gathered through an annual conference (DH and HPA 2012, 2013).

The National Heatwave Plan provides a blueprint for heatwave planning that can be adapted by local authorities to their specific organisational context. This helps local authorities to meet their statutory responsibilities to plan for and respond to emergencies. It means that local authorities don't have to conceptualise heatwave planning individually, but that they can rely on the guidance of the plan. While this facilitates the development of heatwave plans within local organisations, the top-down strategy to heatwave planning in the UK might also undermine a thorough examination of risks by local emergency planners and health specialists. Evidence from the interviews conducted for this project suggests that the National Heatwave Plan often is adopted without much consideration for the specific organisational context. This "copy-paste" strategy allows risk managers to demonstrate that they are meeting their statutory responsibilities without having to invest much time and resources in what is often considered an insignificant risk (Abrahamson and Raine 2009).

3.2.4.1 Heat-Health Watch alert system

A central element of the National Heatwave Plan is the "Heat-Health Watch alert system" (PHE 2014: 12-16). This system provides hot weather and heatwave alerts to local au-

thorities, healthcare organisations and other stakeholders in heat risk management. It is active from June 1st until September 15th each year. The Heat-Health Watch alert system is operated by PHE in close cooperation with the Met Office. It is based on five alert levels, some of which are linked to regionally-specific temperature thresholds, shown in Table 2. If threshold temperatures are reached, the Met Office notifies risk planning organisations of the specific alert level. Alerts are disseminated to local organisations via email. When receiving heatwave alerts through the early warning system, local authorities are expected to implement specific planning arrangements corresponding to the alert level. These are outlined in the National Heatwave Plan, and discussed in more detail in section 3.2.4.2.

The typical cascade of heatwave alerts as outlined in the National Heatwave Plan is shown in Figure 6. The Met Office is the central stakeholder in the early warning system. It disseminates heatwave alerts to various stakeholders at the national, regional, and local level. A notable aspect of the cascade shown in Figure 6 is that NHS England and local authorities are positioned as gatekeeper organisations. They receive heatwave alerts directly from the Met Office, and are expected to disseminate alerts further, through administrative and hierarchical scales. The NHS, for example, is expected to disseminate alerts to Clinical Commissioning Groups, ambulance trusts and GPs, amongst others. Local authorities are expected to disseminate alerts to Health and Well-Being Boards, schools, voluntary organisations and to the social services, amongst others. The analysis in section 5.2.2.2 will show, however, that this hierarchical structure of risk communication is complemented and sometimes substituted with informal communication channels not included in the cascade as shown in Figure 6.

A striking aspect of the cascade of heatwave alerts is the missing cross-over between the NHS and local authorities. This is surprising because both organisations are key stakeholders in local heatwave planning. Evidence presented in section 5.2.2.2 suggests that missing communication between both organisations during the heatwave in July 2013 caused problems in the response of a London local authority. A Director of Public Health from the a local authority did not know what information about the heatwave was given to local GPs by the NHS. This constrained their ability to coordinate response measures dur-

Figure 6: Cascade of heatwave alerts in the UK
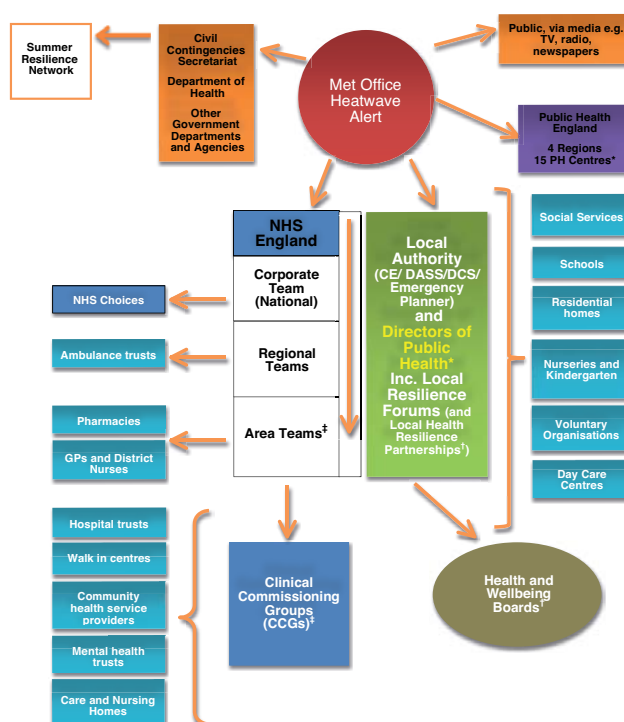
Source: PHE (2014: 16)

ing the heatwave. Such challenges in communication between two important stakeholders in local heatwave planning might be reinforced by the absence of formal communication channels in the cascade of heatwave alerts outlined in the National Heatwave Plan.

Heatwave alert levels are summarised in Table 3. The alert system differentiates between five alert levels. The five alert levels can broadly be classified in three categories: a) long term preventive planning for heatwaves (Level 0-1), which goes well beyond contingency management and includes issues such as education, housing interventions and urban planning; b) acute heatwave response (level 2-3), including local authority emergency planning as well as public health and social care actions; and c) disaster management (level 4) in case of an extremely severe heatwave with unprecedented health impacts.

Level 0 refers to year-round, long term planning. Level 1 is the heatwave and summer preparedness programme, which encourages local authorities to plan for heatwaves when summer approaches. Levels 2 ("Heatwave in forecast - alert and readiness") and 3 ("Heatwave Action") are linked to temperature thresholds. Level 2 is issued by the Met

Table 2: National Heatwave Plan: local threshold temperatures (°C)

Region	Day	Night
London	32	18
South East	31	16
South West	30	15
Eastern	30	15
West Midlands	30	15
East Midlands	30	15
North West	30	15
Yorkshire and Humber	29	15
North East	28	15

Source: PHE (2014: 40)

Office if there is a 60% or greater chance of significant adverse effects of heat on at least two consecutive days. Level 3 is issued for those regions that reach heatwave threshold temperatures. Finally, level 4 denotes a major incident and would invoke emergency and disaster planning. Unlike levels 2 and 3, level 4 is not triggered by temperature thresholds, but is based on judgement by national government. Since the development of the National Heatwave Plan in 2004, a level 4 alert has never been declared.

Threshold temperatures specified in the National Heatwave Plan vary across regions. The London threshold temperatures are the highest, with 32°C during the day and 18°C during the night. Especially the night time maximum temperatures are significantly higher in London than in the rest of England, with 2°C higher compared to South East and 3°C higher for all other parts. These differences in temperature thresholds are controversial in the risk planning community of practice. The rational for introducing different temperature thresholds in heatwave alert systems is to account for the population's adaptation to their local climate (Kovats and Kristie 2006: 594). However, there seemed to frustration with the different temperature thresholds among respondents of this study. An Emergency Planning Officer from a London local authority expressed concerns that

> [...]the triggers are too high for London. I understand why they argue that they are higher for London than in other parts of the country, but I think that people are sensitive to heat no matter where they are from. Why would a Londoner be more adapted to heat than someone from other parts of the country? (MI-NE-06:36).

Table 3: National Heatwave Plan: heatwave alert levels

Level 0	Long-term planning *All year*
Level 1	Heatwave and summer preparedness programme *1 June - 15 September*
Level 2	Heatwave is forecast - Alert and readiness *60% risk of heatwave in the next 2 - 3 days*
Level 3	Heatwave Action *Temperature reached in one or more Met Office National Severe Weather Warning Service regions*
Level 4	Major incident - Emergency response *Central Government will declare a Level 4 alert in the event of severe or prolonged heatwave affecting sectors other than health*

Source: PHE (2014: 12)

3.2.4.2 Information and advice

The National Heatwave Plan outlines a range of best-practice planning activities. These aim at offering guidance to local organisations and focus, in particular, on preventive aspects of heatwave planning. The information included in this part of the National Heatwave Plan highlights that the policy is not solely focused on disaster response, but includes broader long-term planning aspects, as well. However, as the analysis in Chapter 5 will show, these long-term planning aspects did not resonate well in the local risk management system in London, which was predominantly implemented by emergency planning actors that were often guided by a responsive planning paradigm.

"Strategic planning" outlines the need for coordinated and long-term approaches towards the impacts of climate change on people and infrastructure. The plan recommends that issues such as greening the built environment, sustainable building design and energy efficiency are incorporated into Joint Strategic Needs Assessments (JSNAs) and Health and Well-Being Strategies (HWS) of public health organisations at the local level[21]. "Heatwave and summer preparedness" suggests to identify within organisations lead bodies that coordinate and oversee heatwave planning. "Communicating with the public" highlights

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[21]Joint Strategic Needs Assessments and Health and Well-Being Strategies are public health planning documents. They are developed on a regular basis, usually every one or two years. They commission public health services within UK local authorities (DH 2011).

the importance of communicating heat-related risks and heatwave warnings to the public, drawing on the media, for example. The National Heatwave Plan recommends that local authorities establish heat-related health information plans. "Working with service providers" is stressed as a key responsibility of local authorities and local health organisations. According to the plan, service providers include, amongst others, hospitals, care and residential homes, General Practitioners, and registered housing providers[22]. Finally, "engaging the community" refers to the need to provide extra care to individuals particularly at risk from heat. The plan recommends to local authorities to engage as many groups as possible to reach out to vulnerable people (PHE 2014: 9-11).

3.2.4.3 Criticisms and annual reviews

Stakeholders in heatwave planning from across the UK are asked on an annual basis to provide feedback to the Heatwave Plan and to suggest revisions. Revisions usually concern details of the plan and offer incremental improvements, rather than profound reforms of heatwave planning (DH and HPA 2012, 2013). More substantial changes to the National Heatwave Plan took place in the context of the 2012 Health and Social Care Act (PHE 2014). This reform of the health system fundamentally altered the organisational architecture of public health services in the UK, and thus required an adaptation of the National Heatwave Plan to new roles and responsibilities in the health sector.

Plans are being discussed to merge the National Heatwave Plan with the Cold Weather Plan, which is developed by PHE at an annual basis, too. From 2015 onwards, both plans might be combined into a joint Extreme Weather Plan. The rationale for this is to capitalise on overlapping planning structures between hot and cold weather, and to draw more attention to both risk planning regimes. The impact of combining both plans is controversial, however. Concerns were raised at the 2014 revision conference for the heatwave plan that the prominence of cold weather planning might further undermine attention to heatwave risk in the UK.

Not all criticisms of the National Heatwave Plan are channelled through the formal

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[22]The plan does not consider private, voluntary, or third sector organisations outside the area of health in its conceptualisation of service providers. This speaks to criticism that the plan fosters a perception of heatwave planning as a public health issue.

platforms appropriated by Public Health England. Respondents of this study expressed concerns about the ownership of the plan by the Department of Health. Due to the association of the plan with the Department of Health and with Public Health England, heatwave planning was perceived by many respondents of this study as a public health issue. This seemed to constrain a consideration of social, environmental, and technical risk dimensions, although many respondents acknowledged them to be of importance for heatwave planning. These concerns and their implication for social learning in heatwave risk management are discussed in more detail in the empirical analysis in section 5.3.

There is limited awareness of the National Heatwave Plan among front-line staff in health and social care services (Abrahamson and Raine 2009; Boyson, Taylor and Page 2014). The plan is also criticised for not offering any financial incentives for heat-related interventions by local authorities or public health agencies (Wolf, Adger and Lorenzoni 2010). Such funding mechanisms exist for cold weather planning (DH 2012c), and were considered successful by respondents participating in this study. Negative media coverage was also a challenge for the National Heatwave Plan in the past. In May 2013, The Guardian featured a cynical comment on the publication of the National Heatwave Plan, as the UK had witnessed unusually cold and rainy weather in the weeks and months before:

> "With Britain enduring hailstones, temperatures below 10C and records revealing the UK's "worst" spring for 30 years, Public Health England has, with impeccable timing and without irony, published its heatwave strategy for 2013. [...] The first chapter of the 46-page strategy asks the challenging question: "Why is this strategy necessary?" Despite valiant efforts, though, it struggles to answer its own question". (The Guardian, 23 May 2013)

The article's criticism speaks to low perceptions of heat risk in the public (LCCP and EA 2012; Kolm-Murray, Smith and Clarke 2013) and among at-risk individuals (Abrahamson et al. 2009; Wolf, Adger and Lorenzoni 2010). It suggests that heatwave risk continues to be perceived as a low priority among both professionals and the public in the UK.

Figure 7: Map of London local authorities

Source: London Councils (2014)

3.3 Heatwave planning in London

This section outlines the organisational architecture for heatwave planning in London. The discussion is not comprehensive but highlights those organisations and policies that are of relevance to the empirical analysis in this thesis. The organisational structures in emergency planning, health and social care and environment and sustainability described in this section are specific for London. In many ways, the architecture of organisations in each of these areas is specific in London, and varies from other organisational structures elsewhere in the UK.

3.3.1 Heatwave risk in London

London has 33 local authorities. A map of all London local authorities is shown in Figure 7. London's densely populated urban area is subject to the urban heat island effect (GLA 2006; LCCP and EA 2012). The urban heat island describes the phenomenon that temperatures in urban areas are higher than in the surrounding countryside (Souch and Grimmond 2006). Studies suggest that mean summer temperatures during the 1990-2006

Figure 8: Spatial distribution of heatwave vulnerability in London
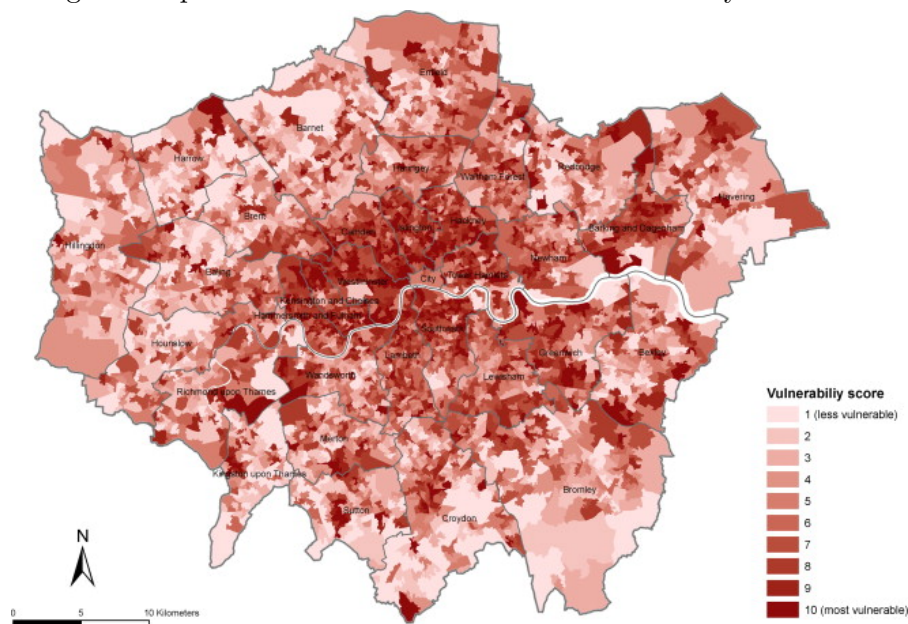
Source: Wolf and McGregor (2013: 64)

time period were 2.8 °C higher in central London than in neighbouring rural areas (Wolf
and McGregor 2013). There is evidence that socio-demographic risk factors and heat
exposure are co-productive of heatwave vulnerability in parts of central and east London,
representing "hot hot" spots for risks related to the adverse effects of heat in urban areas
(Wolf and McGregor 2013). Studies suggest that in London, adverse effects on health
seem to start at relatively low temperatures of about 19 °C (Hajat et al. 2002).

Figure 8 shows the spatial distribution of heatwave vulnerability in London. It is based
on a heatwave vulnerability index developed by Wolf and McGregor (2013). The map
indicates that heatwave vulnerability is clustered in central London, especially north of
the Thames, but that spots of high vulnerability are distributed across the city (Wolf and
McGregor 2013: 60-64). The map suggests that heatwave risk management in London
should be of concern to all London boroughs, and that social factors need to be considered
in organisational risk planning approaches. The index calculates vulnerability as a function
of heatwave exposure and sensitivity. It combines physical aspects of heatwave exposure
with social characteristics of the population. This includes factors such as age, gender and
health status.

3.3.2 Organisational framework

The organisational architecture of heatwave planning in London is hierarchical. National organisations are usually represented regionally through intermediary organisations, which in turn coordinate the work of local organisations. Of particular relevance to the empirical analysis in this thesis are organisations from emergency planning, health and social care, and environment and sustainability. For the purpose of this discussion, the policy field "environment and sustainability" refers broadly to policies on climate change adaptation, including environmental health and sustainable housing. These issues are currently less relevant for local heatwave planning than emergency planning and public health, but are increasingly recognised as an important aspect of preventive heatwave risk management (see empirical analysis in section 5.3).

3.3.2.1 Emergency planning

An overview of selected organisations and policies from emergency planning is shown in Table 4. The table indicates that the Cabinet Office is the lead coordinating body for emergency planning and response at the national level. Through its Civil Contingencies Secretariat (CCS), the Cabinet Office spearheads a structure of emergency planning bodies at the regional and local scale. The 2004 Civil Contingencies Act and the 2010 Enhancement Programme are key policies in the field of emergency planning. The Cabinet Office shapes heat risk management through its leading role in the national risk assessment process. This formal process aims at identifying potential risk for the UK, classified in three categories: natural events, major accidents and malicious attacks (Cabinet Office 2013a). The National Risk Register has equivalents at the regional (e.g. London Risk Register) and local scale (borough risk registers). It serves as a template for regional and local assessments. The Cabinet Office thus shapes heatwave risk management through its agenda setting role in the risk assessment process, as heatwaves are routinely considered in risk assessments across all scales (Cabinet Office 2013a; GLA 2014).

At the London level, Table 4 indicates that the Greater London Authority (GLA) provides an organisational framework for emergency planning at the London scale. Within

Table 4: Organisations and policies: emergency planning

Scale	Organisation	Key Policies
National	Cabinet Office - Civil Contingencies Secretariat	Civil Contingencies Act (2004)
		Enhancement Programme (2010)
		National Risk Register (2015)
London	Greater London Authority (London Resilience Team, London Local Resilience Forum)	London Risk Register (2014)
		London Resilience Heatwave Plan (2010)
Local	Local Authorities (Emergency Planning Teams)	Borough Heatwave Plans
		Borough Emergency Plans
		Business Continuity Plans
	Borough Resilience Forum	Borough Risk Register

Source: own

the GLA, the London Resilience Team (LRT) supports the London Resilience Partnership (LRP). The London Resilience Partnership is an association of organisations involved in contingency planning in London. It convenes the London Local Resilience Forum (LLRF), which is its operational body and directs the work of the LRP. It also leads the London risk assessment process, which cumulates in the London Risk Register (GLA 2014). The London Resilience Forum issued a London Heatwave Plan in 2010, and updates the London Risk Register on an annual basis. As sub-groups of the LLRF, six Sub-Regional Resilience Forums convene. They are cross-borough platforms for knowledge exchange, and bring together Category 1 and 2 responders from neighbouring boroughs. This organisational set-up emerged in 2010 in response to the Enhancement Programme of the CCA. Prior to 2010, the SRRFs were statutory, and the London Resilience Team operated within the Government Office for London, rather than within the GLA.

At the local level, risk planning is delivered by London's 33 local authorities. Under

the 2004 CCA, local authorities have a statutory responsibility to plan for and respond to emergencies. Emergency planning teams of local authorities usually host the Borough Resilience Forums, which are the principle platforms for multi-agency coordination at the local level. The Borough Resilience Forums bring together the Category 1 responders, as identified in the CCA, and Category 2 responders depending on local arrangements. BRFs are required to meet on a regular basis, usually four times a year. Since the 2010 amendments to the CCA, each borough has a statutory obligation to maintain a Borough Resilience Forum. The Borough Resilience Forum issues the Borough Risk Register and arranges planning provisions for all the risks considered in the register. In most London boroughs, these registers include heatwaves.

3.3.2.2 Health and social care

An overview of selected organisations and policies from health and social care is shown in Table 5. The Department of Health is the key national organisations that shapes heat risk management in the UK. Together with Public Health England, it issues the National Heatwave Plan. Both organisations cooperate in the dissemination of the heatwave plan, and in information and awareness raising. Public Health England is an important boundary organisation between health science and policy making. It was established following the 2012 HSCA, and replaces the former Health Protection Agency (HPA). NHS England is an executive agency that administers and oversees planning and service delivery in the public health system in the UK. Its involvement in heat risk management stems from its responsibility under the CCA to prepare the healthcare system for emergencies. In this role, NHS England replaces the former NHS Commissioning Board.

At the London level, Table 5 shows that NHS England (London Region) is a key stakeholder for heatwave planning. It facilitates coordination and knowledge exchange between NHS organisations in London. NHS England has an Emergency Preparedness, Resilience and Response Team (EPRRT) for London. This branch coordinates NHS emergency planning for the London region, which also includes planning for heatwaves. Public Health England is represented in London through the Health Protection Units (HPUs). There

are four geographically defined Health Protection Units in London, which provide expert advice to local authorities and NHS organisations, mostly in the areas of infectious diseases, radiation and chemical hazards. This focus on emergency planning gives London Health Protection Units a role in heatwave planning. As boundary organisations both between science and policy, on the one hand, and between policy organisations, on the other hand, they have a role in agenda setting and facilitate knowledge exchange between key heatwave planning stakeholders.

Table 5 shows that health and social care teams of local authorities, the NHS, but also private care providers are involved in heatwave planning at the local level. Public Health in local authorities is lead by the Director of Public Health. Directors of Public Health used to be with NHS Primary Care Trusts before the healthcare reforms. Primary Care Trusts were replaced by Clinical Commissioning Groups and Health and Well-Being Boards. The CCGs and HWBs commission healthcare services in the boroughs. They increasingly rely on private care providers to carry out services previously delivered by the NHS. Despite this development, local NHS trusts and hospitals continue to play a crucial role in healthcare delivery. NHS trusts and hospitals are required to plan for emergencies, and work with the local authorities to do so.

3.3.2.3 Environment and sustainability

An overview of selected organisations and policies from environment and sustainability is shown in Table 6. It shows that the Department for Environment, Food, and Rural Affairs (DEFRA), the Met Office and the Environment Agency (EA) are national organisations with relevance for heatwave planning in London. DEFRA frames environmental and climate change policy in the UK, and is leading government efforts to enhance climate change adaptation. It thus defines the broader policy context in which heatwave risk management takes place, and links risk management efforts to national adaptation policies. The Met Office provides the weather data that is integral to heatwave risk management, and the Heat-Health Watch alert system, in particular. It maintains, throughout the summer, a monitoring system for extreme temperatures and disseminates alerts to local authorities

Table 5: Organisations and policies: health and social care

Scale	Organisation	Role in Heatwave Planning	Key Policies
National	Department of Health + Public Health England	provide disaster risk knowledge and advice on heatwaves	National Heatwave Plan (2014)
			Health and Social Care Act (2012)
London	NHS England (London Region)	oversees NHS organisations in London	
	London Health Protection Units (four units)	provide expert advice to local authorities	
Local	Local Authorities (Directors of Public Health, Public Health Teams + Social Care Teams)	develop local heatwave plans, coordinate risk management practices	Local Authority Heatwave Plans
	Clinical Commissioning Groups	ensure that commissioned healthcare services are sensitive to heat stress	
	Health and Well-Being Boards		Joint Strategic Needs Assessment
			Joint Health and Well-Being Strategy
	NHS Trusts, Hospitals + Private Care Providers	frontline staff interacting with vulnerable individuals	

Source: own

Table 6: Organisations and policies: environment and sustainability

Scale	Organisation	Key Policies
National	Department of Environment, Food, and Rural Affairs	Climate Change Adaptation Act (2008)
	Met Office	Heat-Health Watch System, heatwave alerts
	UK Environment Agency	Climate Ready Support Service (guidance and support on climate change adaptation to public sector organisations)
London	Greater London Authority	London Climate Change Adaptation Strategy (2011)
	London Climate Change Partnership	London Local Climate Impact Profiles
Local	Local Authorities (Environment and Sustainability Teams)	sustainable urban design and planning

Source: own

and health agencies. In this role, the Met Office is closely linked to the Category 1 responders of the CCA. The Environment Agency leads environmental protection efforts in the UK. It is involved in heatwave planning through its Climate Ready Support Service, which offers guidance and support on climate change adaptation to public sector organisations.

At the London level, Table 6 shows that the Greater London Authority shapes heatwave planning through its 2011 London Climate Change Adaptation Strategy. The strategy provides a policy framework for actions relating to heatwave risk reduction. It focuses on overheating and health implications of climate change, amongst others. Advocacy for climate change policy in London, including actions on heat stress, is provided by the London Climate Change Partnership (LCCP). The LCCP is an association of public, private, and voluntary organisations that facilitates knowledge exchange on climate change adaptation and resilience to extreme weather. It regularly publishes reports that provide knowledge of relevance to heatwave risk management in London, for example on heat thresholds in London (LCCP and EA 2012). The LCCP was also involved in a project

in which several boroughs conducted "Local Climate Impact Profiles" to explore issues of climate change adaptation in their boroughs. These included considerations of extreme temperatures, and how to plan and prepare for heat.

Locally, environment and sustainability teams of local authorities can be involved in heatwave planning. There is no statutory requirement for boroughs to maintain environment and sustainability teams. Consequently, not all 33 London local authority teams have environment and sustainability teams. Where they exists, these teams can advocate for preventive aspects in heatwave risk management, for example by providing expertise on sustainable urban design and planning.

3.4 Summary

This chapter discussed the empirical subject area of the study. The aim of this chapter was to provide background information for the empirical analysis. It highlighted that heatwaves are an increasingly significant natural hazard in the context of climate change, and pointed to some of the epidemiological and social implications of heat stress. The chapter reflected on response strategies to extreme heat, and suggested that there is a lack of research on the organisational and institutional architecture that underpins heatwave risk management. The National Heatwave Plan for England was discussed as a risk planning regime for heatwaves. The policy was contextualised in the legal and organisational framework for contingency planning in the UK. The last section described the organisational architecture of heatwave planning in London. It highlighted that local authorities and public health organisations are the main stakeholders for heatwave planning in London. It also outlined the networks and platforms in which these organisations are embedded. The next chapter discusses the methodology of the research project.

4 Methodology

This chapter discusses the methodology of the thesis. Methodology refers broadly to both fundamental assumptions about the nature of knowledge (epistemology) and technical aspects of the analysis process (Hoggart, Lees and Davies 2002). The aim of this chapter is to demonstrate how the project's methods and research design result from and interact with the epistemology and the framework of the analysis. To do so, the chapter makes explicit the epistemological premises of the analysis and outlines how they shape the way in which empirical evidence was used to explore the research questions. The chapter is structured in a way that moves from general considerations to specific design choices of the study. The discussion in this chapter presents the key aspects of how the study engages with empiricism, explains the merits and pitfalls of methodological choices and justifies them.

The chapter starts with a discussion of the project's epistemology. It then demonstrates how the epistemology shapes the research design and the identification of the research methods. Further, the case selection, the data collection, the data analysis, as as well as ethical considerations will be discussed. The chapter closes with a brief summary.

4.1 Social constructionist epistemology

The research project is based on a social constructionist epistemology (Berger and Luckmann 1991; Castree and Braun 2001; Young and Collin 2004). Epistemology refers to the question of what constitutes knowledge and how it is acquired. Social constructionist epistemology refers to an understanding of the nature of knowledge which emphasises that knowledge is socially constructed[23]. It does not refer to a specific and unified re-

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[23]The terms "social constructivism" and "social constructionism" are often used interchangeably. Young and Collin (2004: 375-377) distinguish between "constructivism" and "social constructionism". They suggest that "constructivism" is a perspective in cognitive psychology which holds that individuals construct reality through mental processes. "Social constructivism", in this reading, is a distinct position within the constructivist family which acknowledges that individual processes of construction are also shaped by social context (Vygotsky 1978; Bruner 1990). "Social constructionism", according to Young and Collin (2004), refers to an interpretation of knowledge as socially constructed. It is less interested in the psychological processes of the construction of meaning than in the culturally and

search paradigm[24]. A social constructionist epistemology is analytically valuable for this project because it emphasises the role of social interaction for the construction of knowledge (Gasper 1999; Schwandt 2003). This focus places social interactions at the heart of the analysis and fits well to the framework developed in section 2.3. It sheds light on the culturally and historically specific context in which individuals and collective agents negotiate knowledge. Social constructionism, as discussed by Berger and Luckmann (1991), limits itself to epistemological, rather than ontological claims about the nature of being. On ontological grounds, social constructionism thus allows to acknowledge the presence of an independent reality (Hammersley 1992), but assumes that such a reality is perceived subjectively by individuals and groups[25].

Some of the key assumptions of the analytical framework outlined in section 2.3 are rooted in a social constructionist epistemology. This concerns, in particular, the focus of the framework on social relationships and networks, and the idea that learning can unfold collectively through the culturally and socially specific interaction of individuals and groups (Janis 1989; Haas 1992; Wenger 2000). According to social constructionism, knowledge originates in social groups, which negotiate meaning to social phenomena (Berger and Luckmann 1991). This highlights the contested and often conflictual character of knowledge. Individuals might belong to different social groups in which knowledge and learning unfold in different ways. Members of social groups experience the world subjectively, and shape collective knowledge through their personal experience (Andrews 2012). Collective knowledge thus emerges through a process of negotiation between the multitude of experiences of individual members of the social group. Because different social groups can agree upon different constructions, knowledge, from a social constructionist perspective, is relative. Science is thus concerned with exploring knowledge that is specific to the social and cultural context in which it is constructed (Young and Collin 2004).

A social constructionist epistemology suggests that this research project itself is part of the process through which knowledge is constructed. Data for this project is thus

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historically specific context of the social construction of knowledge.

[24]Social constructivism is discussed as a school of though in social learning research in section 2.1.2.

[25]Social constructionism is often criticised for its presumed neglect of an objective reality (Bury 1986; Burr 1995; Schwandt 2003). Such criticisms ascribe ontological claims to an epistemological concept (Andrews 2012).

"created" rather than "collected" (Cope 2009). Its analysis is not independent of, but rather inherently shaped by the researcher, their worldview and experiences. In this way, social constructionism facilitates an acknowledgement of reflexivity and positionality, which will be discussed in greater detail below. The thesis thus does not claim that its findings and results are definitive representations of an objective reality. It rather focuses on how meaning is constructed in specific cultural and historical contexts. The remainder of this chapter will discuss how the project's epistemology informs choices concerning the research design and methods of the thesis.

4.2 Inductive research approach

An inductive research approach guides the analysis in this study. Inductive research approach refers to a detailed exploration of the phenomenon of interest with the aim to build theory based on empirical findings (Hoggart, Lees and Davies 2002). The choice of an inductive, rather than deductive research approach follows from the social constructionist epistemology of the project. The project is not interested in testing a theory by examining whether it is applicable to different contexts. It rather seeks to contribute to the development of theory. The inductive approach of the project is reflected its application of key principles of grounded theory for the analysis of collected data, which will be discussed in more detail below.

Through an inductive research approach, this project focuses on the phenomenon of interest, institutional constraints for social learning, and attempts to explore it in detail. This allows for a critical reflection on theory. The research approach unfolds the notion of learning in a case study context, and aims at making explicit how learning in a specific case is shaped through formal and informal institutions. The empirical analysis is based on observations, which are categorised in order to develop themes and to gradually move towards more abstract conceptualisations. This inductive approach adds to the development of scientific knowledge by specifying theory based on empirical observation, and by exploring in detail processes of learning that might subsequently be tested in future research projects. The project is thus more concerned with the usefulness of its findings

for furthering knowledge than with their validity (Kelly 2001).

4.3 Case study research

To analyse institutional constraints for social learning in heat risk management, the project draws on a single case study research strategy. Single case study refers to a research strategy that examines a phenomenon of interest in detail through empirical observation of a single example of the case. A case refers to "a spatially delimited phenomenon (a unit) observed at a single point in time or over some period of time" (Gerring 2007: 19). The aim of applying a case study research strategy in this project is to contribute to the development of theory (De Vaus 2001: 223). London, UK, serves as a case for the analysis in this project. The rationale for choosing London as a case for the analysis in this project is explained in more detail in section 4.4 below.

The selection of a single case study research strategy follows from the social constructionist epistemology of the project. The latter emphasises cultural and historic context as a factor that shapes the construction of knowledge. The desired depth of analysis in this project suggests a case study analysis with a small sample size. A single case study strategy offers sensitivity to the social and cultural context of the phenomenon under investigation (Orum 2001: 1509). This speaks to the constructionist interpretation of knowledge that guides this project. Case study methodology in this project is interpreted as an inductive, rather than deductive tool. A case study strategy in this project is not interpreted as a means to test causality, as it is elsewhere (George and Bennett 2005; Simons 2009; Yin 2009). Validity and reliability are not the primary standards on which the case study approach is conceptualised, as the project does not aim at identifying causality that can be inferred to a larger population of cases[26].

The selection of one, compared to several cases, puts emphasis on an in-depth analysis and suggests appreciation for the unique and context-specific character of institutions and the constraints they put on social learning. Sensitivity to the context in which social

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[26]Case study research is often ill-equipped to develop such inference, especially in the social sciences (May 2011). Amongst others, this is due to lacking unit homogeneity and an inherently biased selection of cases by the researcher.

learning unfolds adds richness to the analysis in this project because it acknowledges the complexity of social learning. Sample size is shaped, in this project, by a dialogue between data needs for analytically valuable information, and the practical and resource limitations of the research project. Sample refers to those cases that are part of the analysis. To analyse institutional constraints for social learning in disaster risk management, the project relies on interview data. Constraints in time, budget, and capacity of a single researcher support the selection of a single-case study in this analysis.

Case study research, like all research methods, has limitations, and these constrain the results of the analysis in this project. Limitations of case study research stem from a trade-off between the depth of empirical evidence, on the one hand, and the breadth of cases studied, on the other hand. A single case study is restricted in the amount of empirical evidence that it can gather. As case study research can be resourceful and time-consuming, restrictions have to be made in the number of cases that are considered in the analysis (Gerring 2007). A selection of cases is inherently linked to subjective determinants, and undermines the ability to generalise findings from the project.

4.4 Case selection

The selection of a single case for the analysis in this project is guided by theoretical reasons, rather than by reasons of (statistical) inference (Orum 2001). A single-case study is chosen over a case comparison because the project's social-constructionist epistemology suggests importance of social and cultural context. No comparison of London with other, possibly comparable cities is made because differences in the specific legal, socio-economic, and political context between both cities would constrain the analysis in its resolution. Although Paris, for example, was particularly affected by the 2003 heatwave (Fouillet et al. 2006), and although heatwave risk management procedures were also developed in France (Pascal et al. 2006), a comparative analysis between both cities would have to account carefully for the differences in the legal and socio-political contexts of both risk management regimes. This would constrain an analysis of the institutional constraints for learning in the organisational risk management systems of both cities. No claims are

made that the case selection in this project is representative of a larger population. The insights derived from the empirical analysis below are specific to the particular case. In this quality, they are tentative, and require additional research in other cases to contribute meaningfully to the development of theory.

London, UK was selected as a case study of this project because there is a larger community of heatwave planning professionals in London than elsewhere in the UK. This suggests a rich empirical context for the investigation of the research questions. There are 33 local authorities in London, each of which has a statutory responsibility under the 2004 CCA to plan for and respond to contingencies, including heatwaves. This organisational architecture is supplemented by a variety of organisations from public health and the social services, as well as organisations from the voluntary sector. It offered a rich but geographically confined organisational context. Access to 33 local authorities and other risk planning organisations would require substantially more travel, and thus more time and resources, elsewhere in the UK.

In its role as the capital city, London hosts not only local, but also regional and national organisations involved in heatwave risk management. This facilitated access of the researcher to organisations from across administrative scales at low costs, and allowed the analysis to consider organisational perspectives from the local, regional, and national scales. The National Heatwave Plan as the primary risk management regime for heat in the UK is formulated at the national, but implemented at the local level. This requires communication between organisations from across administrative scales, and suggests that a consideration of different perspectives adds traction to the analysis.

London has demonstrated political ambitions to establish itself as a leader in urban climate change mitigation and adaptation (GLA 2009, 2011a,b). This political commitment suggests that London's local authorities might be able to implement policies on adaptation and disaster risk management for which political support and resources are lacking elsewhere in the UK. Local heatwave management might thus be more elaborate in London than in other parts of the UK. Through the GLA, London hosts regional policy platforms on climate change adaptation (e.g. London Climate Change Partnership) and disaster risk

reduction (e.g. London Resilience Team) (LRT 2013). These platforms add another layer in the complex system of formal (and informal) relationships across organisations.

A strong risk management regime for heatwaves in the UK, compared to other countries in the European Union, contributed to the selection of London as a case study for this analysis. The National Heatwave Plan for England provides a rich risk planning framework that allows for an analysis of its implementation through local government and public health organisations. The 2004 Civil Contingencies Act established local authorities as leading organisations in disaster risk management. This provided additional weight to the analysis of social learning and its institutional constraints in public sector organisations.

Finally, the selection of London as the single-case study of this project was also driven by the PhD project's relation to the EU FP7-funded project "emBRACE - Building Resilience Amongst Communities in Europe". The case study analysis in this thesis was planned to complement an emBRACE case study on heatwave planning in London, conducted by King's College London and the University of Reading. Through its focus on organisational risk management the PhD project added to the emBRACE London case study, which explored heatwave resilience and vulnerability through a focus on behavioural change and decision-making among at-risk individuals.

4.5 Data collection

Primary data collected for this project includes 49 semi-structured expert interviews with 57 respondents. An overview about the sample is shown in Table 7. Figure 9 maps the sample on the heatwave alert cascade presented in Chapter 3 to present an overview about how the sample represents key stakeholders of the planning system. The sample is focused on a set of key actors in heatwave planning in London that shape risk management in the local organisational system of local authorities as well as public health and social care organisations. This allows for an analysis of how the interaction of formal and informal institutions influenced learning processes of individuals that operate in their professional role at the boundaries of the canonical and shadow spaces within organisations.

The largest group of respondents (n=27) are representatives from 15 different London

Figure 9: Study sample, mapped on heatwave cascade
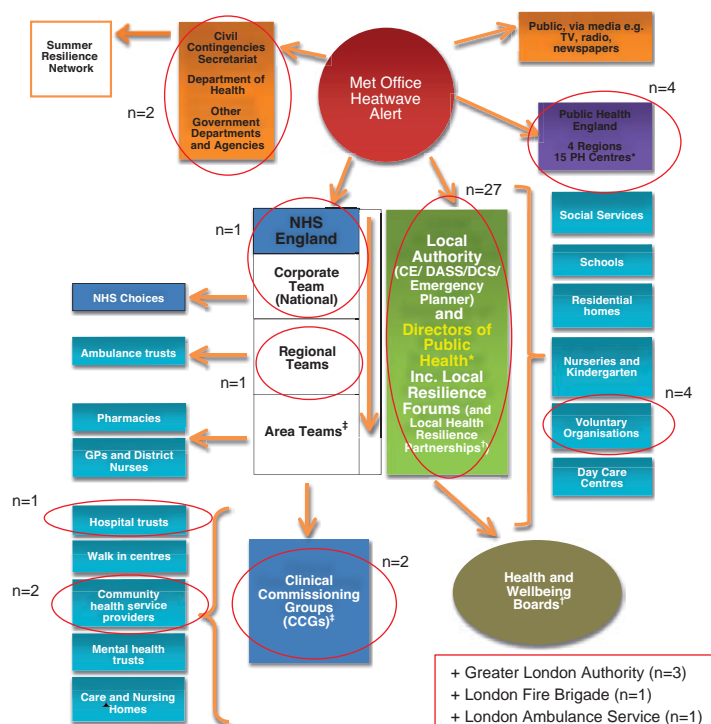
Source: Amended from PHE (2014: 16)

local authorities. The sample also includes representatives from the NHS (n=7), from Public Health England (n=4), from the voluntary sector (n=4), from the Greater London Authority (n=3), from national government (n=2), from the London Ambulance Service (n=1) and from the London Fire Brigade (n=1). The sampling strategy and its pitfalls are discussed in more detail in section 4.5.1 below.

Data was collected over a period of six month, divided into two phases. The main phase of data collection took place between April and August 2013. A second phase of data collection took place for one month between March and April 2014. Between April and August 2013, 43 interviews were conducted and six expert meetings attended as an observer[27]. Between March and April, additional six interviews were held. In March 2014,

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[27]Expert meetings were attended with the goal of obtaining additional information against which to evaluate findings from the analysis. The six expert meetings attended as an observer include the revision conference for the National Heatwave Plan in March 2013, a workshop on "Local Health and Well-Being in Climate Change" in March 2013 (organised by the London Climate Change Partnership), a borough risk workshop held by a local authority resilience forum in June 2013, a quarterly meeting of the London Environmental Coordinators Forum in June 2013, a borough resilience forum meeting in July 2013, and an emergency planning workshop at a London local authority in August 2013.

preliminary results of the project were presented to public health and emergency planning professionals at an annual revision conference for the National Heatwave Plan in London.

Data collection was divided in two phases to allow for ground-testing preliminary results of the analysis. Field research began with a range of scoping interviews (n=17), followed by a set of more focused interviews (n=26). Finally, a small number (n=6) of interviews were conducted between March and April 2014 to ground-test results of the analysis. These final interviews were designed to gather respondents' reactions to some of the key findings from previous interviews of April-August 2013. This helped to verify the key findings of the analysis. The distribution of respondent types, for example those representing local authorities, health organisations, or voluntary organisations, was similar across the three different interview forms (scoping, main, test).

The study relied on semi-structured expert interviews (Longhurst 2010) to collect primary data. Primary data in this analysis predominantly refers to the spoken word of professionals involved in heatwave risk management in London. Primary data was collected through interviews in a natural and social setting (Blaikie 2000) with the goal of retrieving information that can help to answer the research questions. Primary data also included documents and publications from organisations involved in heatwave planning in the UK. These documents were obtained through the organisations directly. Repeat interviewing supplemented the single interview data collection technique (Vincent 2013). The aim of repeated interviewing was to build trust between researcher and respondent in order to gain in-depth insights into discussions within the heatwave planning community of practice in London. Repeated interviews also added to the analysis because they helped to follow-up on themes from the interviews and to evaluate them against developments in the heatwave planning community.

Interviews were conducted through personal meetings, except for four cases in which respondents were interviewed over the telephone because a personal meeting was not possible. Duration of interviews varied between 20 minutes and two hours. On average, interviews took about one hour. Attendance at interviews varied between one and three respondents. The majority of interviews (n=42) were conducted with a single respon-

dent, six interviews were conducted simultaneously with two respondents, one interview was conducted with three respondents. In cases where more than one respondent was present during interviews, initial contacts had invited additional colleagues to participate. No requests were made by the researcher for interviews with more than one respondent because the study sought to obtain personalised, in-depth accounts of the prospects and constraints of learning in the organisation. Requests for interviews with multiple respondents were considered to potentially undermine the informal and confidential atmosphere of interviews. This decision on data collection might have constrained the study's findings, and the use of focus-group discussions is highlighted in section 6.3 as an opportunity for improving future research on the subject.

Semi-structured interviews, rather than structured interviews were chosen to allow study participants to direct conversation towards issues that they considered important within the thematic framework established by the researcher. This speaks to the grounded theory approach of data analysis because it suggests sensitivity to emerging themes. Semi-structured interviews also helped to put focus on how respondents generate and develop meaning of the social phenomena of interest to this study (May 2011: 135). This speaks to the social-constructionist epistemology that underpins this research project, which emphasises the construction of knowledge through individuals and groups. Moreover, semi-structured interviews helped to accommodate the limited information that the researcher had on heatwave planning in London prior to the analysis (Kitchin and Tate 2000: 214).

4.5.1 Identification and recruitment of participants

Snowball sampling was used as a technique to identify and recruit participants for this study (Griffiths et al. 1993; Faugier and Sargeant 1997). Snowball sampling refers to the identification of study participants through building on one or a few initial contacts, which are then asked to identify peers that they think would be interested to participate in the study, too (Vogt 1999). Snowball sampling is most commonly applied to study populations that are hidden or difficult to identify formally, for example socially isolated groups (Atkinson and Flint 2001). In contrast to probability sampling techniques, snowball

sampling does not allow for inference, as the sample cannot be considered representative of a larger population. Arguments and results from the analysis should be interpreted as limited to the study population, only. Results of the analysis do not apply to the larger risk planning community of practice in London or in the UK.

As Curtis et al. (2000) point out, an explicit acknowledgement of choices regarding the sampling strategy is of critical importance for accountable qualitative research. Different criteria exist that can help to guide decisions on the sampling strategy, and often conflicting criteria have to be balanced. The snowball sampling strategy applied in this study was of relevance to the analytical framework, promised to generate rich and believable data on heatwave planning in London, and was evaluated with respect to its ethical implications (Miles and Huberman 1994). The intention to gather rich data that is of relevance to the study's framework conflicted with and constrained the ability to generalise findings. These constraints are discussed in more detail in section 4.5.4.

Relevance to the analytical framework stemmed from the reliance of snowball sampling on social networks for the identification and recruitment of study participants (Atkinson and Flint 2001). A sample recruited through this technique is likely to represent formal and informal social networks of individual participants. This characteristic of snowball sampling has pitfalls (Griffiths et al. 1993), but was valuable for this research project because it helped to make visible cross-organisational informal networks between risk planning officials. These often diverted from formal organisational relationships and thus would have been difficult to observe through other recruitment techniques.

The strategy promised rich and believable information because the population of heatwave planning individuals and organisations in London was considered as difficult to identify through formal channels, for example through research on websites or in directories. There are no "heatwave planning officers" or designated council officials in London local authorities or public health organisations. Rather, responsibilities for heatwave risk management are subsumed under different roles and responsibilities, including emergency planning officers, public health officials, or social care professionals. A snowball strategy helped to identify and access these professionals at relatively low costs. Ethical consider-

ations are discussed separately and in more detail in section 4.8.

An initial gate-keeping contact was approached with the help of the project's supervisors. The gate-keeping contact facilitated participation of the researcher at the 2013 heatwave seminar (the annual revision conference for the National Heatwave Plan) and helped to identify a contact at a London local authority. Study participants were recruited based on these initial contacts. The limitation of the sample size to 49 interviews was based on the indication of saturation by the snowball sampling technique. Towards the end of data collection, an increasing number of contacts suggested by study participants had already been identified and interviewed for the study. This suggested saturation of the community of practice, and informed the decision to end the data collection process. A list of all semi-structured expert interviews including their codes referenced in the empirical analysis is shown in Table 8.

In order to obtain a coherent sample, not all contacts identified through snowball sampling were approached for participation in the study. Rather, the sample primarily focused on local government and health organisations because these organisations have a primary responsibility for local heatwave planning under the 2004 CCA. This rationale speaks to the criteria of generating rich empirical data (Miles and Huberman 1994). The majority of interviews from the sample (n=27) was therefore conducted with 15 different local authorities, which are leading agents of disaster risk reduction in the UK. From the 27 local authority respondents, 13 had responsibility in emergency planning, five of which in a senior role as Heads of the local authority emergency planning team. This reflects a balance between mid-level and senior planning officers and allowed gathering insights from two different hierarchical levels. Interviews were also conducted with representatives from local authority health and social care teams (seven interviews), environment and sustainability teams (six interviews), and city planning teams (one interview).

The second largest group of interviews (n=7) was conducted with representatives from NHS and public health organisations, which are important partners of local authorities in heatwave planning. The GLA and the blue light services (London Fire Brigade, London Ambulance Service) were included in the sample due to their supporting role in heatwave

Table 7: Overview about the study sample, by organisation

Organisation	No. of interviews
London local authorities	27
NHS	7
Public Health England	4
Voluntary organisations	4
Greater London Authority	3
National government	2
London Fire Brigade	1
London Ambulance Service	1
Total	49

planning. Voluntary organisations also support and sometimes challenge public sector risk management, and thus added context to the analysis. To explore cross-scale policy networks and the way in which they shape risk planning policy, national government organisations were also considered in the sample.

There were 13 individuals that declined to participate or did not respond to the inquiry. All contacts were approached via email. The introductory email explained the context of the research project and asked individuals for their availability for a short meeting of about 30 minutes to 1 hour. The email referenced previous contacts that suggested to get in touch with the potential respondent, and which had given their consent to be referenced in the contact email. The email outlined the value of participation for the project, and provided an overview about discussion topics. It also contained, as an attached file, the information sheet for participants and the consent form, as well as a hyperlink to the website of the emBRACE research project[28].

4.5.2 Interview design

Interview design remained flexible throughout the research project (Tremblay 1982). Following the grounded theory method, interview questions were modified or amended to respond to emerging patterns in the data[29]. This gradually made collected data more focused, and helped to shift the focus of interviews from specific heatwave planning ar-

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[28]The information sheet is shown in Appendix B, the emBRACE website is http://www.embrace-eu.org/.
[29]Sample interview guides can be found in the Appendix A.

rangements in the organisation to more theoretical themes concerning the institutional constraints for social learning (Bryant and Charmaz 2007). The intention of amending interview questions was to remain responsive to emerging themes from the data (Engward 2013). This allowed to acknowledge issues which were initially not prioritised in the research process, but which were considered important by study participants. For example, the theme of informality emerged as a key issue of the interviews, and gradually received more attention in the interview design and the analysis.

All interviews shared similar opening and closing questions, but specific themes and questions evolved throughout the interviews. Interviews usually began with a few introductory questions that concerned heatwave planning in the organisation, and which aimed at setting the theme of the conversation. To allow interviews to remain open to emerging themes, participants were asked at the end of each interview whether they wanted to add something they believed to be of importance for the research topic (Dunn 2010). Beyond this basic structure, interview questions were modified according to the data collected.

Key themes of scoping interviews included a) heatwave planning in the organisation, b) motivation for heatwave planning, c) risk planning actions taken by other organisations/stakeholders, and d) platforms for collaboration with other risk planning stakeholders. The objective of interviews at this early stage of the research process was to develop an understanding of heatwave planning at the local level in London, and to understand the organisational and institutional set-up of the risk management system, including the formal networks of organisations involved in planning for heat stress. The interviews aimed at retrieving information on these issues, but allowed respondents to direct the conversation to issues they deemed relevant.

Interview questions were modified after the scoping interviews to put the focus more specifically on learning and its institutional constraints. Themes of interviews during the main phase of field research were a) heatwave planning in the organisation, b) determinants of change in heatwave planning, c) pathways and constraints for change in heatwave planning, and d) implications of change in heatwave planning.

Table 8: List of semi-structured expert interviews

Nr.	Code	Role of Respondent	Inter-viewed alone	Admin. Scale	Sign. Events	Date	Duration	Prot./ Tran-script	Follow-up Interview
1	MI-EL-05	government official	y	national		2012-05-29	00:45	P	n
2	MI-EL-12	government official	n	national		2012-12-05	00:50	P	n
3	MI-YS-12	public health specialist	y	regional		2012-12-05	01:20	P	n
4	MI-KY-03	sustainability officer	y	local		2013-03-01	00:20	P	n
5	MI-NY-03	seasonal health officer	y	local		2013-03-07	01:00	P	y
6	MI-RG-03	emergency planner	y	local		2013-03-15	00:40	P	n
7	MI-HL-03	sustainability officer	y	local		2013-03-27	00:20	P	n
8	MI-NH-04	public health specialist	y	local	HSCA	2013-04-03	02:00	P	n
9	MI-EE-04	manager, voluntary organisa-tion	y	local		2013-04-03	00:20	P	n
10	MI-HK-04	emergency planner	y	local		2013-04-05	00:40	P	n
11	MI-AN-04	emergency planner	y	local		2013-04-08	00:25	P	n
12	MI-WK-04	emergency planner	y	local		2013-04-10	00:40	P	n
13	MI-HN-04	emergency planner	y	local		2013-04-12	00:40	P	n
14	MI-EL-04	manager, voluntary organisa-tion	y	national		2013-04-12	01:00	P	n
15	MI-NE-04	public health specialist	y	local		2013-04-15	00:45	P	n
16	MI-NN-04	emergency planner	y	local		2013-04-25	01:00	P	n
17	MI-NT-04	emergency planner	y	local		2013-04-26	01:00	P	n
18	MI-NS-05	emergency planner	y	local		2013-05-23	01:40	P	n
19	MI-ER-06	Dep. Director of Public Health	y	local		2013-06-05	00:20	P	n
20	MI-NE-06	emergency planner	y	local		2013-06-07	01:10	P	n
21	MI-LD-06	emergency planner	y	local		2013-06-12	01:00	P	n
22	MI-EW-06	emergency planner	y	local		2013-06-18	00:50	P	n
23	MI-MC-07	government official	y	national		2013-07-08	01:00	P	n

Nr.	Code	Role of Respondent	Inter-viewed alone	Admin. Scale	Sign. Events	Date	Duration	Prot./ Tran-script	Follow-up Interview
24	MI-RK-07	public health specialist	y	local		2013-07-10	01:00	P	n
25	MI-KT-07	public health specialist	n	regional		2013-07-11	01:00	P	n
26	MI-WN-07	emergency planner	y	regional	heatwave	2013-07-16	01:30	P	n
27	MI-LR-07	social care manager	y	local	heatwave	2013-07-17	01:15	P	n
28	MI-AS-07	public health specialist	n	local	heatwave	2013-07-18	01:00	P	n
29	MI-ER-07	city planner	n	local	heatwave	2013-07-18	01:00	P	n
30	MI-NN-07	emergency planner	y	regional	heatwave	2013-07-19	01:00	P	n
31	MI-LT-07	environmental health officer	y	local	heatwave	2013-07-24	01:00	P	n
32	MI-WE-07	Fire Brigade Commander	y	regional		2013-07-25	01:00	P	n
33	MI-MT-07	emergency planner	y	regional		2013-07-29	00:45	P	n
34	MI-WH-07	emergency planner	y	local		2013-07-29	01:20	P	n
35	MI-EL-07	public health specialist	y	local		2013-07-31	01:15	P	n
36	MI-YZ-08	public health specialist	y	local		2013-08-05	01:20	P	n
37	MI-NY-08	seasonal health officer	y	local		2013-08-06	01:00	P	y
38	MI-RD-08	emergency planner	y	national		2013-08-07	01:10	P	n
39	MI-ET-08	manager, voluntary organisa-tion	y	regional		2013-08-14	00:45	P	n
40	MI-EL-08	emergency planner	y	local		2013-08-14	01:00	P	n
41	MI-AY-08	government official	n	national		2013-08-15	02:15	P	n
42	MI-NL-08	Director of Commissioning	y	local		2013-08-21	01:10	P	n
43	MI-ND-08	Director of Public Health	y	local		2013-08-22	00:35	P	n
44	MI-NN-03	climate change officer	y	regional		2014-03-20	01:15	P	n
45	MI-NY1-03	seasonal health officer	y	local		2014-03-25	01:00	P	n
46	MI-WE-04	Director of Public Health	y	local		2014-04-03	00:40	P	n
47	MI-YD-04	Director of Social Care	n	local		2014-04-04	00:40	P	n
48	MI-YR-04	public health specialist	y	local		2014-04-07	01:10	P	n
49	MI-EN-04	emergency planner	y	local		2014-04-10	00:30	P	n

Questions were again modified during the final set of interviews during March and April 2014. These interviews took place after the majority of collected data was analysed. The intention of the final round of interviews was to ground-test key research findings by sharing them with respondents. The themes of the final interviews were thus amended to reflect some of the main findings of the analysis. Key themes for final interviews were a) heatwave planning in the organisation, b) the role of informal institutions in risk planning, c) change in heatwave planning towards social, environmental, and technical risk dimensions, d) drivers or barriers of this change.

A review of documents supplemented the information obtained through interviews. Prior to the scoping interviews, information on heatwave planning and on the organisational architecture of disaster risk management in London was researched through publicly available documents. This information guided the specification of a small set of preliminary themes and questions for interviews in the scoping phase (Longhurst 2010). Document review focused on publications and texts that contain information on local heatwave planning of local authorities or NHS organisations. Documents included, for example, borough-specific heatwave plans at the local and London level, as well as advice leaflets and publications from various organisations that provide general information about heat stress and strategies to adapt to and cope with them.

4.5.3 Interview records and transcription

Interviews were not audio-recorded, but notes were taken by the researcher. Interviews were not audio-recorded because this undermined an informal and confidential atmosphere during the interviews. Study participants were reluctant to speak on tape, as requests for permission to audio-record during the first interviews were denied. An informal atmosphere during interviews was considered important by many study respondents because some of the key themes of interest to the research project required participants to talk openly about personal viewpoints, informal practices, and problems in organisational risk planning. This often involved participants expressing their frustration or disagreement with formal practices, and sometimes revealed conflicts within organisations and profes-

sional networks.

Statements of respondents presented in chapter 5 are no direct quotes, but are reproduced from written notes taken by the researcher during interviews. The statements are not presented in quotation marks to acknowledge that they do not identically replicate the spoken word of respondents. Note-taking aimed at capturing as much information as possible, and attempts were made to take detailed notes that replicated the conversation as much as possible. To limit the loss of information, notes were usually transcribed immediately after the interviews, and never later than 24 hours after the interview. Nevertheless, the practice of note-taking inherently invokes a loss of information from the interviews, and interview protocols contain interpretations of the researcher. Potential biases and implications for data analysis of transcribing interviews from notes are discussed in more detail in section 4.5.4.

4.5.4 Biases

Biases in data collection stem from the design of interviews, from the composition of the sample, and from the technique of recording and transcribing interviews, amongst others. Biases concerning the design of interviews relate to questions of positionality. These are addressed in section 4.7 below. Biases in the design of interviews refer to a potential exclusion of issues that are of importance to the research questions. This concerns, in particular, the selection of themes for semi-structured interviews. For the scoping interviews, these were identified based on prior knowledge of the researcher, and on perceptions about the phenomenon of interest. This might have introduced a bias because scoping interviews were used to refine interview themes for the main interviews, and thus steered the research process in a particular direction. Attempts to minimise potential biases from the interview design were made by including an open question at the end of the interviews. This allowed respondents to highlight issues that they considered important, but which so far had not been addressed in the interview.

Potential biases from note-taking and transcription of interviews concern the loss of information and the imposition of personal interpretations of the researcher. To minimise

biases from note-taking, notes were transcribed immediately after interviews, and never later than 24 hours after the interview. Despite these efforts, note-taking inherently inserted interpretations of the researcher, and lead to a loss of information. The protocols written from the notes were shaped by the language of the researcher and thus can at best closely resemble, but never identically replicate the spoken word of respondents. This had implications for data analysis because it limited the techniques available to analyse and interpret the data. No analysis could be conducted, for example, based on word counts or other techniques that rely on a quantification of words or phrases.

Interview protocols were not shared with respondents after the interviews for checking their accuracy. Although this would have reduced misinterpretations and loss of data, the effort and time required for a coordination of protocols with respondents was beyond the scope of the project. Relying on respondent feedback on interview protocols would have substantially prolonged the research process and this would have exceeded the available budget.

Biases also stem from the size and composition of the sample of 49 respondents. The sample of the study is neither comprehensive nor representative of the heatwave planning community of practice in London. The sample might fail to include individuals and organisations that are important for heatwave planning in London, but which have not been identified through the snowball sampling technique. Other research projects on the subject of this thesis will address a different set of people and organisations, and might consequently arrive at different findings. A sampling bias is acknowledged, but cannot be resolved or controlled for, since it is inherent to the non-probability sampling technique applied in this study. It does not affect, however, the quality of the research results because the analysis does not seek to generalise results or to imply inference based on probability sampling.

The political orientation of respondents of this study is an uncontrolled element in the sample that arises from snowball sampling. An over or under-representation of particular political viewpoints of respondents might introduce a bias to the results of the analysis. Reflections of respondents on organisational decisions and change processes are likely to be

shaped by the political orientation of respondents. For example, the group of respondents for this study might have an overly homogeneous political orientation, if study participants recommended peers for participation that share their political worldview or that might belong to the same political party. Interviews did not inquire about the political orientation of respondents because this information is personal and not directly linked to the research subject. Therefore this element remains uncontrolled in the sample.

Finally, data collected for this thesis might be biased because the public health system in the UK underwent a major transformation at the time of the interviews. The 2012 Health and Social Care Act fundamentally changed the structure of the public health system in the UK. It included, amongst others, a transition of competencies in local healthcare commissioning from the NHS to local authorities. This changed routine procedures and challenged established administrative practices. Many respondents of this study were affected by the 2012 HSCA and had to adapt to new roles and responsibilities at the time of the interviews. Viewpoints of respondents might have been influenced by these changes, and this potentially introduced biases in the collected data.

4.6 Data analysis using principles of grounded theory

Selected principles of grounded theory were applied to analyse collected data (Glaser and Strauss 1967; Charmaz 1995, 2000; Bryant and Charmaz 2007). Grounded theory refers to an inductive approach to data analysis where data collection and analysis occur simultaneously. Data analysis draws on selected principles, rather than comprehensively on the grounded theory method. This project's interpretation of grounded theory as a set of principles, rather than a fixed and coherent method, reflects recent readings of grounded theory in the literature (Charmaz 2006: 9). These interpretations add flexibility to the analysis of this thesis because they allow considering existing theoretical concepts while remaining open to new themes emerging from the data. This provides space for the framework to shape the interpretation of collected data.

Principles of grounded theory were chosen as a method for data analysis because grounded theory reflects the project's social constructionist epistemology, its inductive research

approach and its aim of building theory. Grounded theory in this project refers to a method, rather than to a theory grounded in empirical data. There is a variety of different approaches and understandings of grounded theory. This complexity has led Bryant and Charmaz to refer to grounded theory as a "family of methods claiming the GTM [grounded theory method] mantle" (Bryant and Charmaz 2007: 11), rather than to a coherent method. The authors broadly distinguish between three schools of thought relating to grounded theory: the Glaser school of thought (Glaser 1992, 1998), the Strauss and Corbin school of thought (Corbin and Strauss 1990; Strauss and Corbin 1990), and the constructivist school of thought (Charmaz 1995, 2000). All three schools of thought emerged after the initial publication of the grounded theory method by Glaser and Strauss (Glaser and Strauss 1967), and vary with respect to some key assumptions about the nature of data, its collection and analysis[30].

Data analysis in this project followed the constructivist grounded theory approach (Charmaz 1995, 2000). Constructivist grounded theory refers to an approach that applies some of the key methods of the original grounded theory method (Glaser and Strauss 1967), but that rejects its main objectivist and positivist assumptions (Charmaz 2001). Constructivist grounded theory was chosen as a particular school of thought in this project because it emphasises that collected data is shaped by the researcher, their worldview, their relationship to the study participant, and by the methods and techniques they apply to obtain it. This interpretation contrasts with assumptions of an unbiased observer that discovers data existing in an external world, as expressed in the original grounded theory approach of Glaser and Strauss. This project does not rigidly adhere to the tools and analytical steps suggested by the original grounded theory approach. Rather, tools from grounded theory were used to derive analytical categories, which are understood in in this project as interpretations of available data. These helped to develop an analytical narrative that should be read as an interpretation, rather than an objective assessment of reality (Charmaz 2001: 6397).

Following one of the central premises of the grounded theory approach, data collection

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[30]For a detailed discussion of the differences between different approaches to grounded theory see Bryant and Charmaz (2007).

and preliminary data analysis were conducted simultaneously during the field research phase (Bryant and Charmaz 2007; Cope 2009). The aim was to remain responsive in data collection to emerging issues that were of importance to previous participants. Preliminary analysis through analytical notes took place during the transcription of interviews. Analytical notes refer to short reflections on the data that draw out similarities, differences, and open questions (Charmaz 2006: 72)[31]. Comments to particularly informing segments of the interview data were included in the interview protocols, offering suggestions for preliminary analysis. This process of commenting helped to identify emerging themes in the data during data collection. It facilitated an adaptation of interview questions to themes of the ongoing analysis. Coding and categorisation of interview data took place at a later stage, between the first and second phase of data collection.

4.6.1 Coding of interview protocols

Between the first and second field research phase, interview protocols were coded, and codes were evaluated through constant comparison. Coding refers to the categorisation of text segments of the interview protocols with the aim of inductively identifying emerging patterns and themes in the data (Cope 2009: 468). Constant comparison refers to the effort to scrutinise and re-evaluate emerging codes and themes as new insights develop (Charmaz 2006: 54). Coding did not take place during data collection, but after the majority of interviews was conducted. This was due to constraints in time and capacity of the researcher. The budget for field research required data collection to be limited to a period of six month. To maximise the data available for analysis, coordinating and conducting interviews took priority over coding during this time. Nevertheless, preliminary analysis of data through analytical notes took place during the field research.

Coding was open in that it remained responsive to themes emerging from the data. However, the concepts and theories specified in the analytical framework shaped the coding process. In this regard, the project deviated from interpretations of the grounded theory

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[31]In grounded theory, the development of analytical notes is also referred to as memo-writing (Cope 2009). Memo-writing usually includes reflections on codes and categories, and thus takes place after the coding process. The research project diverted from this practice by developing reflections based on interview notes before these were coded. To avoid confusion, these reflections are thus referred to as analytical notes here, rather than as memos.

method which argue that codes and categories should emerge purely from the data, and should not be informed by existing concepts and theories (Glaser 1978, 1992). More recent contributions call for "theoretical sensitivity" - an acknowledgement that existing concepts inherently shape the coding process (Strauss and Corbin 1994; Dey 1999; Charmaz 2006), but that this does not necessarily undermine the openness of the data analysis to new or alternative ideas.

The analytical framework was used in this project as a tool to interpret the themes emerging from the coding process, rather than as a prescriptive guide for coding and analysing data. The framework was used to relate themes from the data to each other and to make these relationships visible (Charmaz 2006: 54). It gradually evolved throughout the research process, as some of the concepts specified prior to the coding process were dropped during the analysis, and others were included to account for themes emerging from the interview data. The framework of this thesis is thus closely related to the coding and analysis process.

The primary aim of coding the interview protocols was to make collected data analytically accessible. The emphasis of the empirical analysis was not on a quantification of the frequency and distribution of codes. Coding of text segments of the protocols allowed to identify themes in the data, to access and explore them, and to relate coded segments to each other both within and across interviews. Coding did not aim at analysing codes themselves and their distribution across interviews, although this might be part of the grounded theory method elsewhere.

Coding started with an initial round of open coding, where interview protocols were read and text elements coded with short analytical codes that abstracted from the narratives told by respondents. MAXQDA 10 was used as a software for data coding. Some codes were developed openly, others denoted references to existing theories and concepts. Only text segments with narratives deemed as relevant to the analysis were coded. No word-by word or line-by-line coding was conducted (Charmaz 2006). The process of initial coding resulted in a diverse set of codes that helped to get an overview about the data and allowed for accessing relevant segments.

4.6.2 Categorisation and analysis of emerging themes

Following initial coding, codes were categorised. The aim was to increase the level of abstraction of the analysis by structuring the data and by drawing out themes (Fielding and Thomas 2009: 259). Categorisation of the code system involved the establishment of higher-order codes as categories, and the identification of subcodes. This allowed for thematically indexing and structuring the data (May 2011: 152). Some codes were re-labelled to adjust them to the emerging structure of categories. Codes were selected as categories if they appeared frequently in the data. This suggested that the issue was considered important by many respondents and indicated a theme within the data. Categories were constructed sufficiently abstract to describe a group of incidents and narratives, rather than specific events. The identification of categories was also informed by preconceptions of the research topic, and by existing theories and categories (Charmaz 2006). Subcodes indicated more specific issues that helped to substantiate categories by adding narratives. However, relationships between categories and individual subcodes were not elaborated precisely. Rather, categories and subcodes were interpreted as thematic clusters in the data.

The aim of data analysis was to draw out complexity, rather than to present a streamlined analytical argument in which quotes are forced in categories that fit to preconceived assumptions about the phenomenon of interest (Kelle 2007: 198). The analytical narrative was not hypothesised in advance of the analysis. Categories were interpreted as thematic clusters. Each thematic cluster comprised a set of quotes from interview protocols. Quotes related to the theme of the category, and laid out narratives, opinions, or events told by respondents. Quotes from the categories were scrutinised for similarities and differences. The analytical process involved an evaluation of shared understandings of respondents, but also of contrasting interpretations and differences expressed by study participants. Contradictory evidence was therefore not omitted systematically from the analysis. Quotes expressing differences in the perception of participants were kept under the same category to make visible diversity in the data. However, quotes within categories were structured thematically by relating similar quotes to each other. This involved, for

example, distinguishing between quotes that expressed agreement or disagreement with a particular issue, and grouping them together.

The categorisation of data facilitated a constant comparison of the themes emerging from interview data (Charmaz 2006; Dey 2007). Constant comparison puts focus on relationships between elements of the data, and thus speaks to the analytical framework, which highlights relationships from a conceptual, rather than from a methodological perspective. The analytical process involved comparisons between quotes from within the same interviews, from within the same codes and categories, but also comparisons between codes and categories themselves. Quotes from categories provided the skeleton of the empirical analysis. The text of the empirical analysis was developed around the quotes of individual categories. It constitutes a synthesis of the interpretation of categories and their relation to each other. Codes and categories will thus not be referred to explicitly throughout the empirical analysis.

The analytical framework served as a tool for making sense of the coded data. It helped to build the analytical narrative by relating categories to each other and by contextualising these relationships within existing theories and concepts. This was an iterative process and required a continuous adaptation of the framework to the themes emerging from the analysis. The framework thus developed gradually over time, and should be read as a synthesis of existing concepts and theories that help to make sense of the themes that emerged from the analysis.

4.6.3 Biases

Biases in data analysis through grounded theory might stem from existing theories and concepts that shape the interpretation of data. The risk of forcing data into preconceived categories or themes (Glaser 1992) is a problem that can be acknowledged, but never fully resolved, as the interpretation of data is inherently shaped by prior experiences and knowledge of the researcher. In this project, biases arising from analytical preconceptions are addressed through theoretical sensitivity - an acknowledgement of prior experiences of the researcher and the way in which they inform the analysis of data (Hesse-Biber

2007). For example, the educational background of the researcher in political science might have influenced the prioritisation of issues relating to the social dynamics of learning in organisations over other, equally justified themes in the data.

Confirmation bias might constrain the results of the analysis. Confirmation bias refers to a tendency to seek out evidence that confirms the analytical narrative. Once an analytical narrative starts to emerge as an ordering structure in the analysis, the researcher might be inclined to "to see patterns and order where there is none" (Dey 2007: 175). Predispositions to recognise evidence that confirms, rather than challenges existing assumptions shape human thinking (Gilovich 1993). This has implications for the analysis of empirical data: evidence that contradicts the analytical narrative might be disregarded whereas supporting evidence is sought out. In practice, this tendency can manifest itself in a biased selection of codes and categories, and a neglect for interview segments that contradict previous expectations. These biases can be expected to become stronger as the analytical narrative takes shape and the story of the analysis becomes more elaborate.

To account for constraints from confirmation bias, the study acknowledges that its data might be interpreted differently elsewhere. Other studies might arrive at results that alter or even contradict the findings from this research. This acknowledgement speaks to the social constructionist epistemology of the project, which highlights the importance of context and the diversity of knowledge constructed by individuals and groups. Accounting for confirmation bias is further facilitated by the analytical framework. It's theories and concepts provided a reference to the emerging analytical narrative. This helped to evaluate the results of the analysis against current knowledge.

4.7 Positionality

Constraints from positionality are closely related to a discussion of biases in data collection. Positionality refers to the perceived positions of both the researcher and the respondent, and how these shape the collected data (Hoggart, Lees and Davies 2002). The project acknowledges that positionality of researcher and study participants has implications for the results of the analysis. Reflecting critically on the implications of positionality can

help to avoid biases in data analysis (Schoenberger 1992). This seems to be particularly important as data collection for this project relied on interviews. Interviews involve a personal relationship between the researcher and study participants. Data generated through interviews is thus shaped by the context, positionality and personalities of both, researcher and respondent (McDowell 1992). Implications of social relationships between researcher and study participants are reflexively acknowledged in this section, but cannot be resolved (McDowell 1992; England 1994).

Social relationships between researcher and respondent, and the power dynamics embodied in them varied throughout the interviews, and were also shaped by the context of the interviews. The context of data collection is often beyond the control of the researcher and the respondent. It refers to the specific time and location of data collection. Researcher and respondent have a pre-determined expectation about the identity of each other. This perceived identity shapes the attitude of the researcher towards the respondent, and vice-versa, and influences both, questions and responses (Hoggart, Lees and Davies 2002). The intensity of personal interaction specific to the interview as a data collection instrument also puts focus on the personalities of researcher and respondent. Data generated through interviews was shaped by the social situation of the interview, which varied with the empathy between researcher and respondent, for example.

The researcher approached this project with a "gendered and culturally-situated" (Hoggart, Lees and Davies 2002: 223) world view - his ontology. This view shaped the epistemology of the research project because it framed expectations about what knowledge is and how it is generated. The epistemology, in turn, framed the selection of the research subject and the research methods. Together, ontology, epistemology, and methodological approach fundamentally shaped the research project and the results it generated. Respondents perceived of the researcher in a particular way, and this shaped the narratives that were told by them. Respondents' perceptions of the researcher might have been influenced, for example, by the institutions that the researcher is affiliated with, the particular topic that they wanted to discuss, and the way the respondent was approached by the researcher.

4.8 Ethical considerations

Ethical approval for the research project was obtained from King's College London (REP (GSSHM) /12/ 13-24). The research project did not involve NHS patients or service users, and was not funded by the UK Department of Health. It thus did not require approval of the UK Health Departments' National Research Ethics Service. Research methods were selected with the aim of safeguarding study participants against any harmful effects of their participation in the study. To this end, confidentiality and informed consent were of particular concern for an ethical conduct of research. Interview data was anonymised to protect participants against any adverse effects from speaking openly about conflicts and criticising formal rules, procedures, or colleagues. Quotes from interviews were encrypted through a coding system. The coding system assigns a code to all interviews of the study to minimise the risk of disclosure of participants. The names, professional positions, and contact details of study participants were not shared, and are known to the researcher only.

Written consent was collected from all study participants. Different approaches were used to collect written consent. Most commonly, consent was collected electronically in the form of emails by study participants that expressed their willingness to participate. Physical copies of the consent forms were signed by participants in a few cases, for example when participants unexpectedly invited colleagues to join them in the interview. Consent to participate expressed via emails was usually preferred over a collection of signatures on physical copies of consent forms because requests for signatures before the interview invoked a formality of the situation that risked undermining an open and informal discussion.

Information about the project was provided to participants in written form through the study's information sheet. The sheet contained information about the research topic, the project's main objectives, its context and funding, as well as contact details of the researcher. Information sheets were provided to participants as an electronic copy attached to emails that asked for participation in the study, usually well in advance, and never later than 24 hours before the interview. Hard copies of the information sheet were brought

to interviews in case participants had not yet considered the electronic copy provided to them via email. In addition to information sheets, more specific information about discussion topics during interviews were usually sent to study participants in advance of the interview.

No pressure was put on respondents to participate in the study. Both the consent form and the information sheet highlighted the right of participants to withdraw from the study until September 2014, after which the empirical analysis was written up and withdrawal was no longer possible. However, pressure to participate might have resulted from the snowball sampling technique. This concerned the risk of putting pressure on potential participants by referencing colleagues that suggested their participation. To mitigate this risk, requests for participation were sent out by email. This allowed potential participants to ignore the request with no implications. No rewards were offered to participants for taking part in the research project.

4.9 Summary

This chapter discussed the methodology of the research project. It reflected on the project's epistemology, its research approach, and its research methods. The aim of this chapter was to outline how the epistemology shaped the research design and the selection of methods. The study is informed by a social constructionist epistemology. This epistemology emphasises the role of relationships and networks in the social construction of knowledge. It also highlights the importance of social and historical context for knowledge development. The project's epistemology is reflected in an inductive research approach and a single case study method. The chapter elaborated on the process of data collection and analysis. It discussed, in particular, how principles of grounded theory informed the data analysis. The chapter acknowledged biases stemming from the methods applied to collect and analyse empirical data. Reflections on positionality and on the implications of the research for study participants supplemented technical information about the research process. The next chapter presents the empirical analysis of the project.

5 Empirical Analysis

This chapter presents the empirical analysis of the thesis. The aim of this chapter is to provide answers to the three research questions outlined in the introduction of this thesis:

1. *RQ1: How do formal and informal institutions constrain social learning in heatwave risk management in London, UK?*

2. *RQ2: What forms of learning can be observed, and what are their implications for local heatwave planning strategies?*

3. *RQ3: What is transformation in heatwave planning in London, and how is it constrained?*

In this chapter, social learning refers to processes through which ideas and practices unfold in social collectives such as organisations or organisational networks. The interaction of the formal risk planning arrangements of the canonical system and the informal institutions of the shadow system serve as an analytical lens. Throughout the analysis, different representations of the canonical and the shadow system are unpacked. Specific conceptualisations are outlined in the introductory text for each of the sections.

The text of the empirical analysis evolves around a series of quotations. The analysis attempts to avoid cause-effect narratives because they invoke linearity and oversimplify the complexity and ambiguity of the social processes under observation. It rather offers explanations based on interpretations that condense and prioritise narratives. Empirical evidence stems from 49 semi-structured stakeholder interviews with risk planning officials in London, conducted over the course of six month between 2013 and 2014. Findings are limited to the sample under observation, and may not be generalised. The names of individuals and organisations are not disclosed to maintain confidentiality.

The chapter is comprised of three sections, which loosely correspond to the three research questions. Answers to the research questions are provided by the empirical analysis as a whole, however, and not separately by individual sections. All sections start with a

brief summary of their main argument. The first section explores tension between formal and informal institutions as a constraint for social learning in heatwave risk management. It suggests that informal spaces for social learning were not only tolerated, but supported by the formal institutions of heatwave planning, and that this fuelled tension between both. The second section focuses on social learning for system rigidity. It suggests that informal institutions of the shadow system supported formal heatwave planning to function, and that this added rigidity to established risk management strategies. The third chapter focuses on social learning for system change. It discusses two forms of transformation, one abrupt and top-down (2012 Health and Social Care Act), and one gradual and bottom-up (change from reactive to preventive risk planning). The section suggests that focal events, risk perception and organisational cultures of fire-fighting constrained these transformations.

5.1 (Un)creative tension: Formal and informal institutions for social learning

This section explores social learning at the interface of the canonical and shadow system. The section aims to address in particular the first research question: How do formal and informal institutions constrain social learning in heatwave risk management in London, UK? The formal bureaucratic rules and responsibilities of the National Heatwave Plan are considered as institutions of the canonical system in this section. Individual agency, motivation, knowledge, and organisational cultures are considered as informal institutions of the shadow system.

Tension between the canonical and shadow systems is approached from two different angles in this section. The first subsection argues that the National Heatwave Plan facilitated diversity in local planning approaches in London by requiring its adaptation to specific organisational contexts. The second subsection explores how the flexibility of the shadow system was constrained by bureaucratic rules of the canonical system, and how this undermined local heatwave planning in London. The analysis suggests that both the canonical and the shadow system are relevant for social learning, and that spaces for

social learning emerged from creative tensions between them. A summary contextualises the findings of this chapter in the theories of social learning discussed in chapter 2.

5.1.1 National Heatwave Plan as a driver of conformity and diversity

Heatwave plans of London local authorities and NHS organisations were usually modelled on the National Heatwave Plan, and this contributed to their conformity. However, the National Heatwave Plan also encouraged local authorities to amend its provisions to match specific organisational contexts. This flexibility provided space for informal practices in heatwave planning to develop, because it allowed local risk managers to set up coordination and risk communication processes in the shadow system of informal networks, if they deemed this to be more effective than the canonical system. The legal and organisational frameworks that deliver heatwave planning in the UK thus seemed to create tensions between institutions of the canonical and shadow system and stimulated incremental social learning that arises from it.

5.1.1.1 Conformity in local risk planning

The National Heatwave Plan provides detailed and comprehensive guidance for local and regional risk planning organisations. It can be considered a form of bureaucratic regulation that contributed to the conformity of local heatwave planning approaches. On the one hand, regulations and the conformity that they facilitate were appreciated by local risk managers in London. On the other hand, respondents also reported various struggles with them. The regulations of the National Heatwave Plan were appreciated for the guidance that they provide to organisations that lack the capacities to develop comprehensive heatwave planning arrangements on their own. An Assistant Director of Public Health from a London local authority reflected on the guidance for local heatwave planning provided by the National Heatwave Plan:

> Overall, heatwave planning at the local level means to implement and live up to the standards that come from the national level. We have to stick to what we *have* to do, because we don't have the time and resources to go beyond that. (MI-ER-06:21)

The role of the National Heatwave Plan in shaping local authority planning for heat risk was also highlighted by the Head of a London local authority emergency planning team. The respondent reported that many boroughs in London adapted the national policy to their local organisational context with little or no amendments. This adaptation contributed to the conformity of local heatwave plans, and undermined opportunities to learn lessons from comparing the effectiveness of different risk management strategies:

> The Sub-Regional [resilience] Forums are run through the London Fire Brigade. [...] Heatwave planning is not so prominent here because most of the boroughs also just cut and paste the Department of Health heatwave plan. (MI-NN-04:41)

An Emergency Planning Officer from a London NHS trust underlined the importance of the National Heatwave Plan for risk planning in health organisations, and argued that changes to the National Heatwave Plan would directly translate into changes in local risk planning arrangements:

> At the same time, the Department of Health heatwave plan is of course crucial for planning [in local and regional organisations] - if it would change so would responses on the ground. In that sense, it is a top down approach to planning. (MI-LD-06:37)

As outlined in chapter 3, the National Heatwave Plan is not a legal document, but rather offers a blueprint for risk planning arrangements that are statutory under the 2004 Civil Contingencies Act. It can thus be considered as an attempt of the Department of Health to develop a coherent national framework for heatwave planning by drawing on the demand of local authorities for risk planning knowledge. Legal requirements for risk planning concern both local authorities and organisations from the health sector. In London, provisions for contingency planning of the 2004 CCA are reinforced by the "Minimum Standards for London", a policy of the Greater London Authority that specifies particular risks that local authorities need to plan for. The Head of Emergency Planning from a London local authority reported on the interplay of regulations of the CCA and the Minimum Standards for London, and the way in which they shaped local heatwave planning in London:

> To a certain degree, planning at the local level is determined by policies at different scales. There are, for example, the Minimum Standards for London. They require us to have minimum planning arrangements in place, and heatwaves are one of them. However, as the name says, it is only a minimum standard. So there is of course leverage at the local level to do more. Most of the heatwave planning actions at lower levels are determined by the Department of Health heatwave plan. This cascades through the different levels to the local level. Most of the plans are cut and pastes of the National Heatwave Plan. (MI-NN-04:33)

National regulations for risk planning were appreciated by risk managers in local authorities for the shared organisational architecture that they provide. A Head of Emergency Planning from a London borough suggested that a shared architecture facilitated communication between local authority organisations by providing a common language. This appreciation suggests that there was no antagonistic relationship between the canonical system of rules, on the one hand, and the shadow system of individuals that resist these rules, on the other hand:

> I think that the harmonisation of local emergency planning through the Resilience Forums [following the 2004 CCA] is quite helpful, because it makes communication easier. I now know that there is a local forum everywhere, and there are certain roles around these forums that I can understand. So if someone is the resilience manager in another borough, I have a rough understanding of what his job is, because we have the same title around here. So this shared language and terminology is useful. (MI-WH-07:45)

Appreciation of national guidance on risk planning was also expressed in recommendations outlined in the 2013 Heatwave Seminar Report of Public Health England. The annual heatwave seminar gathers feedback from local, regional and national organisations involved in heatwave planning in the UK. This feedback mechanism is encouraged by Public Health England as the custodian of the heatwave plan. It speaks to the socio-technical transitions literature, where Geels (2002: 1259) suggests that regimes provide stability by directing novelty "towards incremental improvements along trajectories".

Feedback from attendees at the 2013 seminar included calls for stronger guidance for local authorities. Local authorities asked the Department of Health to "[p]rovide clearer responsibilities for people in Local Authorities" (DH and HPA 2013: 16)". Local authority

representatives further asked to "[h]ighlight in the HWP [Heatwave Plan] particular actions which are statutory" (DH and HPA 2013: 17). These recommendations underline the focus of local authorities on statutory requirements. They suggest that constraints in local capacities require local authorities to plan according to the minimum requirements, rather than actual needs.

Such a focus of local authority risk planning on minimum requirements, rather than on actual needs, was highlighted by a Director of Public Health from a London local authority. The respondent suggested that their local authority did not have the capacity to go beyond minimum requirements for heatwave planning. This seemed to undermine any planning beyond essential requirements:

> [...] if heatwave alerts come in, there will be a response, as outlined in the National Heatwave Plan. It is not a priority, but the minimum planning structures are there. Planning and response according to the plan would happen, but nothing beyond this. (MI-WE-04: 21)

Government scrutiny during the 2012 London Olympics was appreciated by a respondent from the London Resilience Team because it facilitated a thorough implementation of risk planning arrangements across local authorities:

> We were fortunate to have the Olympics here in London, in the sense that it really forced people to get things right. There was immense scrutiny from government, a lot of control on how things are planned. This had an impact on planning, because it meant that you could not just update the date on the plan and then say it is a new one, but that you really needed to go into the content of things. (MI-WN-07:24)

The top-down delivery of the National Heatwave Plan and the appreciation of national guidance from local risk managers suggests a passive nature of heatwave planning in London. As many procedures for heatwave planning overlap with risk planning for other forms of extreme weather, this passivity did not constrain the delivery of response measures in times of crisis, according to an Emergency Planning Officer from NHS England. Reflecting on the response to the 2013 heatwave in London, the respondent suggested that there were only few challenges:

[...] despite the fact that we haven't had a heatwave for quite some time, we
have a fairly well managed approach to the heatwave now. This is because the
processes for managing heat are largely the same as managing cold weather. In
this sense, it did not matter that we have not had a heatwave in quite a while,
as we had rather robust winter planning in place, and a few cold winters,
so that we had the processes and communication channels well established.
(MI-MT-07:30)

5.1.1.2 Diversity in local risk planning

The boundaries of the formal roles and responsibilities of the canonical system are fuzzy.
Diversity observed in heatwave planning strategies in London suggests, however, that these
boundaries existed, and that there were limits to the conformity that formal risk planning
arrangements established. The breadth and scope of heatwave planning varied across lo-
cal authorities and public health organisations in London, despite the legal obligations for
risk planning under the CCA, and despite the detailed advice provided by the National
Heatwave Plan. Both frameworks did not seem to translate into identical heatwave plan-
ning arrangements at the local level. An Emergency Planning Officer from a London local
authority suggested that constraints on the conformity of planning approaches stemmed
from the inability or unwillingness of local organisations to follow rules:

> The Civil Contingencies Act and the Minimum Standards for London are two
> things that shape heatwave planning at the local level. However, I think you
> should expect a varying degree of implementation of the requirements across
> boroughs. (MI-NT-04:21)

In the perception of the Head of Emergency Planning from a London local author-
ity, diversity in heat risk planning across London local authorities referred to a varying
cooperation between emergency planning and public health teams within councils:

> Differences for heatwave planning [among local authorities in London] exist
> with regard to cooperation with the health teams. Some emergency planning
> teams would engage with Public Health more strongly than others, and this
> can make a difference. (MI-NN-04:42)

An Emergency Planning Officer at NHS England suggested that diversity in heatwave
planning arrangements also existed among Clinical Commissioning Groups in London, and

thus within the public health sector. Here, diversity referred to a varying adherence to mandatory assurance processes in CCGs:

> I don't work with CCGs directly, but I can guarantee you that there is a differ-
> ence with regards to how well they manage things [in heatwave risk planning].
> As an example, during the recent reforms some of them already had assurance
> processes in place, other did not. (MI-DN-07:38)

Diversity in local risk planning approaches across London was appropriated by the National Heatwave Plan. It required local authorities and public health organisations to adapt its regulations to their specific organisational contexts. This suggests a degree of flexibility for organisations at the local level, and reveals the fuzzy boundaries of the canonical system. The requirement for the adaptation of the National Heatwave Plan to local organisational contexts reveals that flexibility in local approaches is facilitated by the same policy that also contributes to their conformity:

> [...]local organisations should consider this document and satisfy themselves
> that the suggested actions and Heat-Health Watch Alerts are understood across
> the system, and that **local plans are adapted as appropriate to the local
> context**. (bold in original) (PHE 2014: 4).

Diversity of heatwave planning strategies in London was reinforced by the London Resilience Team through the guidance it provided on the development of risk registers by local authorities[32]. Guidance for the development of risk registers was provided by the national to the regional, and by the regional to the local administrative scale. In London, for example, most local authority risk registers are based on the regional risk register for London, developed by the Greater London Authority. A respondent from the London Resilience Team reflected on attempts of the LRT to foster diversity in local risk assessments:

> In the context of risk assessment, for example, when we work with local Bor-
> ough Resilience Forums, we try to provide guidance, but we also try to make

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[32]Risk registers at all administrational scales are a statutory requirement under the 2004 Civil Contingen-
cies Act. All category one responders, including local authorities in London, are required to develop
risk registers in their organisation. Risk registers are planning documents which identify potential risks
that can impact on a given territory (e.g local authority, city, country), and which rate their likelihood
and impact.

> sure there is variance. If they all ended up with the same risk register, there
> would be no need to have the local ones, in the first place. We could also
> just make do with the London register then. The variance emerges from lo-
> cally specific risks. These revolve around industrial sites, pipelines, airports.
> (MI-WN-07: 36)

An explicit focus of management approaches on fostering diversity in local risk planning could be observed in the public health sector, too. Here, regulations in risk planning concerned, for example, surge capacity management and assurance processes[33]. NHS England coordinates Clinical Commissioning Groups at the local level. An Emergency Planning Specialist from the organisation reflected on regional line management of CCGs in London, and on the importance of local diversity:

> However, you have to be aware of the fact that you can't legislate for differences
> in personality, or in the way people handle things. There is no template for
> Clinical Commissioning Groups that you can just impose on the local level
> and expect people to be happy with it. None of these areas come without
> a history, there are individuals involved, with different characters, and with
> different histories of the organisations. (MI-KT-07: 41)

Both the formal rules and responsibilities of the National Heatwave Plan and manage-
ment strategies in the public sector supported and appropriated diversity in local heatwave
planning in London.

Diversity at the local level allowed risk managers to develop coordination mechanisms for
heatwave planning in the shadow system of informal relationships. This informal organisa-
tional space was considered by some respondents as more effective for the development of
effective risk planning arrangements than the formal canonical space. The Head of Emer-
gency Planning at a London local authority was explicit about the value that informality
provided for the coordination of work within the organisation:

> I think it is absolutely critical to have freedom at the local level to manage
> things as appropriate in the specific local context. Often coordination of work
> is not measurable, it cannot be documented. These informal ways of doing
> things are very effective, but are under threat if everything is regulated and
> has to be visible and measurable at other levels. (MI-WH-07:52)

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[33]Assurance in heatwave risk management referred to responsibilities of organisations to report on their
activities relating to heatwave planning to higher-ranking actors.

Concerns about increasing regulation revealed struggles of the shadow system with the canonical system. Another Head of Emergency Planning from a London borough reflected on this struggle. In their perception, their role as chair of the local Borough Resilience Forum was threatened by the increasing regulation of local contingency planning. Due to their lack of a degree that formally qualified them for their role as BRF chair, the respondent worried that they would no longer be able to serve in this position, and that more senior staff with the required formal qualifications might take on the role as BRF chair:

> Just yesterday we had a meeting with the London Fire and Emergency Planning Authority [a body of the GLA that runs the London Fire Brigade]. They are thinking about developing guidance for the local Borough Resilience Forums in the London boroughs. This is a process in the making, we don't know yet if it will go through, and whether this will be something compulsory. Whether it is going to be compulsory depends on how high up it goes. I personally think that we don't need this here in [London borough]. The forum works very well for us, we have a lot of people attending. I am a little afraid that they will have guidance on who has to chair the forum, and that it is going to be at the Director level, and that soon I won't be able to chair the Forum any more because I don't have a degree, and I am not high up enough. I think it can potentially have negative implications, if it affects the work of well-running forums like ours. (MI-EL-08: 31)

Both statements suggest that informality of the shadow system was threatened by an expanding canonical system of formal regulations. This reveals tension at the fuzzy boundaries between the canonical and shadow system. On the one hand, the formal rules and responsibilities of the canonical system were appreciated by some local respondents for the guidance that they provide to organisations that lack the financial and human capacities to develop comprehensive heatwave planning arrangements on their own. On the other hand, the flexibility that was offered by the requirement to adapt the National Heatwave Plan to different organisational contexts was appreciated for the leverage it provided for risk managers to set up coordination and risk communication mechanisms in the shadow system of informal relationships.

5.1.2 Struggles between canonical and shadow institutions

This subsection explores in more detail the tensions between institutions of the canonical and shadow systems. The analysis suggests that tension between the canonical and shadow system does not necessarily stimulate creativity and learning in spaces of bounded instability (Griffin, Shaw and Stacey 1999; Pelling et al. 2008), but that it can undermine learning if the balance between both is lost. Examples are provided here of prevalence of the formal rules of the canonical over the informality of the shadow system, and how this undermined opportunities for learning. This adds substance to the argument developed in the first subsection because it suggests that the shadow system needs to be supported in order to stimulate social learning.

In this subsection, the canonical system is conceptualised as bureaucratic control mechanisms, and the shadow system as individual agency, motivation, knowledge, and organisational cultures of dedication to work. These conceptualisations differ from those of the previous subsection and add an additional perspective to the complex interplay between the canonical and shadow system.

5.1.2.1 Constraints on agency

In the NHS, struggles in the shadow system with the formal rules of the canonical system concerned eroding agency of risk managers confronted with bureaucratic control mechanisms. During the 2013 heatwave in London, assurance was sought from NHS England on the response of local healthcare providers and CCGs. The NHS controlled whether CCGs were disseminating heatwave alerts from the Met Office to local healthcare providers[34]. Assurance unfolded as a top-down control mechanism along the bureaucratic hierarchy. NHS England communicated with CCGs at the local level, and CCGs communicated with their local healthcare providers. Both CCGs and local providers felt overwhelmed by the extent to which assurance was sought from NHS England, and perceived the control as overly rigorous. An Emergency Planning Officer from a London CCG reflected on how

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[34]Assurance processes during the heatwave can be associated with the 2012 healthcare reforms in the UK. The reforms shifted roles and responsibilities in public health, and caused insecurities which seemed to be addressed by stakeholders through extensive control mechanisms.

this practice frustrated local actors:

> There were too many assurance processes, and this frustrated many of our
> providers, I believe. Because there is only so much that they can do. When I
> have to check on them two or three times a day, there is little that they can
> tell me. When I call them at 9am and say these are the things you need to do,
> these are the things you need to look out for, then they understand this and
> can go about it. But if I have to call them again at 12 and at 5pm, and ask
> them to report to me what they did, then this can be frustrating. It should
> rather be up to them to report if something doesn't work, or something is
> challenging. But if you have to repeatedly report the same things two or three
> times a day this is challenging. (MI-YZ-08:21)

In this case, frustration can be associated with an inability of local risk managers to
identify those actors higher up the hierarchy that initiated control mechanisms, and to
understand their reasons for doing so. Lacking information about the rationales behind
the extensive control mechanisms undermined ownership of managers from CCGs and
healthcare providers:

> [...] I think the buy-in was missing here, because the goal of this assurance was
> unclear, it was introduced as an ad-hoc thing. [...] There needs to be a reason
> why the information is sent up through assurance processes. And this reason
> needs to be simple and communicable to the providers. Because you do not
> want to make people feel that you mistrust them in doing their job, you don't
> want to take away their ownership. (MI-YZ-08:31)

The respondent was concerned that excessive control mechanisms could be interpreted
at the local level as a lack of trust in organisational responses to the heatwave. This
observation supports arguments from crisis management literature that strong control
mechanisms undermine the development of trust in the organisational system (Schoor-
man, Mayer and Davis 2007). In the absence of information on the rationale behind the
extensive assurance of NHS England, the control mechanisms were perceived by the CCG
as bureaucratic conduct:

> The assurance is all about giving information back up [to higher levels]. This
> can be frustrating if you start to wonder whether there is an actual need for
> this assurance, or whether it is only to assure higher-level people that they have
> written evidence of the work, in case there should be legal questions. If you

have to report two or three times a day, it appears more like a paper exercise that allows people higher up to have written testimony that they fulfilled their duties. (MI-YZ-08:23)

A senior manager from another London CCG reported on a similar experience with assurance processes during the July 2013 heatwave. They seemed to share the frustration with the bureaucratic control mechanisms:

> It is bloody annoying. It is assurance for assurance sake. We know what we are doing here, and we know that it is working fine. We have very good relations with the council, with the social care team, and the emergency planning team, so we knew it [the situation during the heatwave] was fine. (MI-NL-08: 27)

The perception at the local level that response to the heatwave was under control contrasted with concerns of regional-level risk managers from NHS England that the response to the heatwave was not handled effectively by local stakeholders. An Emergency Planning Officer from NHS England reported that many CCGs in London were overburdened with their task to disseminate heatwave alerts to hospitals and healthcare providers[35]:

> In this heatwave, we saw CCGs cascade the alert messages to hospitals and healthcare providers. Usually, we at the Strategic Health Authority would have done this centrally. Now [after the healthcare reforms], as CCGs were expected to cascade information locally, there was a challenge for them to actually get in touch with local providers and hospitals. The CCGs were often lacking the contact databases, they did not fully know whom to contact, or how to contact actors they wanted to get in touch with. (MI-MT-07:23)

Ownership of CCGs was undermined by their inability to communicate feedback to higher ranking actors. From the perspective of a senior manager at a London CCG, only NHS England as the next higher-ranking organisation in the hierarchy of the NHS could be identified as a contact for feedback. NHS England, however, appeared to be unable to identify or unwilling to disclose the origin of command and control mechanisms:

> I actually told the NHS at some point that I was really annoyed with their bureaucratic exercises. Their response was that they were made to do this by "the center" - whatever "the center" is. (MI-NL-08: 28)

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[35] As a consequence of the 2012 healthcare reforms, responsibility for the dissemination of heatwave alerts to local hospitals and healthcare providers shifted from the London Strategic Health Authority (now NHS England (London Region) to Clinical Commissioning Groups.

Reference by NHS England to the abstract notion of the "center" as the origin of extensive assurance processes hints at the way in which actors in the bureaucracy can divert responsibilities up the hierarchy to (abstract) actors at higher administrational scales. These "buck-passing" dynamics disguise the origin of control mechanisms and undermine the ability of actors at lower hierarchical levels to feedback their criticism. This can be associated with bureaucratic alienation, as it appeared to erode agency of local actors.

Buck-passing strategies within the NHS, and the bureaucratic alienation with which they can be associated, were observed in everyday risk planning work, and outside of events like the 2013 heatwave in London, too. They occurred not only in the communication of NHS England with CCGs, but also with hospitals in London. An Emergency Planning Officer from a London hospital reported their struggle to communicate feedback regarding the timing of the heatwave plan to NHS England:

> We don't get the heatwave plan nearly as early as we would need it. Right now, we are actually planning for winter. We would need the plan much earlier. I actually complained about this to NHS England, but they just passed the buck on, saying that it was a Department of Health thing and that they could not really do anything about it. It is a bit like, *I don't care who is responsible, please just make sure something is done about this.* (MI-LD-06:39)

Although the organisational context in a hospital differs from that of a CCG, in both cases the reference of NHS England to higher ranking actors can be associated with a gradual alienation of local risk managers. The inability to feed back experiences seemed to contribute to a perception of eroding agency of lower ranking stakeholders. This perception can be expected to build up gradually over time and is therefore difficult to associate with particular cases where feedback was not acknowledged.

Inability to communicate feedback to higher hierarchical levels and the lack of information on the rationales behind control mechanisms inside the bureaucracy suggest struggles in the shadow system with the rigidity of the canonical system. This rigidity appeared to have caused frustration of local risk managers, and was interpreted as a prevalence of formal rules over the customary practice of everyday work. This constrained agency, and

eroded motivation and dedication to work.

5.1.2.2 Constraints on flexibility

In the local authority sphere, struggles of the shadow system with the formal rules of the canonical system constrained flexibility in emergency response. Data protection regulations of many organisations undermined the identification of vulnerable individuals during emergencies. In local authorities in London, lists of individuals were maintained non-centrally in organisational units, according to a Head of Emergency Planning from a London local authority:

> The emergency planning unit has a list of vulnerable individuals [...] The utilities are required to have a list of vulnerable individuals, too. And Social Care also have their own lists. (MI-RG-03:23).

This practice correspondents to UK government guidance on identifying vulnerable individuals in times of crisis (Cabinet Office 2008). The criteria for what classifies individuals as vulnerable varied across local authorities, and across the organisational units that maintained the lists. Commonly, social care teams in local authorities maintain lists of vulnerable individuals and are expected to share these lists with colleagues from contingency planning in the case of an emergency. A Social Care Manager from a London local authority managed the list for their department and hinted at the layers of communication involved:

> I am actually managing the list of vulnerable people to extreme weather. We maintain this list in social services, and use it for emergency planning. For example, last year just before Christmas, we had an incident where a generator broke down and there was a power cut. We worked with Emergency Planning, and passed on the information on vulnerable people. They then passed this information on to the British Red Cross, which we work with as a front-line operator in emergencies like these. (MI-LR-07: 17)

Several respondents from emergency planning teams suggested that bureaucratic regulations constrained access to databases during emergencies. The Head of Emergency Planning from a London local authority explained that their team became aware of its

lacking access to a database during an event, and that dysfunctional data protection reg-
ulations were upheld by the organisation despite the potentially harmful implications for
residents affected by the emergency:

> At Christmas last year, we actually had 1600 homes without gas, electricity,
> and heating. There was a water leak that damaged the gas pipe right next to
> it, so the whole gas system had to be shut down. We had a major problem with
> identifying vulnerable people. We worked with the utility providers, namely
> [company], who are a nightmare to deal with, and [company]. The utilities
> wanted us to identify the vulnerable people in the area. We [the local authority]
> have a database of vulnerable individuals, but it is held by Social Services. We
> [the emergency planning team] were not allowed to access this database, due
> to data protection reasons. I did not have security clearance to access the
> database. (MI-NS-05: 23)

Strict adherence to bureaucratic rules and procedures constrained the flexibility of the
organisation in its emergency response, according to the respondent. Although data pro-
tection regulations in many cases will be in the interest of vulnerable individuals, they
can also stand in the way of the flexibility required for an effective response in times of
an emergency. This points to tensions between the canonical and shadow system. The
respondent exemplified these tensions when reporting of an incident where organisational
policy on insurance undermined flexibility in the response to extreme snowfalls in 2009:

> Christmas 2009, a lot of people [in the borough] were snowed in, people that
> needed to get their relatives to doctors were snowed in. We actually had a 4x4
> [auto] club offer their help, but we had to turn it down due to insurance issues.
> (MI-NS-05: 33)

In both cases, the lack of flexibility in temporarily suspending the bureaucratic rules
of the canonical system constrained the capacity of the local authority to respond to
an emergency. In other cases, emergency response capacities were maintained despite
bureaucratic constraints. A Director of Public Health at a local authority reflected on
their attempts to circumvent official communication pathways and to obtain information
on local response measures during a pandemic flue event:

> I will give you an example from the flue pandemic: Here, the Directors of Public
> Health also needed to know what the NHS was doing. The NHS, however,

> initially was reluctant to share this information, they were trying to give it to
> Public Health England first, and they could then pass it on to the Directors
> of Public Health. I thought that this would make no sense, at all. Why would
> you add this extra layer of communication, why would you force it through
> Public Health England? The issue was resolved, ultimately, but it took a lot of
> phone calls and emails. I was on the phone constantly saying *Come on, guys,
> don't be so ridiculous, why would you not give the information directly to us?*
> (MI-ND-08: 24)

Initial unwillingness of NHS England to provide information to the Director of Public Health directly, without drawing on PHE as an intermediary communicator, suggests bureaucratic inefficiency. However, the respondent reported that they successfully circumvented official information pathways by drawing on informal networks. This suggests that the institutions of the shadow system can also withstand the pressure that is put on them by the canonical system.

5.1.2.3 Constraints on knowledge

In the local authority sphere, struggles in the shadow system with the bureaucratic rules of the canonical system concerned constraints on the activation of available knowledge in the context of the healthcare reforms. The latter are associated with a retrenchment of employment and the redeployment of individuals, both within the NHS, but also from the NHS to local authorities[36]. The relocation of individuals to new roles and responsibilities undermined opportunities for learning in the organisation by separating individuals from communities of practice to which their knowledge and skills would otherwise contribute. A Public Health Specialist from a London borough suggested that their transition to a new job prevented them from participating in the Borough Resilience Forum:

> [I]n my current and new job as Senior Health Specialist, I do not attend the
> Borough Resilience Forum. This is because my boss had a fear that I get
> dragged down into emergency planning. Before I came here, in November 2012,
> I actually completed a fairly expensive diploma that made me specialised in
> certain elements of emergency planning. I therefore avoid getting drawn into
> emergency planning. (MI-RK-07:32)

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[36]Amongst others, this included, at the local level, the abolishment of Primary Care Trusts, which were previously hosted by the NHS. Following the 2012 Health and Social Care Act, responsibility for public health provision shifted to local authorities, mainly in the form of Clinical Commissioning Groups and local authority public health teams.

The example suggests that there were struggles for influence between the Public Health and Emergency Planning units within the organisation. The hosting organisational unit, in this case the Public Health Team of the local authority, seemed to be concerned that new staff would continue working in its previous area of expertise. To avoid this, the knowledge and skills of relocated individuals that did not match the profile of the public health team were suppressed by higher-ranking managers to maintain conformity within the group. This speaks to the notion of groupthink (Janis 1989), and suggests that specialised knowledge in emergency planning could not benefit those communities of practice (the Borough Resilience Forum) in the organisation to which it had value. The way in which a separation of individuals from communities of practice can contribute to bureaucratic alienation was expressed by reflections of the Public Health Specialist on how this change affected their personal agency:

> Honestly, [...] there is not a lot of leverage to prioritise things. In my job here at [London borough], I work on the Joint Strategic Needs Assessment. My previous work had a lot to do with the blue light services, and quick emergency response - it was much more exciting. Now, I am looking more at the long-term planning side of things, which is not as exciting as what I did before. (MI-RK-07:17)

This statement suggests resignation and acceptance of the prevalence of the formal responsibilities. This tension between the canonical and shadow system reveals how the interaction of individuals with the organisational structures in which they are embedded affected their potential for learning. Lacking experience and knowledge in their new role, individuals perceived of their new roles as a setback in terms of responsibilities and seniority, and consequently invested less energy in developing novelty. An Emergency Planning Specialist from NHS England suggested that the detachment of work in the context of the 2012 healthcare reforms undermined individual agency:

> There are various studies about what is happening to staff that are going through major organisational reforms. They show that although things mostly manage to keep on track, most people still get bruises. They don't feel at the peak of their responsibilities, they don't want to move around all the time. So the reception that they receive in the new host organisation is key to how they respond to the change. (MI-KT-07: 47)

A similar point was made by the Director of Public Health from a London local authority who shared the perception that a welcoming reception of new staff in the organisation matters for motivation and dedication to work. From their perspective, however, there was an unhelpful culture in some organisations that hosted relocated individuals:

> Most people are trying to make the system work. However, I think there are issues around morale. Many people ended up in jobs that they didn't apply for, just for the sake of having them in a job. I think that you have people in organisations that don't feel comfortable with their new roles, for example in NHS England. There is a disconnect between what people used to be working on, and what they are expected to be working on now. Some have found the culture in the new organisation to be one of bullying. (MI-ND-08: 29).

5.1.2.4 Constraints on organisational culture

Struggles in the shadow system with changing bureaucratic rules of the canonical system also unfolded on a collective level. In the opinion of a Public Health Specialist from a London local authority, the health reforms put in peril an organisational culture within the NHS that was considered as one of its central assets:

> The NHS is particularly good when you need it the most. When it comes to an emergency, you have, in the NHS, very committed staff, which will find solutions for you rapidly. For example, we had regulations that in the case of a severe weather warning, staff should show up at the trust nearest to their home, if they lived far from their work, to make things more effective. Staff are incredibly dedicated when it comes to being there when needed. There is a risk of loosing this mentality in the transfer of much of Public Health to the local authorities. (MI-RK-07:26)

The statement suggests that an eroding culture of dedication constrained the ability of the organisation to function. This included learning, because it undermined the flexibility of individuals and their willingness to change daily routines. Insights on how reforms can constrain organisational culture were offered by an Emergency Planning Specialist from NHS England:

> We understand the arguments on reorganisation, on making things more effi-
> cient, also in terms of costs, but they are not really convincing. This is because

> reorganisations also cost a lot of money. It also costs a lot of money each time
> you shake up the system. This makes people become cynical. (MI-KT-07: 53)

In the perception of the respondent, organisational culture in the NHS was robust enough to absorb the changes of the healthcare reforms. However, the respondent suggested that colleagues were less willing to go beyond official obligations and invest more thought, time and capacities than formally required by the canonical system:

> The culture within the organisation [the NHS] is still strong, in terms of the value of the mission. People still do their job, come what may, it is just that they could do it a lot better if there wasn't reorganisation all the time. (MI-KT-07:51)

Organisational culture thus seemed to be affected by changes in the canonical system gradually over time, rather than in an ad-hoc way. As a collective institution of the shadow system, organisational culture was more robust than individual shadow institutions such as dedication, motivation and ownership, which appeared to be affected by canonical changes in the short-run.

5.1.3 Summary

This section aimed to explore social learning at the interface between formal institution of the canonical system and informal institutions of the shadow system. Findings suggest that tension between the canonical and shadow system can undermine learning if the balance between both is lost. The analysis argued that the National Heatwave Plan supported diversity in local heatwave planning approaches by allowing risk managers to adapt the plan to local organisational contexts. It was found that this flexibility was used by some respondents to set up coordination mechanisms for heatwave planning in the shadow system of informal relationships, rather than in formal organisational spaces. The analysis also highlighted that adherence to formal bureaucratic rules constrained agency, motivation, knowledge and organisational cultures as individual and collective institutions of the shadow system.

Findings of this section speak to theories and concepts of the analytical framework. Tendencies of groupthink (Janis 1989) were observed when knowledge of individuals was

suppressed in the interest of maintaining group conformity in organisational units within a London local authority. The analysis adds perspective to arguments rooted in systems thinking that creative tension between formal and informal institutions stimulates creativity and innovation in spaces of bounded instability (Griffin, Shaw and Stacey 1999; Pelling et al. 2008). Theories of social learning were helpful for an examination of how organisational culture was constrained by formal rules of the canonical system. The interaction of individuals with their organisation, and the cultures that characterises it, both speak to the complexities of learning situated in relationships (Jarvis, Holford and Griffin 1998; Wenger 1998; McCarthy et al. 2011). Finally, observations of how formal rules constrained heatwave planning at the local level support research from the crisis management literature that points to the way in which formal rules can undermine organisational response capacities (Boin and 't Hart 2010), and that informal networks are important for flexibility (Cross, Borgatti and Parker 2002). The next section turns in more detail to the implications of a tension between formal and informal institutions for social learning.

5.2 Social learning for system rigidity

This section explores social learning as incremental change that follows from the integration of formal and informal institutions in heatwave planning. The section aims to address primarily the second research question: What forms of learning can be observed, and what are their implications for local heatwave planning strategies? The interaction of the formal institutions of the canonical system and the informal institutions of the shadow system serves as an analytical lens. It helps to shed light on the way in which the shadow system supported incremental optimisations of formal risk management and how this added rigidity to existing heatwave planning strategies in London.

The analysis suggests that informal relationships consolidated a formal system of heatwave planning that many respondents considered in need of transformation. The shadow system supported the canonical system at its fuzzy boundaries - where formal heatwave planning failed or was perceived as inadequate by risk managers. This contributed to social learning to unfold as incremental change because it concealed the dysfunctionalities

of existing risk planning arrangements and undermined momentum for reform.

The integration of formal and informal institutions is approached from two different angles in this section. The first subsection explores how formal coordination platforms for contingency planning supported the development of informal networks between risk managers. The second subsection investigates in more detail how this support from the shadow to the canonical system facilitated rigidity of risk planning frameworks. It suggests that informal support to the canonical risk planning system concealed dysfunctionalities of risk planning arrangements. A brief summary reflects on how the analytical findings from this chapter relate to theories of social learning discussed in chapter 2.

5.2.1 Formal risk planning as a framework for informal relationships

This subsection explores how informal relationships of the shadow system developed in the framework of formal platforms for the coordination of risk planning in London. The analysis adds to the previous section, which explored how the formal rules of the canonical system constrained the informality of the shadow system. The canonical system, in this subsection, refers to Borough Resilience Forums and Sub-Regional Resilience Forums as local and regional platforms for coordination. The shadow system refers to informal networks and relationships between risk planning officials. The analysis suggests that informal relationships can outlast the canonical structures that support their development, but also seem to gradually erode if they lack formal institutionalised forums as a basis. This dynamic sheds light on the close integration of the canonical and shadow system.

5.2.1.1 Canonical frameworks for the shadow system

Borough Resilience Forums allowed for the development of informal networks between risk managers at the local level. An Emergency Planning Officer from a London local authority highlighted the value of informal networks that emerged in the context of the Borough Resilience Forum:

> [...] the Borough Resilience Forum [...] proves to be absolutely invaluable. It allows us to establish communication channels that make things so much easier

for us. Last year, for example, we had a power cut in the borough, and I was
informed of this by a colleague who I know well, but who does not work in
emergency planning and thus had no obligation or duty to inform me. But we
know each other very well. [...] This strong cohesion among the agencies is
something that I have seen grow over time. (MI-NE-06: 48)

In the NHS, informal networks of the shadow system developed along formal organi-
sational relationships across administrative scales. This concerned, for example, assur-
ance processes in the context of the 2012 Olympics, where regular exchange between local
healthcare providers and NHS England contributed to the emergence of informal networks
between both organisations. An Emergency Planning Officer from a private healthcare
provider in London reflected on this process, and how it was of benefit to risk planning in
the organisation:

A lot of our work on emergency planning and risk management was driven by
the preparations for the Olympics. NHS England asked us for a lot of assurance
during that time. We were happy to deliver this, but needed guidance on the
process, since we were new to the subject. We got a lot of help from NHS
England at that time, and that was when we developed a relationship with the
emergency planning contacts of NHS England. That was very helpful for our
work. (MI-EL-07: 25)

Informal relationships between local authority officers working on climate change adap-
tation seemed to be less developed than those between emergency planning officers or
between public health professionals. This was because of lacking legal mandates for cli-
mate change adaptation at the local level, according to a Resilience Officer from a London
local authority. The respondent suggested that for the emergency planning community,
such legal mandates were important to institutionalise regular meetings and to stimulate
the coordination of work between risk managers:

[...] cooperating is a legal duty for us. It is not just the Civil Contingencies Act.
Emergency planning legislation in this country goes back to 1920. We have a
legal history. I can't comment on behalf of colleagues [...], but environment
and climate change colleagues lack this legal basis, they don't have comparable
legal arrangements. (MI-EN-04:20)

Where legal structures on climate change adaptation existed, these were considered as
important for supporting preventive risk planning in the organisation. A Senior Environ-

ment Officer from the GLA suggested that legal requirements for reporting on climate change adaptation provided momentum to their work. The respondent referred to the "Adaptation Reporting Power", a policy instrument under the 2008 Climate Change Act that allows government to ask for adaptation progress reports of organisations:

> [...] regulations provide an impetus for our work. It [the Adaptation Reporting Power] is basically a legal requirement under the 2008 Climate Change Act that makes us report on how we address risk. It's about someone who cares and who signals that our work is important to them, and who wants to see results. This gives me momentum for my work, because I can refer my colleagues to these legal requirements. (MI-NN-03: 37)

The absence of formal canonical structures did not provide space for officers to innovate and to explore alternatives to existing planning policy, but rather constrained opportunities for learning. A Seasonal Health Officer from a London local authority suggested that the absence of legal structures undermined inter-organisational communication between climate change adaptation officers in London, and that this constrained the development of heatwave planning policy:

> Overall, I would like to do more on heat, and it frustrates me that I can't. [...] [W]e are missing cross-borough communication. We in the proactive camp almost don't have cross borough platforms for communication, as they routinely exist in emergency planning. (MI-NY-08:32)

The lack of communication described by the respondent suggests that legal mandates were important to support heatwave risk management at the local level. They facilitated the development of informal networks between risk managers. Where legal mandates were missing, this was considered as a drawback for effective work by respondents. This finding adds perspective to research that suggests that formal rules and regulations can constrain disaster response (Boin and McConnell 2007; Boin and 't Hart 2010; Somers 2009) and that a resilient organisation should be able to suspend formal rules in times of crisis (Boin and Van Eeten 2013).

Platforms for cooperation institutionalised through legal mandates were considered important for the development of informal relationships at the local level by a Senior Emer-

gency Planning Officer at a London local authority. For the emergency planning community of practice, the 2010 Enhancement Programme for the CCA institutionalised, for example, Borough Resilience Forums as statutory inter-agency coordination platforms at the local level. The respondent served as the chair of the local Borough Resilience Forum. They reflected on the way in which they tried to use the forum for the development of informal networks to support response measures during contingencies:

> I want an informal meeting [of the Borough Resilience Forum], a meeting where people can connect, and get to know each other. They need to be included in the forum because when it comes to an emergency, they are involved, anyway. Everybody plays a role when it comes to responding to and planning for emergencies. We might as well have them at the meeting, and have them connect. The more you know the people, the better it is, because the better you can respond and connect when there is an emergency. (MI-EL-08:26)

Voluntary coordination of work between emergency planners from different local authorities contributed to the development of group cohesion, and thus supported the informal institutions of the shadow system. Meetings of emergency planners from neighbouring boroughs in London are not statutory under the 2004 CCA. These groups convene separately from the Sub-Regional Resilience Forums, but are often used to prepare meetings of the latter. The Head of Emergency Planning from a London local authority reflected on cohesion within their cross-borough group of emergency planners:

> We have a particularly strong group of emergency planning officers here in [London borough], we meet regularly, and have strong connections. So when it comes to the Sub-Regional Resilience Forum, we show up with a lot of people there. (MI-EL-08:32)

Formation of groups within formal risk planning coordination platforms fuelled power struggles within these forums. The respondent suggested that the strong representation of their group of emergency planners was perceived as threatening by other members of the Sub-Regional Resilience Forum, who called for weakening the position of the group within the forum. This reveals tension between informally organised groups within formal risk planning structures:

> We were actually asked to dumb it down, and to bring less people to the meetings, because we were too strongly represented there. I don't understand this, why should we be punished for having strong working relationships? (MI-EL-08:32)

Tensions arising from the perceived over-representation of interests of particular professional groups within sub-regional risk planning platforms suggest that balance between the shadow and canonical system can be lost if informal networks of the shadow system become strong enough to be perceived as threatening to the canonical system. This tension constrained opportunities for learning and effective delivery of services. In the perception of the respondent, attempts to weaken their position within the SRRF would constrain capacities for problem-solving in the forum:

> Our relationships pay off. During the exercise [in the Sub-Regional Resilience Forum], people would often complain that certain things take a long time, or would not be really feasible, and we [the group of emergency planning officers] would be like: No, that would be no problem at all for us. (MI-EL-08:32)

Insights into the perceived benefits of informal coordination groups among risk managers were offered by a Deputy Head of Emergency Planning from a London local authority. The respondent suggested that the regular meetings with peers from other boroughs in the region offered opportunities for learning:

> This [the group of emergency planners] is a specialist forum for the emergency planners from this part of London. We try to meet every eight weeks. We use this to test our communication links, for example through physical checks of our equipment. Moreover, we use this to share information, consider things that will likely affect all of us together, we share our learning. An example was a case where a particular borough reported on an experience with fire evacuation in a school, where children were brought to the building's roof to then be evacuated through fire escalators. The colleague reported on how this [risk planning] could be arranged for children with wheelchairs. This makes us all think then: 'Oh yes, let's go back to our department and check how they do it.' This is how we share learning and how we benefit from each others' experience. (MI-HN-04:48)

According to the respondent, the specialised group of emergency planning officers met more regularly (every eight weeks) than the Sub-Regional Resilience Forum (four times

per year). This frequency of meeting suggests that informal communities of practice can be more strongly organised than their formal counterparts. It points to the strength of social relationships in the shadow system.

5.2.1.2 Persistence of informal relationships

The informal social relationships of the shadow system that developed in the framework of formal coordination platforms seemed to be able to outlast the canonical risk planning structures that supported their emergence. This was observed, for example, in the context of Sub-Regional Resilience Forums. SRRFs used to be statutory under the 2004 Civil Contingencies Act until the 2010 Enhancement Programme for the CCA, which made local Borough Resilience Forums statutory instead. SSRFs continue to exist, however, despite the fact that they are not statutory any more. The continuation of SRRFs as platforms for regional coordination suggests that canonical can turn into shadow institutions, and that there is value to the informal relationships which emerged in the context of formal platforms. An Emergency Planning Officer from a London local authority reflected on this value:

> The Sub-Regional Resilience Forums are not statutory any more. However, they are good practice. This means they are usually kept active as a platform for cooperation and coordination between key stakeholders. Workshops are held, and meetings are held to take advantage of face to face meetings. People coming together in the [London region] Regional Resilience Forum all know each other, anyway. The meetings are thus a good opportunity to meet people in person. (MI-HK-04:28)

Stability of informal relationships was also observed in the context of airTEXT, a risk communication tool for environmental health. airTEXT disseminates air pollution and temperature forecasts to vulnerable individuals in London. One of the initiators of this instrument, an Environmental Health Officer from a London local authority, suggested that the informal professional relationships that developed in the context of airTEXT can potentially be beneficial in the future. This suggests that informal networks were expected to outlast the canonical structures that facilitate their development:

> We have stronger working relationships with Public Health over airTEXT.
> They helped us to involve the GPs [General Practitioners] and health centres.
> With the cold weather alerts this was the first time that we had a real working
> partnership with them. They helped us by providing access to the networks of
> General Practitioners and health centres. This relationship will last, and this
> can have implications for how we work with them in the future. (MI-LT-07:36)

Similar dynamics were observed in the context of the "Warm Homes Healthy People"
funding scheme from the Department of Health, which offered national funding to local
authorities with the aim of improving seasonal health during the winter. A Social Care
Manager from a London local authority suggested that stronger relationships between different
organisational units within the local authority were among the sustainable benefits
of this funding scheme:

> Besides the money, there are actually implications of this funding that last.
> We now have a database with the people we contacted through this scheme,
> and we also had a survey to evaluate the programme. Moreover, we intensified
> ties with other departments and teams, like Housing and Health, which will
> also last for work in the future. (MI-LR-07:41)

5.2.1.3 Gradual erosion of informal relationships

Over time, however, informal relationships gradually eroded and ultimately broke if the
formal canonical institutions that supported their development changed or dissolved. A
Director of Public Health from a London local authority reported that some of their
personal networks within the health community of practice dissolved when they left the
NHS and joined the local authority:

> My networks used to be stronger in the health community than in the council.
> I had very good relationships with Community Nursing, for example. I don't
> have them any more since I moved to the council. A lot of my networks and
> personal relationships were broken by the healthcare reforms and the move to
> the council. (MI-WE-04:16)

An erosion of personal networks that follows a dissolution of canonical platforms reveals
the role of formal organisational structures as pillars for the shadow system of personal
networks. It suggests that the formal organisational architecture is important to facilitate
those informal shadow spaces that provide capacity for critical reflection and learning.

Personal networks appeared to erode gradually, rather than abruptly, when the formal structures that supported their development dissolved. This was observed for networks built in the context of Sub-Regional Resilience Forums in London. A Deputy Head of Emergency Planning from a London local authority suggested that attendance at the meetings decreased over time as the forums lost their legal mandate following the 2010 CCA Enhancement Programme:

> The Sub-Regional Resilience Forums still take place four times a year, we use them as a platform for cooperation and to exchange views. However, attendance in these meetings is falling visibly, as they are not statutory any more. (MI-HN-04:45)

Changes to the organisational architecture of the NHS in the context of the 2012 Health and Social Care Act constrained informal relationships in the shadow system, according to a Director of Commissioning from a Clinical Commissioning Group in London:

> You can't manufacture these relationships, so if there are big shake-ups like the healthcare reforms, this has negative impacts, and you need to work to build relationships up again. (MI-NL-08:20)

A gradual erosion of informal relationships can also be associated with high staff turnover within organisations. When individuals leave the organisation, so do the informal relationships that they built in the past. Frequent changes in staff within an organisation were perceived by some respondents as a prominent organisational phenomenon in the context of austerity programmes in the UK. An Emergency Planning Officer from a London local authority suggested that the staff turnover had adverse effects on heatwave planning in the organisation:

> There used to be minimum staff turnover [within the organisation], but this is increasing more and more now, unfortunately. This has implications for our work, and heatwave planning, too, because you have to go over the same things again and again. (MI-NE-06:56)

A similar statement was made by the Head of Emergency Planning from a London local authority, who suggested that high staff turnover in the organisation required constant efforts to build relationships that were lost when colleagues left their jobs:

> Of course people change, there is staff turnover, and then you might lose established relationships, which then need to be built up again. (MI-EL-08:15)

Negative implications of staff turnover for organisational heatwave planning speak to research that suggests that resident turnover is a determinant of urban heatwave vulnerability (Klinenberg 2003). In both cases, change is associated with constraints on social networks. While in the context of this study, eroding social networks undermined effective delivery of risk planning through the public administration, Klinenberg's analysis of the 1995 Chicago heatwave suggested that resident turnover fostered social isolation of residents. Similarities between staff turnover in organisations and resident turnover in urban areas might be interpreted as a reflection of social dynamics in organisations.

The discussion above has shown that formal risk planning platforms in London can support the development of informal networks of risk planning officials in the shadow system. The analysis revealed that the informal networks of the shadow system are able to outlast the formal canonical structures in which they developed. However, the informal networks of the shadow system seemed to gradually erode over time if the formal platforms in which they developed ceased to exist. This highlights that the canonical and the shadow system are closely intertwined. The next subsection will explore how this integration of formal and informal institutions adds rigidity to existing risk planning strategies.

5.2.2 Informal support to formal heatwave planning

This subsection explores how institutions of the shadow system supported formal heatwave planning in London to function. The canonical system, in this subsection, refers to formal risk planning frameworks in London. The shadow system, in this subsection, refers to trust, leadership, informal social relationships, as well as to the flexibility and unbureaucartic problem-solving that they can facilitate. The analysis reveals that shadow institutions supported the canonical system at its fuzzy boundaries - where formal planning frameworks failed or were perceived as inadequate by risk managers. Learning unfolded as small, often improvised change which seemed to conceal the dysfuncationalities of formal risk planning. This added rigidity to existing heatwave plans at the local level, and thus constrained social

learning to unfold as profound change.

5.2.2.1 Flexibility in response capacity

Trust relationships of the shadow system added flexibility to the organisational response to the July 2013 heatwave in London. During the heatwave, formal communication pathways of the canonical system were perceived as dysfunctional by a Director of Integrated Commissioning from a London CCG. The respondent wanted to reach out to local General Practitioners to ask them to treat incoming patients with heat-related symptoms directly. Their interest was to prevent a build-up of pressure on hospital services during the heatwave. The respondent reported that their communication with GPs had to be formally authorised by NHS England, but that colleagues at the NHS were difficult to reach during the heatwave:

> [...] we wanted to talk to the GP practices to sort out what was happening there. Our goal was to get them to provide care and support to people coming to GPs due to the heat, or to refer people to community services, rather than to the hospital. Our intention was to keep people out of the hospitals, because there is always an increase in demand for hospital services when it is really hot, and the hospitals then struggle to provide services to the people. However, since we do not have a contract with the GP practices [following the 2012 healthcare reforms], we had to go through NHS England, which now holds the contract with GP practices. But to get hold of those people in NHS England is actually really difficult, especially during the level 3 alert. (MI-NL-08:22)

Difficulties in reaching out to NHS England during the heatwave invited an informal problem-solving approach at the local level. The Clinical Commissioning Group liaised directly with local GPs, although this violated the formal rules. This violation speaks to findings from the crisis management literature that overload at central levels during crisis situations facilitates decentral and informal approaches (Hart, Rosenthal and Kouzmin 1993: 232). Stakeholders knew each other from past working relationships, and the respondent suggested that they were confident that higher ranking actors of NHS England would trust in the appropriateness of their actions. This accelerated the local response to the heatwave because it allowed for an unbureaucratic coordination of work between GPs and the Clinical Commissioning Group at the local level, according to the respondent.

This breaking of formal rules was facilitated by trust relationships of the shadow system:

> We actually ended up circumventing the official pathway, in a way. We went
> directly to the GP practices to talk to them, and most of them were quite
> welcoming and willing to cooperate. Only a few insisted on the official struc-
> ture. Our big luck in this situation was that those people in NHS England that
> have to authorise and deal with this now have worked in the [London borough]
> patch of the Strategic Health Authority before. So we knew some of them,
> and were able to draw on these informal relationships. They just told us to
> say they looked at and approved it, although they really had not had time to
> actually do so. But we knew each other, they trusted us, and we could then
> go to the GP practices and say that we coordinated our initiative with NHS
> England. (MI-NL-08:22)

Trust relationships thus added flexibility to the local heatwave response by enabling officials to break the formal rules of canonical risk planning. This finding supports studies that identify improvisation as a key feature of organisational working (Ciborra 1999; Boin and Van Eeten 2013), but contrasts with the previous argument that the formal rules provided through legal mandates were considered important for effective local heatwave planning by respondents (see section 5.2.1.1). It reveals complexity in the interplay between formal and informal institutions and echoes arguments from the crisis management literature that control and trust are not mutually exclusive, but can complement each other (Schoorman, Mayer and Davis 2007; Moynihan 2009).

Professional relationships in the canonical system provided a basis, but not an automatism for the gradual development of trust. Respondents referred to a variety of factors that shaped the development of trust relationships. Past rounds of successful problem-solving were identified as important by a senior representative from a CCG in London:

> [...] we had quite a few thorny issues to deal with. [...] We try to solve these
> thorny issues together, and we form alliances to get things done here. Based
> on experiences with troubling issues [...] we gradually built up a tradition of
> working closely together. Trust and connections are key for getting things done,
> they are the good things that come with the tradition of working together.
> (MI-NL-08:16)

The emphasis on previous rounds of common problem-solving reveals that events played a role for the development of trust relationships. Events that required risk managers to

implement response measures provided collective experiences and lessons-learned. If experiences were remembered positively, for example when cooperation proved to be successful, they seemed to facilitate a gradual development of trust. The Head of Emergency Planning from a London local authority reflected on how the crash of a small air plane in their borough required coordination between the emergency planning team and the local Primary Care Trust, and how this experience facilitated cooperation between both organisations:

> In 2008, we had an air crash in [London borough], which left five people dead. I remember this very clearly. It was a Sunday afternoon, between 2pm and 3pm. I was called out, and we set up an emergency response group. The Primary Care Trust did the same, they also set up an emergency response group, but we did not know about this. It was not until the evening of that day when I was called up by the lady who led the PCT at that time, and she informed me about the efforts of the PCT. [...] If something similar were to happen now, I would know that I need to get in touch with Public Health right away, with the CCG, for example. It is mostly this anecdotal stuff that you learn lessons from. (MI-NS-05:50)

The development of trust relationships in the shadow system was also shaped by the personality of key individuals. An Emergency Planning Officer from a voluntary organisation suggested that personalities mattered for the development of trust relationships between their organisation and local authorities in London:

> We have different relationships with the councils. With some local authorities, we work very closely, others see us more as a backup to their staff, and others we almost don't work with. These differences in how far we work with the local authorities are determined, to a large degree, by personalities [...]. (MI-RD-08:27)

The Head of Emergency Planning from a London local authority valued trust within their professional networks, and sought to facilitate an inclusive climate of cooperation within their organisation. The respondent reflected on how this management approach supported the gradual development of trust relationships in the organisation:

> I think a lot of the inclusive approach that we have in the Borough Resilience Forum here in [London borough] comes down to my personality. I would like to take all the fame for this, but of course I can't. It's not just me, of course. But

> I am different from [colleague], for example. He is more about having the plans
> in place, and sticking to them. I think it is important to have the plan, but
> I want it to be flexible. For this flexibility, I need the personal relationships,
> and the connections with people on which I can build on. (MI-EL-08: 15)

However, trust relationships in the Borough Resilience Forum did not translate into changes to formal risk planning, in this case. The respondent's motivation to activate informal networks to drive changes to the canonical system was limited. This was demonstrated by their apparent lack of interest in whether an initiative for change to the Borough Risk Register had been followed-up and translated into actual changes. Reflecting on the initiative, the respondent diverted responsibility for change to higher administrational levels:

> During the last BRF [...] we had a representative from [community group],
> which represents people with disabilities. They came back to us with some
> comments on the Borough Risk Register. This was a really nice surprise. We
> send it up to the London level, because we can't make these changes locally.
> I am doubtful whether that will actually lead to something, but we did our
> part. (MI-TL-08: 19)

The development of trust relationship also seemed to depend on the strategic benefit that these relationships had to particular individuals. A Director of Public Health from a London local authority reported that they tried to maintain trust relationships with colleagues because they were an asset in the context of the 2012 healthcare reforms:

> I try to maintain connections with people that now work in different organisa-
> tions. For example, I keep offering desk space here in our offices to people who
> might want a change in office, and who want to take their work somewhere
> else. (MI-ND-08:23)

Informal trust relationships added rigidity to the formal system of healthcare provision, according to the respondent. However, they did not consider informal relationships as a reliable element of risk planning, and suggested that the informal support was a potential risk to the system:

> I think that overall, personal relationships so far have been maintained through
> the health reforms. However, for a system to be robust, it needs to be robust
> without relying on personal relationships and networks. (MI-ND-08:23)

5.2.2.2 Robustness of risk communication

Informal networks of the shadow system supported risk communication during the July 2013 heatwave by adding to or substituting formal communication channels specified in the National Heatwave Plan. This support made risk communication more robust, but also undermined opportunities for learning by concealing dysfunctionalities of formal communication pathways.

During the heatwave of July 2013, heatwave alerts were communicated through the Heat-Health Watch system specified in the National Heatwave Plan. The system draws on existing contingency planning frameworks and communication pathways, as specified in the 2004 Civil Contingencies Act, but also introduces communication pathways that are specific to extreme weather. A Head of Emergency Planning at a London local authority explained risk communication within their organisation, and how information on heat risk was obtained through risk communication channels during the July 2013 heatwave in London:

> We have a weekly crisis message from the emergency planning department that goes to a very wide audience in the council. This crisis message is around emergency planning, in general, but has a breakdown for weather, too. We are thus on top of our game in emergency planning. During extreme heat, we contact children and adult social services. We liaise mainly with strategic level senior staff. During the level three last week, we were actually copied into an email from a senior level manager of Adult Social Care, who informed and warned his colleagues about the heat. We also sent out a warning about the level 3 alert from the Met Office to our partners in the council. (MI-WH-07:17)

Several risk managers from local authorities, the NHS and private care organisations reported that they received heatwave alerts through communication channels that were not outlined in the formal cascade of the National Heatwave Plan. These informal communication channels supplemented or substituted the formal pathways of the cascade specified in the National Heatwave Plan. An Emergency Planning Officer from a private healthcare provider suggested that they received heat alerts during the July heatwave from the Met Office directly, and not from the local authority. A direct link of healthcare providers to the Met Office is not specified in the cascade of the National Heatwave Plan shown in

Figure 6 in chapter 3:

> I receive the heatwave alerts through two ways, both from the Met Office, and
> from the local authority. When these alerts come in, I monitor the levels, and
> disseminate the message in my organisation. (MI-EL-07:12)

An Emergency Planner from a voluntary organisation reported that they received heatwave alerts through the Met Office and the London Resilience Team, although both pathways are not outlined in the National Heatwave Plan. According to the Heat-Health Watch system, voluntary organisations should receive heatwave alerts from the local authority (PHE 2014):

> We were both [the organisation's health and social care team] targeted by
> the alerts that come down from the Met Office, I received them directly from
> the Met Office and the London Resilience Team, our health team were also
> contacted with alert messages by two of their commissioners. (MI-RD-08:20)

Informal communication channels did not only supplement, but also substituted formal ones. Both respondents quoted above did not refer to those organisations that should have disseminated heatwave alerts to them, according to the National Heatwave Plan. This suggests that these formal communication pathways were absent or dysfunctional during the heatwave in 2013, and that they were replaced by informal ones.

An Emergency Planning Officer from a London Clinical Commissioning Group suggested that informal communication pathways existed in addition to formal ones, and thus made redundant formal links between their organisation and private care providers. According to the respondent from the CCG, care providers had often received alerts through channels not specified in the Heatwave Plan:

> We also learned that in many cases, when we contacted our providers to tell
> them about the level 3 alert, they had already got the information, and already
> initiated some actions. (MI-YZ-08:27)

A Head of Emergency Planning from a London local authority also reported of redundancies in risk communication and suggested that other units in their organisation had informal links to the Met Office:

> We liaise, for heatwave planning, mainly with children and adult social services, the highways team and the parks and recreation team. During the heatwave last week, we would pass on our weather warnings from the Met Office to them. However, most of them subscribe to the Met Office weather alerts, anyway. They get the alerts directly. (MI-WH-07:21)

Individuals play a role in the development of informal communication pathways between organisations, for example when they bring pre-existing communication channels with them to new jobs. In this process, formal pathways can turn into informal ones, as the new organisation might not formally be connected to the organisations to which a new staff member has an existing relationship:

> During the recent heatwave, we got the alerts from the Met Office. I actually got the alerts directly from the Met Office because I signed on to their alert service during my old job at the local authority. (MI-YZ-08:16)

In the perception of a Head of Emergency Planning from a London local authority, informal communication channels between specific organisational units and the Met Office undermined coordination of work within the organisation. The respondent suggested that teams within the local authority that receive alerts directly from the Met Office might limit response to the implementation of their own protocols, and would not coordinate their actions with other stakeholders in the organisation:

> In a way, this undermines a coordination of work, because everybody gets his own alert, and can thus carry out his response internally and in his realm, without having someone from external coordinate their work with others. (MI-WH-07:21)

It should be acknowledged, however, that the emergency planning team usually serves as a focal point for the coordination of risk planning within the local authority. Concerns with constraints on such coordination might thus also relate to the role of the team within the organisation, and not merely to a potentially increased risk of adverse effects through inadequate coordination in the organisation.

Where informal networks of the shadow system supported risk communication during the July 2013 heatwave in London, this seemed to conceal the dysfunctionalities of formal

communication channels and thus constrained opportunities for social learning. A Director of Public Health from a London borough suggested that informal networks allowed them to obtain information necessary for an effective response, and that they did not received this information through formal channels:

> I only got the information I got, concerning the communication of the NHS with the GPs, because I had connections with individuals. There was no routine process of information from the side of the NHS. For example, I would have expected for us to receive the information that has been sent to GPs. However, we were not told so, and I had to use people I know to find this out. (MI-ND-08:16)

Informal networks of the shadow system thus stabilised the canonical system of risk communication where this would have failed, otherwise. The respondent suggested that attempts to initiate learning from the dysfunctional formal communication pathways were not successful:

> There was somewhat of a challenge concerning the information that went out to GPs. I got hold of the info that the NHS London sent out to all the GPs, and I found it to be too generic. [...] I found this to be insufficient. I fed this criticism back to NHS England, but I have not yet heard back from them. (MI-ND-08:12)

The successful delivery of response measures was facilitated through informal problem-solving in the shadow system. However, this success appeared to disincentivise higher ranking actors to respond to critical feedback about dysfunctionalies in the canonical system of formal risk planning. Although feedback on dysfunctional communication structures at the local level was provided to NHS England, the organisation did not respond to it, according to the respondent:

> I don't feel very confident that the communication will become more routine. In the NHS they are very lean on resources, and they need to focus on the essentials. (MI-ND-08:18)

A representative from a NHS trust in London also suggested that there was no feedback system that would make visible problems with formal risk planning at the local level:

> [...] we do not give any feedback to the NHS or the Department of Health on
> things that we think need to work better. [...] They don't ask us to tell them
> anything. They just send out their messages. (MI-YR-04:25)

The absence of feedback systems suggest that the dysfunctionalities of local heatwave planning remain hidden and are likely to cause similar problems in the future. Informal networks helped to buffer problems with dysfunctional formal risk planning arrangements. This limited changes to short-term fixes driven by local actors, and constrained comprehensive reform driven by national regulations.

5.2.2.3 Individual leadership

Individual leadership supported formal risk planning by providing spaces within bureaucratic structures to develop, discuss, and optimise existing risk management strategies. Individual leadership is considered as an institution of the shadow system here, but might represent the canonical system of formal risk planning, elsewhere. Individual leadership depends on informal aspects from the shadow system, including personality, but can be framed as an aspect of formal command and control mechanisms of the canonical system, too. This ambiguity underlines that the shadow and canonical systems can overlap substantially, and that boundaries between both are permeable and fuzzy.

Individual leadership supported the implementation of heatwave planning strategies in local organisations. An Emergency Planning Liaison Officer from a NHS trust in London suggested that their superior allowed them to dedicate time during organisational risk planning meetings to the discussion of heatwave planning. According to the respondent, this directed attention towards the optimisation of existing frameworks. Leadership can thus be associated with a manifestation of established plans as an accepted way of responding to heatwave risk:

> Leadership is a key determinant for effective emergency planning. I am lucky
> that I have a boss who often gives me slots in meetings, where I can step in and
> say 'Hi everybody, here is the heatwave plan'. I will then of course be made
> fun of, because it is snowing outside. But when it gets hot in the summer and
> I contact them they will remember that specific meeting, and will have heard
> of it [the heatwave plan] already. So in this sense, your boss determines in how
> far you can drive your agenda. (MI-LD-06:36)

Incremental learning and optimisation of existing planning arrangements can be supported by individual leadership if it facilitates an inclusive organisational culture that supports ideas and creativity. In the perception of a Public Health Specialist from a London local authority, changes in leadership of the Borough Resilience Forum provided space for them to include the voluntary sector more strongly in the local heatwave planning strategy:

> [...] the culture in the forum changed, from being a platform for the Director of Emergency Planning to present stuff, towards a more collaborative sharing platform. This cultural change was due to a change in leadership. The old director retired, he was doing stuff in an old-school fashion. The two guys that replaced him [...] they brought a new approach. Within this more collaborative atmosphere, the forum proved absolutely useful to communicate our message. For example, I did a couple of presentations on heatwave planning there, particularly addressing the voluntary sector to make them understand that heatwave planning is not just a health issue, and that they had a role to play in this, too. (MI-RK-07:30)

Individual leadership supported risk managers to circumvent formal hierarchies, and this facilitated a bottom-up communication of ideas to higher-ranking actors in the organisation. According to the Head of Emergency Planning at a London local authority, the Chief Executive of the organisation established flat hierarchies in the organisation and allowed colleagues to approach them directly. The respondent was able to leapfrog the next higher hierarchical level and communicate with the most senior representative from the organisation directly:

> [...] my good relationship with the Chief Executive is important. I know I can call her any time of the day, she is somebody that always wants to know about everything. I know I have her ear when I need it. This is somewhat outside of the official bureaucratic structures, normally I would have to call my Director first, and he would then contact her. I can circumvent this, and go right to her. So it depends a lot on her, and on the person that she is. (MI-EL-08:42)

Non-hierarchical, informal relationships between superiors and individuals within the organisation supported learning by facilitating ideas to be put into practice. The respondent drew on their good relationship with their superior to implement an emergency planning

exercise in the borough. Creative energy of informal relationships across organisational hierarchies was thus used to optimise existing risk planning arrangements:

> We were the first local authority that was able to run a live decontamination exercise. This was only possible because the fire brigade commander wanted this, and gave his support for this. It was a political issue, actually. I went to the Chief Executive to get staff for the exercise, here again, the relationship with the Chief Executive proved very valuable. (MI-EL-08:44)

The role of leadership for changes to organisational culture was highlighted by an Emergency Planning Officer from a private healthcare provider in London. According to the respondent, leadership was integral for the emergence of an organisational culture that supported regular emergency planning exercises:

> When it comes to testing and exercising, we have a good culture in our organisation that facilitates this [...]. Leadership is important for this culture to emerge, and for being open to changes. This is important to allow for an understanding in the organisation to emerge that it is not only about ticking boxes and making sure everything exist that needs to exist, but that we actually need to know that when it comes to an emergency, we can deliver. (MI-EL-07:34)

Leadership as an informal institution of the shadow system can support the canonical system in implementing and testing its formal heatwave planning frameworks. This can be associated with incremental, rather than profound changes to existing planning arrangements, because tests reveal weaknesses of existing strategies and provide momentum for their optimisation.

5.2.2.4 Organisational leadership

Risk planning organisations in London imitated policies of peers that proved to be successful. An Environmental Officer from a London local authority reported that their organisation imitated successful policies from neighbouring boroughs:

> I have worked in planning, environment and sustainability for the last 12 or 13 years, in four local authorities across the UK. [...] When I started my work here, I have noticed gaps in [London borough] around climate change adaptation.

> So I looked around in the neighbourhood, and found that [London borough]
> was actually doing quite a few things, which I then tried to replicate here in
> [London borough]. (MI-ER-07:1)

An imitation of successful policies suggests that some local authorities acted as leaders by progressing ahead of their peers, and that others learned from them. This observation speaks to research on policy learning and diffusion (Bennett and Howlett 1992; Simmons and Elkins 2004; Brooks 2005; Holzinger, Knill and Sommerer 2008; Sommerer 2010) which suggests that successful imitation of policies leads to their gradual manifestation. As a policy is implemented by an increasing number of organisations, it gradually gains acceptance and becomes established practice.

Ideas and novelty brought forward by individuals fed into communities of practice, and spread from there across organisations. An Emergency Planning Officer from a London local authority reflected on their role in introducing regulations on risk planning in contracts of the local authority with private businesses. The respondent reported that they introduced this practice in the organisation, and that it was subsequently imitated by other boroughs in London. This puts into focus the interplay between individual and collective learning for policy diffusion:

> What we do in [London borough] is to require small and medium businesses
> betting for contracts from us to consider risks and sustainability. This way, we
> push them into considering these issues. It proves to be very important. In the
> contracts, we would require, for example, considerations of business continuity.
> Extreme weather is indirectly related to this, and I want them to show me they
> know. We started this four years ago. I essentially introduced this idea here.
> [...] I also communicated it in a cross borough group, and since then other
> boroughs have begun doing it, too, although maybe differently than we are.
> (MI-NE-06:63)

Cross-borough communication platforms like the Sub-Regional Resilience Forums were important for the dissemination of knowledge on pilot projects. This was highlighted by an Environmental Health Officer from a London local authority. The respondent reflected on the possibility to include Met Office heatwave alerts in the airTEXT instrument, an air pollution and weather information service for vulnerable individuals:

> I use all possible events and opportunities to talk to colleagues, and to get our message out there. However, I believe at the end of the day it depends on a trial by some borough to get this to a London level across the consortium. (MI-LT-07:26)

Organisational leadership in risk planning depended on funding that allowed frontrunners to implement policies and to share experiences with their peers, according to the respondent:

> It depends on the leadership of someone to apply for funding to do this expansion, and from there it could potentially develop. If we can find someone to apply for funding for the heat expansion, that would facilitate this change [the inclusion of heatwave alerts in the airTEXT instrument]. (MI-LT-07:28)

National level funding schemes promoted leadership of local authorities in London. The 2001 "Warm Homes Healthy People" funding scheme from the Department of Health provided resources to local authorities in the UK to address fuel poverty and excess winter deaths. A representative from Public Health England reflected on the objectives of this funding programme:

> The Warm Homes Healthy People fund came about because there was a feeling in the Department of Health that the Cold Weather Plan was not well understood locally. They wanted an instrument to support this. Moreover, cold weather was a priority in 2011/2012. We had a few cold winters at that time, and we were worried about the high number of excess deaths. It was especially [colleague] and me that worked for a pilot project on cold weather. The aim was to get local authorities involved in cold weather planning, and to make them understand the seriousness of the issue. (MI-AY-08:12)

National level funding was strategically used in this case to promote leadership by individual local authorities, and to support others to follow the frontrunners. According to the respondent, the aim was to strengthen the UK Cold Weather Plan. This suggests that leadership among organisations can be strategically directed by national actors towards the implementation of existing risk planning frameworks, with the goal of supporting their rigidity. A Social Care Manager from a London local authority that received funding from the "Warm Homes Healthy People" scheme suggested that the instrument consolidated cold weather planning in the organisation:

> We got funding through this scheme until March. This gave us a lot of money
> to actually run things. We implemented an awareness campaign, together with
> the third sector. [...] So we had money to actually buy things for people, like
> insulation, warm cloths, blankets etc. In this campaign, it was also about
> making people understand what they are entitled to. We advertised in papers
> here in [London borough], and also teamed up with Public Health to spread
> the information. We actually helped over 500 people to claim things from the
> council that they were entitled to, and which they did not know about before.
> (MI-LR-07:39)

Funding opportunities were perceived as a way to catch up with champion boroughs by
the Head of Emergency Planning from a London local authority. The respondent suggested
that funding mechanisms like the "Warm Homes Healthy People" scheme could facilitate
local projects in their organisation that otherwise would not be realised. They also implied
an appreciation for champion local authorities that they thought had successfully attracted
funding in the past:

> We would love to have more projects in this area [seasonal health]. There are
> certain champion boroughs, which we admire. [London borough], for example,
> has seasonal health people who work exactly on these issues. With the public
> health reforms, there might be opportunities to actually do seasonal health
> planning under the public health budget. (MI-NN-04:20)

Limitations of funding mechanisms as a way of promoting and steering leadership
stemmed from the specific time frames to which they applied. The respondent indicated
that any measures in the context of the "Warm Homes Healthy People" scheme were of a
temporary nature only:

> The project is funded only in the winter month, from November to March. So
> the funding has already run out, it was first obtained in 2011 but won't be
> received in the next year. (MI-NN-04:19)

Funding programmes rarely seemed to support new risk planning projects in a sustain-
able way, but were rather used to implement existing risk planning frameworks in the
short-run. This observation hints at the incremental nature of social learning that follows
from organisational leadership supported by national funding.

5.2.3 Summary

This section explored how a close integration of formal and informal institutions has limited social learning in heatwave planning in London to incremental changes. It aimed to address the second research question: What forms of learning can be observed, and what are their implications for local heatwave planning strategies? Findings suggest that support from informal networks and trust relationships to formal risk planning arrangements limited learning in heatwave risk management to incremental optimisations that consolidated the status-quo. The analysis adds perspective to the results of the previous section. It sheds light on how novelty of the shadow system can also create rigidity, rather than change in existing risk planning frameworks. A differentiation between informal institutions as agents of change, and formal institutions as agents of rigidity, thus seems to lack nuance.

Findings of this section emphasise the importance of social context in shaping individual learning (Bandura 1977; Jarvis, Holford and Griffin 1998). The analysis showed how institutionalised forums for emergency planning in London provided support for informal relationships between individual risk managers. The results also speaks to theories of social learning that focus on collective learning (Senge 1990; Argyris and Schön 1996), and to policy learning theories (Bennett and Howlett 1992). The imitation of risk planning policies across local authorities can be framed by the political science literature on policy diffusion (Simmons and Elkins 2004; Brooks 2005; Holzinger, Knill and Sommerer 2008; Sommerer 2010). The observation that the shadow system was used to cope with problems of risk planning strategies relate to the multilevel heuristic, which suggests that niche innovations are geared towards the problems of existing regimes (Geels 2002: 1261). The next section discusses opportunities for more comprehensive forms of social learning in heatwave planning in London.

5.3 Social learning for system change

This section explores social learning as fundamental change in heatwave planning frameworks in London. The section aims to address primarily the third research question: What is transformation in heatwave planning in London, and how is it constrained? As an an-

alytical lens, the chapter draws on the multi-level heuristic of socio-technical transitions (Geels 2005), which suggests that transformation follows from the interaction of the three analytical levels of niches, regimes, and landscapes. The multilevel heuristic, rather than a focus on formal and informal institutions, is chosen as an analytical lens to shed light on the way in which transformation is constrained by factors at interrelated system scales.

Social learning as fundamental change in this section refers to paradigm shifts at the local, regional, or national scale. Two specific examples of such paradigm shifts in the context of heatwave planning in London are discussed in this chapter: At the regime level, the 2012 Health and Social Care Act is considered as a radical transformation that was associated by respondents with both negative and positive implications for heatwave planning in London. At the niche level, shifts from response-focused heatwave planning frameworks towards preventive approaches that highlight social, environmental, and technical risk dimensions are considered as an incremental transformation. The analysis then focuses on factors that can support or constrain such learning processes. It discusses the role of focal events, public and professional perceptions of heatwave risk as well as organisational cultures of problem-solving. The chapter closes with a summary of the analytical findings of this section.

5.3.1 Transformation in heatwave planning in London

Transformation was not always considered desirable by risk planning officials in London. Rather, transformation was also associated with negative implications for heatwave planning, for example when changes to the legislative frameworks that govern public health provision in the UK undermined effective risk planning. This suggests complexity and ambiguity of deep social learning processes in disaster risk management.

5.3.1.1 2012 UK healthcare reforms

The 2012 Health and Social Care Act was an administrative reform of the healthcare sector in the UK. It was not primarily targeted at facilitating change to health-related disaster risk management, but had significant implications for heatwave risk management

because it changed the organisational architecture that underpins heatwave planning in England. For the purpose of this analysis, the HSCA can thus be considered as an abrupt transformation at the regime level. Change processes following the reforms were perceived differently among respondents, even within the public health community of practice in London. Some respondents associated transformation with negative implications, both for the ability of their organisation to function and for heatwave planning in London. Other respondents did not perceive of the reforms as a constraint, but suggested that there were positive implications for their work.

The healthcare reforms fundamentally transformed the legislative and bureaucratic frameworks that govern public health provision in the UK. At the local level, public health provision shifted from the NHS to the local authorities, and commissioning of services shifted from Primary Care Trusts to Clinical Commissioning Groups. Heatwave planning was affected by the reforms because the planning provisions specified in the National Heatwave Plan are delivered to a large extent through the healthcare sector in the UK. Although the HSCA was not introduced with the intention to facilitate heatwave planning, or to support change to the risk management system, it thus had significant implications for the organisational architecture of the risk management regime in London.

Uncertainty, loss of familiarity, and a disequilibrium (O'Brien et al. 2012: 466) of existing planning arrangements characterised the implementation of the 2012 healthcare reforms according to many respondents. A Director of Integrated Commissioning at a London Clinical Commissioning Group associated the reforms with a retrenchment of employment:

> These reforms are, quite frankly, terrible. They are the biggest reforms in the history of the NHS, and they are also the worst reforms in the history of the NHS. Hideous reforms, really. We have a huge loss of individuals and of staff, there are considerably fewer people. Compared to the Primary Care Trusts, Clinical Commissioning Groups now have on average half of the staff that they used to have. Fortunately most of us are old enough to not have to go through this again. (MI-NL-08: 20)

New healthcare frameworks established by the 2012 reforms were considered dysfunctional by a Director of Public Health from a London local authority. The respondent suggested that they struggled with ambiguous new organisational responsibilities, and

that the new system of healthcare provision had many flaws:

> I think that the new system is fundamentally not fit for purpose. If this doesn't
> change, I don't think there will be a change in response. Take the provision
> of immunisations. This is administered by school nursing, traditionally. The
> commissioning needs to be done by NHS England. However, they said to us
> that we would need to do the commissioning, as we maintain the school nursing.
> But it is clearly laid out that the immunisations need to be commissioned by
> the NHS. (MI-ND-08:35)

Undesirability of healthcare reforms was also implied by an Emergency Planning Specialist from NHS England. According to the respondent, public health reforms had a profound impact on the functioning of the organisation:

> We had considerable disruptions through the healthcare reforms. Of course we
> tried as much as possible to have a managed process for this, but this is only
> possible to a certain degree. (MI-KT-07: 35)

Transformation of the healthcare sector affected stakeholders well beyond the public health community in London. Due to the transition of public health teams from the NHS to local authorities, the healthcare reforms also concerned local government organisations in London. The Head of Emergency Planning from a London local authority indicated that they had difficulties to fully understand the changes that took place, and that this had implications for their work in the Borough Resilience Forum:

> We struggle with getting our heads around the new structures in the health
> sector, with NHS England, the Clinical Commissioning Groups, etc. This
> is somewhat difficult to understand, still. We attached the Pandemic Flue
> Planning Group to our Borough Resilience Forum. This is very useful, and we
> can turn it again into a sub-group if we should have a need for pandemic flue
> planning. (MI-EL-08:29)

Negative implications for heatwave planning stemmed from disruptions, uncertainties and challenges that followed the 2012 healthcare reforms, according to a Head of Emergency Planning from another London local authority. The respondent suggested that the healthcare reforms constrained an effective response to the 2013 heatwave in London:

> [...] there is enormous pressure on the NHS. This general pressure has impli-
> cations for heatwave planning. I think because their resources and capacities
> are so stretched anyways, if you stick a heatwave on top of this, there will be
> severe trouble managing this effectively. (MI-WH-07:24)

The loss of familiar and established coordination mechanisms following the 2012 health-
care reforms constrained effective heatwave planning in a London local authority. The
Deputy Head of Emergency Planning from the organisation suggested that the healthcare
reforms can be associated with a retrenchment of employment, and that this undermined
cooperation between the emergency planning team of the local authority and the NHS.
Coordination mechanisms between both organisations were lost because a colleague that
used to provide links between them had to leave their job. The respondent indicated that
this would have implications for heatwave planning:

> Public health reforms have a rather significant impact on heatwave planning.
> [...] our key person that was the link to the PCT has lost its job due to the
> reconstruction in the health sector. More over, Public Health has less funding
> now. Instead of the Primary Care Trust, it is now the Clinical Commissioning
> Group that deals with public health incidents. However, I am not sure how
> much capacity they will have to actually do so. In flue planning, for example,
> the PCT used to pull together a board that managed planning. The new CCG
> does not seem to have the same capacity to do this any more. I don't know
> how they are going to do this in the future. (MI-HN-04:37)

Loss of familiar planning arrangements in the organisation was a direct consequence of
the 2012 healthcare reforms, according to an Emergency Planning Officer at another local
authority:

> Everything is changing now. Usually it would have been the PCT that would
> react to the Met Office weather alerts and that would make sure that social
> services have their arrangements in place. The PCT always used to be the link
> between the council and the NHS. I don't know if things will get easier now
> that the PCTs cease to exist and Public Health is part of the Council. It is
> too early to say what the implications of the reform are. (MI-AN-04: 24)

Adverse effects of abrupt transformation can decrease as individuals and organisations
get used to the new planning arrangements. This was suggested by the Head of Emer-
gency Planning at a local authority in London. While a loss of contact networks was a

direct consequence of the healthcare reforms, the respondent indicated that networks and coordination links will likely be re-established over time:

> Public Health still has to evolve, it still has to settle in its new role. The Director of Public Health has to make friends, has to establish connections. The health reforms impacted on my work in that I used to have regular contacts in the PCT, which are now gone. (MI-WH-07:54)

No implications or even positive changes were associated with the 2012 healthcare reforms by some risk planning officials in London. This points to the ambiguities and non-linearities of transformation. Fundamental change might be harmful to some actors, but beneficial for others. An Emergency Planning Officer at a London local authority suggested that the transition of Public Health from the PCT to the local authority would be beneficial for heatwave planning in the organisation. According to the respondent, it facilitated a better coordination of work between health and emergency planning teams:

> It makes a lot of sense that Public Health moves to the local authority now. For heatwave planning, this will make risk management more effective, as heatwaves are primarily a health issue, and now competences and especially resources are bundled together in the council. Now you won't have the split between Health and the council so severely any more. (MI-HK-04:35)

Better coordination of work was also highlighted as a desirable implication of transformation in the public health sector by a Social Care Manager from a London local authority. The respondent suggested that benefits stemmed from pooling budgets, but also from easier access to healthcare personnel:

> I think that the recent changes around the Health and Social Care Act only enhanced our work. We are more integrated with Health, and therefore have easier access to them. Also we have, through Health, additional resources to tap into. For example, now I can go to the Health manager directly if I need to find out something, and I might not even know this had he been in a different department. (MI-LR-07:31)

Positive impacts of the 2012 healthcare reforms for heatwave planning manifested themselves as a stronger involvement of public health teams of the local authority in heatwave planning, according to an Emergency Planning Officer at a London local authority:

> It is really to early to tell, but I think that the health reforms will potentially increase cooperation and thus will be beneficial for heatwave planning. The Director of Public Health is an important figure that links together different teams and brings together various people working on the same issues. I expect that Public Health, now that it moved to the council might be more involved in heatwave planning. (MI-NT-04:23)

5.3.1.2 Shift towards preventive risk planning

An emerging focus of heatwave planning on social, environmental, and technical risk dimensions was observed in local heatwave planning in London. This change in focus can be considered a gradual transformation at the level of niches. It emerged within small communities of practice and was driven by individual risk managers. Niche innovations seemed to destabilise existing heatwave planning regimes incrementally, rather than abruptly. Although change in heatwave planning towards more preventive approaches was observed both at the local authority level and at London-wide organisations, it had not yet unfolded as a comprehensive change in the National Heatwave Plan. Innovations penetrated this national planning regime only gradually because they escaped their niches only through pathways appropriated by the regime, for example through the annual rounds of review of the National Heatwave Plan.

Several respondents emphasised the need for preventive, rather than response-based approaches to heatwave planning and argued for a stronger consideration of risk dimensions not directly related to health. Social dimensions of heatwave risk, as well as the role of urban planning was not sufficiently represented in existing planning frameworks, according to a respondent from the London Resilience Team:

> However, I believe that we need to think more broadly about the impacts of heatwaves, to consider social issues, housing and planning etc. These things are more on the forward planning side, and not yet well considered in heatwave planning, and not in our plan. (MI-WN-07:15)

Technical aspects of heatwave planning such as adverse effects of heat on infrastructure were not sufficiently represented in the National Heatwave Plan, according to a Head of Emergency Planning from a local authority in London:

> Health is very important, but heatwaves are not solely a health issue. There are other very important things to consider for heatwave planning. This includes effects on transport, for example melting asphalt, and implications for power generation. (MI-WK-04:31)

Social dimensions of heatwave planning related to a preventive, rather than a response-based approach in the perception of a Seasonal Health Officer from a London local authority. The respondent highlighted social isolation as a risk factor for heatwave vulnerability. This reflects findings of research on the social dimensions of heatwave risk (Klinenberg 2003; McGregor et al. 2007) and suggests that this knowledge penetrates policy and practitioner discourses in London:

> This long-term planning for heatwaves would essentially be about housing, social isolation, and education. Housing is about overheating. Why would we put elderly people in single, high-rise buildings with no shading? Things like these need to be considered. Social capital and isolation are probably the most important risk factors. So the biggest measure, in a way, is to make sure people have contact. (MI-NY-08:29)

A shift away from response-based heatwave planning towards more inclusive, long-term strategies was highlighted as a potential paradigm shift by an Emergency Planning Officer from a London Clinical Commissioning Group:

> I am a firm believer that we should not only be reacting, but that our approach towards hazards like heat should be broad and inclusive, and should tie in with other areas, for example when we target vulnerable people. We should try to target [healthcare] providers early on, get the message to them, and make it their culture to care about these things, too. This is an exercise that goes all the way from the school to the care home, its about information and changing the perception of the relevance of issues. (MI-YZ-08:29)

Preventive heatwave planning approaches in London that went beyond the National Heatwave Plan incrementally penetrated existing risk planning regimes at the local level, and seemed to destabilise these over time. In the local authority sphere, attempts to foster a preventive approach to heatwave planning unfolded, for example, as "main-streaming" of heatwave planning aspects into regular risk planning in the council. An Emergency Planning Officer from a London local authority suggested that their team promoted this change, and that it was perceived as beneficial by colleagues in the organisation:

> We are integrating heatwave planning more and more into business as usual. Usually, people are opposed to receiving stuff because they believe that it causes them work. However, if they realise that is useful for them, also beyond the direct heatwave planning, and has positive side effects, they are not so opposed to it any more. (MI-NE-06: 39)

A holistic approach to heatwave planning was also highlighted as a characteristic of organisational risk planning by the Head of Emergency Planning from a London local authority. According to the respondent, heatwave planning in the organisation was shaped by aspects beyond the traditional health-centred planning frameworks:

> We are taking steps in terms of general emergency preparedness, which are also beneficial for heatwave planning, plus we work with social care providers and the NHS in the context of their Department of Health heatwave plan. More generally, policies also evolve around the climate change agenda. (MI-WK-04:16)

A gradual inclusion of preventive aspects in risk planning approaches was also observed at London-wide organisations. This suggests that incremental transformation did not only unfold at the local level, but also regionally. A respondent from the London Resilience Team emphasised that prevention was included for the first time in the 2013 conceptual risk planning approach of the organisation (see LRT (2013)). According to the respondent, this constituted a departure from traditional risk planning frameworks as outlined in the 2004 Civil Contingencies Act:

> [...] prevention and mitigation is new to the London Resilience Team. This is not a classical emergency response issue. The focus set by the 2004 Civil Contingency Act was initially: assess risk, and plan for the response. (MI-WN-07:53)

The integration of preventive strategies into the risk planning approaches of the LRT was associated by the respondent with the need for a stronger coordination with organisations from policy areas that shape emergency planning, but are not formally part of it:

> [...] we don't have to do more, necessarily, but [...] it is about drawing a line between what we do and what others are doing in their business as usual, anyway. Everybody does things that often relate to emergency planning and

preparedness, but they don't necessarily appear under this label. So there is
actually a lot of work that we can draw on. This means it is about engaging
with others and about knowing what they do, and how it can be mutually
beneficial. (MI-WN-07:60)

This focus on collaboration within and between risk planning organisations sheds light
on the role of networks and relationships for transformation. It adds nuance to the analysis
of the previous two chapters because it suggests that networks remain integral elements
of risk planning regimes even if these are subject to fundamental change.

As a consequence of the increasing recognition of environmental risk dimensions, heat-
wave planning was in development and was lacking a clear organisational custodian, ac-
cording to the Head of Emergency Planning from a London local authority:

> Heatwaves are very likely to become more frequent and more severe in the
> future as a consequence of climate change. So the whole climate change adap-
> tation agenda is very important for heatwave planning. It also means, however,
> that the policy [heatwave planning] is in development, and that there is no clear
> home for it. (MI-WK-04:33)

In the public health sector, transformation of local heatwave planning approaches was
supported by regime change following the 2012 healthcare reforms. According to a respon-
dent from the NHS, the reforms fostered multi-agency cooperation in heatwave planning.
This was associated by the official with a stronger focus of heatwave planning on social
care and the voluntary sector:

> Things changed in heatwave planning recently, and in the context of public
> health reforms, in particular. Public Health England is now the lead agency
> for heatwave planning. Now there is much more of a multi-agency approach to
> heatwave planning, which involves healthcare, social care, and also importantly
> the voluntary sector. (MI-KT-07:14)

A stronger integration of health and social care policies following the 2012 healthcare
reforms was also reported by a Social Care Manager from a London local authority. This
supports the assertion that the healthcare reforms contributed to a gradual transformation
of heatwave planning approaches in London:

> For example, when you provide social care to individuals, some of their needs
> are actually health needs. After the reforms [the 2012 healthcare reforms], we
> are now able to have a dialogue with Health to identify which aspects of the
> service we provide actually relate to health, and how they can help us with
> this. This is a really good exercise. (MI-LR-07:26)

In summary, transformation as a gradual change in heatwave planning frameworks towards preventive approaches that consider social, environmental, and technical risk dimensions was considered desirable by many risk managers in London. This transformation was supported by innovations that emerged at the level of niches. It can be associated with a gradual destabilisation of existing planning regimes, as changes to local and London-wide risk planning frameworks put pressure on the National Heatwave Plan as the dominant risk planning regime. However, unless this pressure unfolds as tangible change to risk planning arrangements in the National Heatwave Plan, niche-level innovations are unlikely to unfold as fundamental change at other system scales.

5.3.2 Drivers of and barriers to transformation

Three drivers and barriers to transformation are considered here. Focal events catalysed transformation if they revealed the inappropriateness of existing risk planning frameworks. Individual and collective risk perception as well as organisational cultures of problem-solving undermined fundamental changes in heatwave planning. All three landscape factors are closely intertwined and often seemed to overlap and mutually shape each other.

5.3.2.1 Focal events

Events can put pressure on planning frameworks and highlight niche innovations as alternatives to existing planning arrangements (Kingdon 1995; Birkland 1996). However, extreme events alone rarely account for the complexities of deep social learning processes, which rather depend on interrelated processes at the landscape, regime, and niche levels. For the purpose of the analysis in this section, focal events can refer to heatwaves, to other weather events such as extreme cold, but also to noticeable events such as the 2012 London Olympics.

Individual events triggered learning in heatwave risk management in London if they revealed the inappropriateness of existing planning arrangements, according to a Head of Emergency Planning at a London local authority:

> Much learning in emergency planning is about trial and error. In this sense, major incidents play a critical role for advancing and changing policy. Major incidents help to focus people's mind on the need to do effective emergency planning. (MI-NS-05:62)

The 2003 heatwave in Europe catalysed transformation of disaster risk management for extreme weather events both in the UK and in France, according to an Environmental Officer from a London local authority:

> It always takes disasters to make things happen. You saw that in France, too, when they only started planning for the heatwave in 2004 after several thousand people died. In London, it's the same. There is really a culture of short foresight in the way in which priorities are set. (MI-ER-07:27)

The 2012 London Olympics precipitated a regime-level transformation of risk planning paradigms at the London Resilience Team, according to a respondent at the organisation. Here, transformation referred to a change away from response-based towards preventive risk planning at the LRT, according to the respondent:

> During the Olympics, we actually had time for some critical reflection, that made us realise that prevention and mitigation are actually very important for our work. It made us see that it is not only about responding to risk, but also about reducing the level of risk overall. (MI-WN-07:54)

Transformation seemed to be catalysed through the absence of focal events, if this absence contrasted with previous expectations of risk planning actors. The absence of major incidents during the Olympics supported a questioning of risk planning strategies within the LRT, according to the same respondent:

> This critical reflection happened because of something that didn't happen: For the Olympics, we had a huge risk assessment process, there was a massive security impetus, which made us all prepare and plan for the worst. So a year ago, we sat here, expecting the worst, and nothing really happened. I

mean there were some minor incidents, but overall, we got off fairly lightly. (MI-WN-07:55)

The absence of major incidents emphasised the importance of prevention, rather than response, and allowed for a new perspective on risk planning approaches in the organisation, according to the respondent:

> This experience made us look at things differently. We asked ourselves why the risks we anticipated did not materialise. It was, of course, because we had so much more police, and extra capacity in general. The Olympic sites had back up capacity for everything, so this already relates quite well to the prevention and mitigation aspect. (MI-WN-07:56)

Transformation of risk planning paradigms at the LRT that followed the 2012 Olympics were supported by critical reflection within the organisation. Capacity for critical reflection at the LRT was generated through excess capacities at the organisation. In the absence of major incidents during the Olympics, staff at LRT offices in London had time to critically reflect on the limitations of the current risk planning approach, according to the respondent. This critical reflection emphasised the role of preventive, rather than response-focused planning approaches:

> [...]we had a lot of time because nothing really happened, and we had extra capacity here at the offices. So we looked at our plans and response arrangements that we currently have and critically asked whether they worked. We recognised that the way we traditionally plan is to look at business as usual, to assume an incident happening to this, and then to look at how we should respond to this. We realised that this is usually not how things unfold, that it is actually much more phased. You would get a warning, a small indication, that then builds up and before you realise that it is a big thing it is already happening. (MI-WN-07:57)

The emphasis of the respondent on excess capacity sheds light on the role of the formal institutional constraints for learning in organisations. According to the LRT respondent, critical reflection on the appropriateness of existing risk planning paradigms was only possible because the organisation was temporarily supported by additional staff, generating capacity that was not used for crisis response due to the absence of major incidents during the Olympics. This suggests that learning processes in the organisation require time

and capacity that exceed those needed for day-to-day business. Such excess capacity can provide niches within the organisation in which individuals can reflect critically on their practice and develop new ideas.

Exercises and training for heatwave events in London took place occasionally, but seemed to focus on improving existing risk planning frameworks rather than on generating critical reflection on their appropriateness. A heatwave exercise of emergency planners and response organisations took place in preparation for the 2012 Olympics, according to an Emergency Planning Officer from a London local authority:

> In the run-up to the Olympics, we had several exercise and training events, which were very helpful to further develop our approach to risk management and emergency planning. For example, we had an exercise with social care that revolved around two specific scenarios: a) traffic gridlock, because that was what everyone was concerned about, and b) heatwaves. The scenario was helpful to make sure that the relevant stakeholders would not only receive information and alerts about the heatwave, but be conscious about the risk. (MI-NE-06:23)

A heatwave exercise was also reported by the Head of Emergency Planning from another London local authority. The respondent indicated that the Borough Resilience Forum engaged in a short training exercise about heat stress shortly before the Olympics, and that this put focus on existing heatwave risk planning strategies:

> [...] a heatwave exercise was conducted in this planning group [the Borough Resilience Forum] in April 2012. This was a scenario and feedback workshop of 45 minutes that helped to raise the game of heatwave planning in this forum. It was also very helpful for us because we had the chance to learn about the work of the others in this area. (MI-NN-04:27).

Both exercises helped to raise awareness among participants about heatwave plans, but did not seem to generate critical reflection on their appropriateness. This suggests that planning and response measures to heatwaves consolidate, rather than challenge existing risk planning strategies. Moreover, there were little prospects of regular training exercises for heat stress in London. In both cases illustrated above, the 2012 Olympics provided momentum for exercises to be run. For heatwave risk the costs of exercises might be

particularly high as the at-risk group is small, marginalised and seems to be distributed more broadly than for flood risk, for example (see Figure 8 in chapter 3). This difficulty was also highlighted by a Senior Emergency Planning Officer from a London local authority:

> Training and long-term preparation of staff for heatwave response takes place only when it makes sense. There are no resources for long-term training for heatwave response, there is no money for that. The council simply can't afford to plan and train for something that is not likely to happen very often. (MI-RG-03:42)

A single focal event initiated learning processes in disaster risk planning within the organisation, according to a Head of Emergency Planning from a London local authority. The respondent suggested that the event revealed the inappropriateness of planning arrangements for cold weather. The organisation learned to strengthen preventive planning for cold weather, according to the respondent:

> We had a wake-up call for extreme weather two years ago, when we ran out of salt during the winter and we could not properly salt the streets. [...] Usually we had around 250 tonnes of salt stockpiled, this used to be enough for our winters. We have recently stocked this up to over 600 tonnes. This was a learning process based on the wake-up call when we realised that our salt supply is quite vulnerable. (MI-WH-07:14)

Single focal events did not seem to trigger learning if they were not associated with a major impact. The 2013 heatwave in London, for example, was not considered as a catalyst for transformation by risk managers in London. An Environmental Officer from a London local authority suggested that the 2013 heatwave did not put heatwaves more prominently on the organisational agenda:

> I don't think this current heatwave will have a long term impact. If we get a cold summer next year, then this will be forgotten very quickly. (MI-ER-07:37)

The 2013 heatwave did not facilitate substantial changes to planning frameworks in the organisation, according to a Seasonal Health Officer from a London local authority:

> I think it is unlikely that there is a big impact of the current heatwave on the way we do our work here in the team. Staff time is very stretched, and there

> is little we can do when we only have two days notice of the heat, especially in the summer where many people are on holiday. (MI-NY-08:19)

The 2013 heatwave did not drive transformation because heatwave planning frameworks were considered effective enough to address the impact of the heat. This seemed to undermine momentum for any fundamental changes. Existing heatwave planning provisions within local authorities in London were considered adequate for the response to the heatwave by a Head of Emergency Planning from a London local authority. The respondent suggested that the heatwave did not stretch planning capacities in the organisation:

> We did not have a lot of work around the recent level 3 heatwave. We circulated the messages to the relevant directors, but apart from that it was not much work for us. It was not a big thing, really, and there is only so much you can do for a heatwave. (MI-EL-08:34)

The moderate impact of the 2013 heatwave constrained learning from the event, according to an Emergency Planning Officer from a private healthcare provider in London. The respondent suggested that the impact of the heatwave was not severe enough to activate existing emergency planning procedures. According to the respondent, there was thus no opportunity to test whether the organisational heatwave plan would work well during an emergency. This lack of disruption of business as usual constrained learning in the organisation, as no lessons-learned could be drawn by local practitioners:

> I would say that the recent level 3 alert was business as usual, with monitoring and preparing for a potential out of business as usual situation. I would not say that there was a great amount of learning around the current heatwave. (MI-EL-07:18)

Opportunities for deep social learning processes in the context of focal events lied within repeated, rather than single events of a substantial impact, according to several risk managers. An Emergency Planning Officer at a voluntary organisation suggested that a series of cold winters supported paradigm shifts in cold weather planning in the UK:

> The emergency planning community in London is not prioritising weather. It is more about traditional emergencies and events. I think for that to change

we need a series of events to show us we are wrong. We actually did see this with cold weather. Since 2007, we had had lots of snow for a series of winters, and now we have good winter plans in place, and are on top of our game for winter planning. (MI-RD-08:38)

A Seasonal Health Officer from a London local authority contrasted the lack of political demand for heatwave planning with the prioritisation of cold weather following a series of cold winters in the past:

> [...]there is no political pressure on me to do anything on heat. This would only change if there were a series of heatwaves in a row, I believe. We actually had that with cold winters recently, where there have been a series of particularly cold winters, and that noticeably increased the importance that was attached to this issue. (MI-NY-08:21)

In the absence of regular focal events, national government agencies were able to maintain momentum for flood risk management, according to an Emergency Planning Officer of a voluntary organisation. The respondent argued that the UK Environment Agency acted as an advocate agency and managed to maintain flooding as a priority issue on the emergency planning agenda in London despite the absence of regular events. This suggests that stakeholders can foster opportunities for learning in risk management by keeping hazards on the organisational agenda:

> [...] for things to be on the agenda, something needs to happen for a while, and then if it does not for a while, it falls off the agenda again. With flooding, I am actually surprised we still have this on the agenda in London, since there haven't been major floods for a while. I think this is because you have the Environment Agency as a player that keeps reminding us about this issue. It is their thing, in a way, they say flooding, flooding, flooding, all the time. For extreme weather, there is no such stakeholder that would do the same. (MI-RD-08:38)

In summary, focal events as landscape factors seemed to be perceived by the risk planning community of practice in London as catalysts for transformation if they revealed the inappropriateness of existing risk planning frameworks. The emphasis of many respondents on the critical role of events to catalyse changes to organisational risk planning approaches sheds light on an institutionally-configured focus on response, rather than prevention. It

illustrates how organisational heatwave planning strategies were geared towards reactive risk planning. Within this configuration of reactive local emergency planning paradigms, guidance of the National Heatwave Plan on preventive aspects of heatwave planning did not resonate. This suggests that the role of focal events in catalysing transformation is often fuzzy and overlaps with other landscape factors. Two of these landscape factors that are closely intertwined with focal events are discussed below.

5.3.2.2 Risk perception

A low level of risk perception acted as a barrier to transformation in heatwave planning in London because it constrained, amongst others, a political prioritisation of heatwave planning, long-term risk planning, as well as a critical evaluation of past policy failures. This argument speaks to research on how the rigidity of core beliefs can undermine change in organisations (Turner 1976; Argyris and Schön 1978; Kets de Vries and Miller 1984; Pauchant and Mitroff 1988). Due to the low perception of heat risk among both the wider public in London and among risk planning officials, there was little momentum for actions that pro-actively addressed potentially adverse effects of heat. A Head of Emergency Planning at a London local authority suggested that perceptions of risk among the wider public in London were considerably lower for heat stress than for other hazards, and that this constrained heatwave planning in the organisation:

> I think, very brutally speaking, that people will be more concerned about 50 deaths in a terrorist attack than about 5000 deaths in a heatwave. So you really have to make the case for anything you do, so that people will actually accept that this work is important. Even the literature on heatwaves is somewhat suggesting that people will die, anyways. This is a very callous statement to make, I think. (MI-WK-04:45)

Public and professional perceptions of risk were closely intertwined, according to a Seasonal Health Officer at a London local authority. The respondent suggested that there was a lack of acknowledgement in the public of individual vulnerability to heat. This speaks to findings that at-risk individuals often do not consider themselves as vulnerable to heat (Abrahamson et al. 2009), and suggests that this lack of risk perception constrained public sector organisations to act on heatwave planning:

> A key problem with heatwaves is that people don't perceive themselves as at risk, and consequently don't complain about overheating and hot temperatures to the local authorities. Hence, the issue is not really on the map. (MI-NY-03:35)

Cultural aspects undermined heatwave risk to be taken seriously within the risk planning community of practice in London, according to the Head of Emergency Planning from a London local authority. The respondent indicated that considerations of risks from warm temperatures were constrained by positive associations of risk managers with heat. This statement reflects findings that unusually warm weather is perceived positively by UK residents (Palutikof, Agnew and Hoar 2004; Fuller and Bulkeley 2013). The implications of such positive associations of heat were analysed in a recent study by Lefevre et al. (2015), who suggest that the impact of heat protection messages during the 2013 heatwave in the UK was undermined by positive affect about heat. Similar dynamics were reported by the respondent:

> We would raise this heatwave issue in the Borough Resilience Forum as part of revisions to the Business Plan. This would then bring out a chuckle from people saying that they all wished a heatwave would come soon, and then we would discuss the issue. (MI-NN-04:29)

Low risk perception seemed to constrain transformation in heatwave planning in London by shaping public policy decisions. In the absence of regular heatwave events in the UK, there was no support for comprehensive changes to budget allocations for risk planning, according to a Seasonal Health Officer from a London local authority. The respondent suggested that individual events such as the 2013 heatwave in London did not build sustainable momentum for policy changes:

> My problem with heatwaves, from the point of view of me being a budget manager, is that they are so unpredictable. As much as an event like the one a couple of weeks ago can make it easier for me to make my argument in budget negotiations, if the next year is a particularly cold summer then the momentum of this heatwave will have gone. Viewed from a larger perspective heatwaves are still unpredictable and seen as rare and infrequent events. (MI-NY-08:12)

Risk perception also undermined preventive planning arrangements to develop at the London Ambulance Service. An Emergency Planning Officer from the organisation called

into question the necessity for stockpiling water for heatwave emergencies, as they considered heat stress as an irregular and unlikely event:

> It was the first time we had had this [a heatwave] in many years, and usually these things are not very likely. So the question really is whether we are going to spend resources on something that happens so rarely. Do we really need to stock hundreds of gallons of bottled water in a warehouse for the next seven years for something that happens so rarely? The approach, at the end of the day, is likelihood over impact. That is what it is, unfortunately. (MI-NN-07:26)

Constraints on transformation that stem from low risk perceptions were reinforced by emergency planning paradigms that emphasised likelihood as a factor that determines planning priorities. An Emergency Planning Specialist from NHS England suggested that this planning approach affected the prioritisation of heat stress in organisational risk planning, compared to cold weather:

> There is a recognition that heatwaves can have a quite severe impact. However, the approach around planning and response is built around likelihood, and there, heatwaves are just not as likely as severe winter weather. (MI-KT-07:23)

The low prioritisation of heatwave risk constrained transformation by undermining preventive risk communication and knowledge dissemination of local authorities in London. These aspects were considered by respondents to be important for facilitating a shift from responsive towards preventive risk planning. However, as heatwave risk was usually not considered as significant as other climate change related hazards, there was little momentum to prioritise resources for risk planning in a way that would allow for a proactive approach towards heat stress. A Seasonal Health Officer from a London local authority suggested that due to the low priority of heatwaves, managers of community centres in the borough did not support the local authority in implementing "Cool it!" information sessions on heat risk at their facilities:

> We did not do any "Cool it!" presentations this summer, because they are simply difficult to sell to community centres. People don't think this is a priority. (MI-NY-08:18)

Risk perception appeared to undermine transformation by constraining a critical evaluation of past policy failures. This speaks to research that identifies tendencies to disregard information on performance failures as a barrier to organisational learning (Janis and Mann 1977). In heatwave planning organisations in London, there seemed to be little critical reflection on the 2,000 heat-related deaths in the UK during the 2003 European heatwave. Despite this significant number of fatalities there was a tendency among respondents to consider the 2003 heatwave in Europe primarily as a failure of risk planning frameworks in France (15,000 heat-related deaths (Robine et al. 2007)), rather than in the UK. The Head of Emergency Planning at a London local authority suggested that there was only a minor impact of the heatwave in the UK, compared to other countries in Europe:

> In 2003 there was the heatwave in Europe, which affected France and other countries, but not so much us. (MI-WH-07:13)

A similar assessment was made by an Assistant Director of Public Health at a local authority in London. In their perception, adverse effects of the heatwave in 2003 were limited in the UK:

> The first heatwave plan came into place after the heatwave in France. We had an impact here in the UK, too, but it was not so bad. (MI-ER-06:20)

Both statements suggest disregard of the failure of UK public policy to prevent heat-related deaths during the 2003 event. This disregard undermined critical reflection and constrained fundamental changes to policy.

High thresholds for heatwaves to be considered a disaster limited the scope of smaller heat events to provide momentum for transformation. The 15,000 deaths during the 2003 heatwave in France were used as a reference point for a heatwave disaster among risk planning officials in London. Smaller events with a limited impact, for example the 2013 heatwave in the UK[37] provided little momentum for transformation of heatwave planning frameworks. A Head of Emergency Planning at a London local authority indicated that the heatwave did not support any learning in the organisation:

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[37]For a discussion of the public health impacts of the 2013 heatwave in the UK see (Elliot et al. 2014).

> It [the July 2013 heatwave] was not a big thing, really, and there is only so
> much you can do for a heatwave. Yes, it gets a little hot, but you can only
> advise wearing lighter clothing and drinking more. It was not that people were
> dying on the street, or that there were difficulties in the hospital capabilities.
> It could become that way, as we have seen in France in 2003, but this was of
> course far from it. (MI-EL-08:34)

In summary, perceptions of heatwave risk among both the public and professional risk managers in London acted as a barrier to a transformation of heatwave planning. Risk perception was closely intertwined with the occurrence of heatwave events. It constrained the political prioritisation of heatwave planning, undermined preventive risk communication and risk planning, and prevented a critical evaluation of past policy failures.

5.3.2.3 Cultures of "fire fighting"

Organisational cultures acted as barriers to transformation in heatwave planning in London because they prioritised short-term problem-solving in reaction to events, rather than preventive long-term approaches. This underlines the importance of focal events as catalysts for change, and suggests that landscape factors are intertwined. A respondent from the London Resilience Team suggested that there was a culture in the risk planning community of practice in London of changing planning arrangements only after events revealed their dysfunctionalty:

> In many areas that we are working on in resilience, there is a tradition of
> changing things only after an event has occurred. This is when we look at
> arrangements, and see clearly if something did not work, and then have an
> impetus to change this. (MI-WN-07:17)

Reactive, short-term approaches to risk planning constrained transformation of heatwave planning frameworks by undermining a shift towards preventive risk planning, according to a Seasonal Health Officer at a London local authority. The respondent referred to this as a culture of "fire fighting":

> [...] long-term proactive measures are undermined by a culture of fire fighting,
> which prioritises short term reactive measures over these long term ones. For
> this culture to change, it really depends, I believe, on a series of hot summers
> in a row. (MI-NY-08:30)

A culture of fire fighting was observed at a London local authority that faced a power outage in the winter of 2012. Formal data protection regulations of the canonical system constrained the ability of the emergency planning team to identify vulnerable individuals during the incident. Rather than seeking a long-term, sustainable solution (e.g. access of the emergency planning team to the list of vulnerable individuals), the Head of Emergency Planning prioritised a short-term solution:

> The access to the database does not even have to be held by someone from emergency planning, directly. I would be happy to simply have someone in Social Services who I know I can call to get information from the database, without accessing it myself. Actually I do not even want to access the database, I just need to know who I need to call in Social Services. (MI-NS-05:45)

A culture of fire fighting undermined transformation by supporting the passivity of risk managers in the absence of visible problems with existing planning frameworks. An Emergency Planning Officer from a voluntary organisation suggested that an emergency would be required for changes to the licensing practices of sporting events during heatwaves. The respondent reported that despite warnings issued by Public Health England, sporting events in London continued to take place during the July 2013 heatwave. They implied that there would be no momentum for changes to this practice unless there were fatalities at future sporting events due to the heat:

> [...] there is advice from PHE not to do sporting events in a level three [heat] alert. However, this advice was either not obtained or ignored by many organisers, as the sporting events took place, nevertheless. So we actually went to a lot of events. [...] I think we should go through licensing procedures to include regulations on when events cannot take place any more, and this should then include a level 3 heatwave warning. It is bizarre that we wait for people to die before we change our practices on how we license these events. (MI-RD-08:37)

Competing interests of stakeholders with specific political agendas and resources were at the heart of a culture of firefighting in their organisation, according to a respondent from the London Resilience Team. They suggested that competing interests within the organisation constrained comprehensive policy changes towards preventive risk planning:

> This tradition [of events to catalyse change] is due to a combination of po-
> litical and administrational factors. As the London Resilience Partnership,
> we have about 120 partner organisations. Each of these organisations is in
> a specific situation, answers to different people, and has a different budget.
> They thus have their own agenda, they need to balance politically what their
> resources are, and where they are directed. They all have to increasingly cut
> budgets and do things more efficiently. This is perfectly understandable, but
> has implications for how they deal with uncertain events. (MI-WN-07:18)

A culture of fire fighting suggests confidence of the organisation in its ability to respond to problems once they occur. This confidence can constrain opportunities for transformation because it limits critical reflection. This was observed, in particular, in emergency response organisations in London. A Borough Commander from the London Fire Brigade expressed their confidence in the resilience of front-line staff. The respondent suggested that there was no need for comprehensive changes in organisational risk planning during the July 2013 heatwave:

> We are prepared for staff safety in hot temperatures, anyways, so there is
> nothing we would do in reaction to the level three alert. As firefighters, we are
> also trained in heat control, we can handle very hot temperatures and know
> how to look after ourselves. (MI-WE-07:17)

Confidence in the resilience of front-line staff was also expressed by an Emergency Planning Officer from the London Ambulance Service, who suggested that paramedics were capable of coping with hot temperatures in the summer of 2013:

> So far our internal planning has been effective. The ambulance personnel know
> how to look after themselves, they always know where to get ice-cream and
> cold drinks, they are pretty resilient. Every refrigerator in this building is
> currently stocked up with bottled water. (MI-NN-07:16)

This perception of the resilience of front-line staff was associated with a "macho culture" by an Emergency Planning Officer from a London local authority. According to the respondent, a macho culture among rubbish collectors of the local authority potentially increased their vulnerability and constrained behavioural changes of staff during extreme temperatures:

> Rubbish collection vehicles frequently run out of water in the summer, and it
> is our job to make them more aware of the risks. It's a macho culture there,
> but we are seeing improvements in the sense that they carry more water, and
> tend to keep their shirts on more often to avoid negative effects of heat on the
> skin. (MI-HK-04:19)

In summary, organisational cultures of fire fighting constrained transformation in heat-wave planning by undermining preventive risk management in the absence of events, and by supporting confidence of organisations in their ability to respond to events when they occur.

5.3.3 Summary

This section explored social learning as fundamental change in heatwave planning in London. The analysis aimed to address the third research question: What is transformation in heatwave planning in London, and how is it constrained? The 2012 UK healthcare reforms were identified as an abrupt regime-level transformation that altered the organisational architecture of heatwave planning in London. A stronger consideration of social, environmental and technical risk dimensions in local heatwave plans was identified as an incremental transformation at the level of niches.

Transformation was not always considered desirable by risk planning officials in London, and intertwined landscape factors both precipitated and constrained transformation. This suggests complexity and non-linearity of fundamental change processes. Focal events as external landscape factors were identified as catalysts for transformation if they revealed the inappropriateness of existing planning regimes. However, events with limited impact seemed to fall short of precipitating transformation. For example, the 2013 heatwave in London did not support fundamental changes to heatwave planning frameworks, as it was considered by risk managers to be of minor impact, only. Public and professional risk perceptions, as well as organisational cultures were discussed as landscape factors that acted as barriers to transformation in heatwave planning.

Landscape factors such as risk perception and organisational culture can be interpreted as manifestations of collective institutions of the shadow system that shape social learning. The results of the analysis in this section speak to the multi-level heuristic of socio-technical

transitions (Geels 2002) as an analytical concept for transformation. They suggest that landscape factors can also be barriers, rather than drivers of transformation.

6 Discussion and Conclusion

This chapter briefly synthesises the main research findings, critically reflects on their implications for theory and practice, discusses some of the limitations of this study and outlines opportunities for further research on the subject.

6.1 Synthesis of key research results

Table 9 summarises some of the key findings relating to the three research questions. The results of the analysis suggest that learning in organisational heatwave planning in London unfolded as incremental change in established risk management approaches. Learning consolidated existing heatwave plans at the local level, reinforced the status-quo and can thus be associated with rigidity, rather than with change. Social learning was constrained by the interaction between formal and informal institutions. Shadow institutions such as trust relationships and networks supported formal risk planning arrangements to function. In the short-run, this added flexibility to disaster risk planning because it provided opportunities to deliver risk management even if formal strategies were dysfunctional or failed. However, support from trust relationships and informal networks seemed to consolidate existing heatwave planning strategies in the long-run and thus stabilised, rather than challenged them. Informal institutions of the shadow system were not used to innovate local risk planning, explore alternatives to existing strategies and to propose paradigm shifts in heatwave risk management.

The analysis found that local heatwave plans in London were modelled on the National Heatwave Plan. They framed heatwave risk through a focus on public health and emphasised preparedness and response, rather than prevention. This focus of local heatwave plans seemed to result from both formal (lack of orgnaisational resources and capacities) and informal (organisational cultures of fire fighting) institutional constraints for learning in local organisations. The reactive character of many local heatwave plans did not result from the content of national guidance on heatwave planning, which stressed the need for

Table 9: Key findings relating to the research questions

Research Question	Key findings	Supporting Evidence
RQ1) How do formal and informal institutions constrain social learning in heatwave risk management in London, UK?	informal "shadow" institutions (**trust relationships, social networks**) **consolidated** formal "canonical" institutions (**organisational heatwave plans**), supported them to function	Chapter 5.2.2
	formal institutions (**Borough Resilience Forums, Sub- Regional Resilience Forums**, etc.) **provided structures** within which informal **relationships developed**	Chapter 5.2.1
	formal institutions (**control mechanisms, bureaucracy, rules**) **constrained** informal institutions (**individual agency, flexibility, knowledge, organisational cultures**) in developing novelty	Chapter 5.1.2
	formal institutions (**legal mandates, regulations**, institutionalised platforms) considered **important to support** local **heatwave planning**; **absence** of such institutions **did not provide space for innovation** and critical reflection	5.2.1.1
RQ2) What forms of learning can be observed, and what are their implications for local heatwave planning strategies?	**interaction** between formal and informal institutions **limited** social **learning** in heatwave risk management to **incremental changes** that **reinforced the status-quo**	Chapter 5.3.2 Chapter 5.2.2
	incremental change optimised, rather than challenged established heatwave plans, **consolidated reactive, health-centred heatwave planning** at local level	Chapter 5.2
RQ3) What is transformation in heatwave planning in London, and how is it constrained?	transformation as shift towards **preventive heatwave planning** that considers **social, environmental, technical risk** dimensions	Chapter 5.3.1.2
	transformation constrained by reliance on events as catalysts for change, low risk perception (public and professionals) and organisational cultures of "fire fighting"	Chapter 5.3.2

Source: own

preventive long term planning beyond public health interventions. Rather, it was a feature of the risk management system which was characterised by organisational cultures of fire fighting and dominated by planning paradigms focused on response.

A shift towards preventive risk management strategies that acknowledge social, environmental and technical dimension of heatwave risk was identified as an opportunity for deep social learning. Findings from the analysis indicate a gradual emergence of such a learning process: Some respondents acknowledged that the optimisation of existing risk planning strategies had its limits, and pointed to the need to develop preventive risk planning that goes beyond public health considerations. Transformation was constrained, however, by low risk perception, organisational cultures of fire fighting, and a reliance on events as catalysts for change. This role of events suggests an element of uncertainty and randomness in transformation, and highlights limited agency in deep social learning processes in disaster risk management.

Findings of this study, and the contribution that they can make to literature on social learning and social geography need to be interpreted with an acknowledgement of the particularities of London as a decision-making space. As discussed in Chapter 4 already, the organisational architecture of disaster risk management in London is unique in the UK, and this is of significance for the interpretation of the practices identified in the analysis of this thesis.

As the capital city and the socio-economic center of the UK, some local authorities in London might be in a stronger financial position than local authorities in geographically and socio-economically more remote areas of the UK. In some cases, relative economic strength of local authorities might translate into an increased organisational capacity, both financially and in terms of available staff. As the findings from the empirical analysis suggest that the availability of resource is an important element for the capacity of the organisation to reflect critically, this distinct aspect of local governance in London suggests that capacity for critical reflection on heatwave risk management might be more strongly constrained elsewhere in the UK.

The geographical proximity of London's 33 local authorities suggests that social net-

works, both formal and informal, cut across the boundaries of individual boroughs, connecting risk managers to colleagues from a variety of different organisations. This density in the network of social relationships can facilitate the dissemination of knowledge, supports sharing of best-practice examples and thus shapes capacity of learning in a way that is particular to the organisational architecture of disaster risk management in London.

The existence of the GLA as a coordinating body at the regional level shapes the unique character of London as a decision-making space. The GLA adds another administrative layer that does not exist in more rural parts of England. Findings from the empirical analysis suggest that such an additional layer can have implications for learning capacity, as it provides, amongst others, institutionalised platforms for disaster risk management that are important for the development and maintenance of social networks. Sub-Regional Resilience Forums, for example, were shown to be of importance for the development of the social networks that underpin disaster risk management in London, strengthening working relationships between risk managers from different local authorities across London.

6.2 Implications for theory and practice

Findings from this study shed light on the complexity of social learning in disaster risk management, and on its institutional constraints. The study nuances existing knowledge because it highlights how particular institutions can act as barriers to learning in one situation while supporting capacity for change at others. This reveals ambivalences in social life, and suggests that assumptions about a linear relationship between institutions and learning fail to grasp the complexity that characterises social processes of change.

The study's original contribution to knowledge on social learning and the socio-geographical understanding of risk governance unfolds around three arguments from the literature discussed in the introductory chapter of this thesis, in particular. First, the results add to the literature that merely focuses on the beneficial implications of informality for learning in disaster risk management (Boin and 't Hart 2010; Hamra et al. 2012). Second, the analysis puts into perspective arguments that adherence to formal rules undermines learning (March and Olsen 1976; Staw, Sandelands and Dutton 1981; Lovell 1984) and organisa-

tional disaster response capacity (Boin and McConnell 2007; Somers 2009). Third, the results nuance arguments that tension between the canonical and shadow system provides opportunities for social learning in places of "bounded instability" (Brown and Duguid 1991; Stacey 1996; Smith and Stacey 1997; Shaw 1997).

In relation to the first argument, the thesis suggests that informal institutions such as networks, trust relationships, dominant perceptions and organisational cultures can undermine learning if they support formal risk planning arrangements to function. Results show that the informal organisational space alone is not necessarily a source of innovation and change. Rather, the analysis suggests that context conditions matter for whether informal spaces can generate novelty. Capacity for critical reflection in informal spaces can be constrained by dysfunctional formal risk planning arrangements that are in need of support to function.

Informal spaces in the organisational system of risk management for heat in London were often used to support formal risk planning to function. This dynamic reveals how informal spaces can be drawn on as a buffer for inadequate or dysfunctional formal risk planning arrangements. They support the existing risk management regime to function and thus have the capacity to facilitate disaster response, in the short term. However, in the long term informal support to formal risk planning risks limiting change to incremental optimisations, because it undermines momentum for reform of established planning system. This association of informality with rigidity, rather than with change of formal organisational structures and practices is not yet sufficiently acknowledged in the literature, which often tends to associate informality with change, innovation and learning (Smith and Stacey 1997; Pahl-Wostl 2009; Saunders, Gray and Goregaokar 2014; Pallett and Chilvers 2013).

The finding also adds to existing literature because it points to the difficulties of changing and revising existing risk management regimes once they are established. It highlights how the status-quo of dysfunctional organisational risk planning arrangements can act as a gravitational center that attracts attention from informal organisational spaces. Literature on learning in the context of disaster risk management should consider more systemati-

cally the wider context of institutional constraints on informal organisational spaces when reflecting on their capacity for social learning.

Findings from this study point to the importance of legal mandates for effective disaster risk management, and thus add to knowledge about the role of formal institutions for learning. The analysis suggests that it is the organisational space protected by robust legal mandates that generates capacity for social learning by providing institutionalised platforms for building social networks. These social networks provide a structure for the dissemination of knowledge, for sharing best practice, and for learning from experiences of others. Such a legal structure existed in heatwave risk management in London for emergency response and contingency planning, but was lacking for more preventive aspects of heatwave planning carried out by local authorities' environmental management and sustainability teams, for example. Informal organisational spaces that lacked such a robust structure of networks did not seem to act as sources of innovation and change in heatwave risk management in London.

This finding adds to the risk management literature because it points to the importance of developing a robust legal structure that supports planning not only for disaster response, but also for prevention and preparedness. While the National Heatwave Plan for England includes detailed and elaborate guidance on prevention, these aspects were not systematically acknowledged and picked up in the institutional arena of emergency planning in London. The local organisational risk management architecture seemed to gear attention of risk managers to those aspects of the National Heatwave Plan that were concerned with emergency response, and therefore most relevant to them. This related, in particular, to the roles and responsibilities of acute public health and social care response, rather than to the wider domain of risk prevention. The institutional architecture that supports current disaster risk planning for heatwaves in London is therefore constrained in its focus on disaster response. By default, it does not support participation of planners that prioritise and approach heatwave planning outside of response and contingency planning paradigms. Access of stakeholders outside of emergency response to institutionalised platforms for the coordination of heatwave planning was observed in some cases, but

depended on individuals and their decision-making and leadership capacity. It was not supported by formal mandates for environmental practitioners to participate in Borough Resilience Forums, for example.

Findings of this thesis add to knowledge on social learning because they suggest that institutional platforms that are supported by a legal mandate provide important spaces to nurture learning capacity in an organisational system. These platforms can be thought of as what Geels (2005) described as niches - protected spaces that support capacity for learning. This argument contrasts with assessments in the literature that conceptualise niches as informal, rather than formal organisational spaces (Pelling 2011). Formal organisational platforms that act as niches provide a structure along which social networks can develop and flourish over time. These networks can turn from formal to informal, for example when individuals change jobs and take with them their established professional contacts. This capacity for transformation of formal to informal networks sheds light on the fuzziness of canonical and shadow spaces in organisations, which often overlap and cannot clearly be separated from each other.

Informal social networks that originate along formal organisational structures can therefore emancipate themselves from the formal structure. They then cut across organisational structures and hierarchies and provide shortcuts for the dissemination of knowledge and information, even if this information is not directly related to the subject of the professional working relationship. The analysis has shown that a strong network of informal relationships can provide capacity for innovation and change if it is not constrained by formal institutions. Spaces where such informal networks existed, such as the emergency planning arena in London, exceeded the social learning capacity of other spaces where such networks were lacking, for example in the arena of sustainability experts and environmental management practitioners. In the latter, organisational stakeholders and their approaches to risk management were more strongly isolated from each other.

The third argument outlined above relates to the tension between formal and informal institutions, and its role for social learning. Pelling et al. (2008: 869) already pointed out that learning at organisational spaces of "bounded instability" showed a "sense of

continuity" with early innovations. Their argument hints at the notion of stability and suggests that novelty that emerged at spaces of "bounded instability" unfolds along existing trajectories of earlier learning.

Results from the analysis in this thesis suggest that claims about the innovative capacity of learning in spaces of bounded instability need to be differentiated even further. In heatwave risk management in London, learning at the boundaries between the formal and informal institutional system was directed at the consolidation of the existing risk management regime. It unfolded incrementally as small and adaptive changes to established organisational heatwave plans, rather than as profound change to underlying planning paradigms. These forms of change add rigidity to established risk management practices and undermine, rather than promote sustainable change in the long-term.

This study's focus on the interaction between formal and informal institutions thus sheds light on their ambivalent role for social learning. Results of the analysis suggest that informal networks, for example, can act as both drivers and barriers to organisational change. The literature on disaster risk management and organisational change would benefit from acknowledging this complexity of institutional constraints on social learning. However, many studies focus on either positive or negative implications for learning only, without acknowledging dynamic changes in the relationship (Stern 1997; Smith and Elliott 2007).

Results of this study also relate to research on climate change adaptation, socio-ecological systems and adaptive resource management (Gunderson 1999; Nooteboom 2006; Olsson et al. 2006; Pahl-Wostl 2009; Pelling 2011). This body of literature is broadly concerned with learning in the context of climate change, and discusses formal and informal institutions as barriers or drivers of change. Learning is often identified as integral for dealing with uncertainty and risk in this literature, and sometimes seems to be used almost synonymously with change and innovation (Gunderson 2000; Walker et al. 2002; Davidson-Hunt and Berkes 2003; Folke et al. 2005). Informal institutions, in particular, are associated with innovation, change, and social learning. Findings from this thesis underline that a consideration of the interplay of formal and informal institutions can help to nuance

discussions on learning in adaptation research.

Practical implications of the research findings for managing risk of climate change in London relate to the architecture of the heatwave planning regime at the local level. Findings suggest that there was a well-developed architecture of heatwave risk management in London. The National Heatwave Plan shaped the risk management regime at the local level and served as a template on which local organisational heatwave plans were modelled. However, the risk management regime outlined in the National Heatwave Plan was often implemented not as a whole, but selectively with a focus on essential planning procedures for emergency response. Preventive aspects of heatwave planning outlined in the National Heatwave Plan were not widely recognised as part of heatwave planning by local emergency planning stakeholders. This selective focus on response, rather than prevention can be traced to a dominant emergency planning paradigm that prioritises response over prevention, and to constraints in organisational capacity that required planning for minimum requirements, rather than actual needs.

This observation sheds light on the need to reform not only risk planning regimes, but also the organisational and institutional systems that are charged with implementing these regimes. In the literature on climate change adaptation, this argument is put forward under the label of "adaptive urban governance" (Birkmann et al. 2010; Birkmann, Garschagen and Setiadi 2014). For heatwave planning in England, the development of the National Heatwave Plan can be considered an important step towards comprehensive risk management, but it is limited in its effectiveness because its implementation is constrained by the organisational system of emergency planning in London. Planning paradigms and institutional constraints on this system mean that parts of relevant planning guidance for heatwaves are effectively ignored on the local level. Emergency planning stakeholders lack capacity to consider preventive aspects that go beyond crisis response, and do not consider them as part of their mandate. For policy making in the context of climate change risk, this suggests that developing comprehensive guidance on risk management is not sufficient to effectively address future risk scenarios. Beyond policy development, there is a need to scrutinise and where necessary reform the organisational systems in which the policy is

implemented.

Beyond the case study context of London, the results of this study raise questions about the desirability of learning as an adaptive strategy in the context of climate change. Both the Hyogo Framework for Action and the 2015 Sendai Framework for Disaster Risk Reduction champion learning as an important element of effective disaster risk reduction (UNISDR 2007, 2015). Findings from this study suggest, however, that learning is not necessarily beneficial for transformation, but that it can undermine paradigm shifts if actors learn "not to learn". If this argument is substantiated through further research, it provides impetus to revisit the role of learning in DRR policy. Of particular concern would be a differentiation between incremental and fundamental forms of learning, and a focus on how to stimulate deep social learning processes, in particular.

Institutionally configured barriers to learning in public sector organisations call into question their ability to drive paradigm shifts in disaster risk management. The 2013 UNISDR Assessment Report on the Implementation of the Hyogo Framework for Action in the UK calls for a stronger focus on preventive risk planning (UNISDR 2013). However, local heatwave planning in London was rather concerned with coping with dysfunctionalities in established strategies than with developing alternative ones. This suggests that local government organisations might be ill-equipped to act as agents of transformation in disaster risk reduction.

Challenges of bureaucratic public sector organisations to go beyond incremental optimisations of existing risk planning strategies ultimately raise questions about organisational agency in risk management. If responsibility for disaster risk reduction lies within organisational systems that appear inertial and resistant to change, agency to actively pursue transformation seems to be constrained. A recognition of institutional dysfunctionality might thus require an acknowledgement of limited abilities of individual risk managers and organisations to drive paradigm shifts in heatwave planning. Such an acknowledgement suggests that there are limits of climate change adaptation, and limits to how far change and learning are possible in institutional configurations that are supportive of the status-quo.

6.3 Limitations of the study

Limitations of this study concern its methodology, in particular. Results of the analysis are based on limited empirical evidence, and this constraints the robustness of findings. Data stems from semi-structured expert interviews, exclusively. Participatory approaches such as focus group discussions could diversify the empirical data and strengthen the robustness of the analysis. Survey-methods could extend the empirical data available for analysis, and substantiate findings by facilitating a more systematic exploration of the research questions.

Limitations also stem from the reliance on notes, rather than on audio-recordings of interviews. This undermined a quantitative analysis of the data, for example through word-counts. Quantitative approaches could help to make the analysis more systematic and increase transparency and replicability of the data analysis. In this study, quotes from interviews were selected according to their significance to the research questions, and not in relation to their quantity in the dataset. This weakens the argument because it suggests a certain selectiveness in the development of the empirical analysis.

Reliance on snowball-sampling in this study risked to systematically exclude relevant individuals, organisations, and subject areas from the analysis. The focus of the sample in this study is on local authorities and public health organisations in London. This primarily included respondents from emergency planning, health, and environment and sustainability. Other policy areas of relevance to heatwave planning are not considered in the sample. This concerns, for example, city planning and building design, which are important to heatwave planning, but remain outside the scope of this study.

During the time of the interviews, public health structures in the UK underwent significant changes, and this might have systematically biased the empirical data. While the 2012 Health and Social Care Act provided an opportunity to study the organisational system of heatwave planning in London during a significant change process, it also augmented the specificity of the data and undermined the ability to generalise findings. The healthcare reforms constrained organisational working at the local level, and put additional pressure on local risk managers responsible for risk planning.

6.4 Opportunities for future research

The conceptual framework of this study provided analytically valuable insights, but other concepts and theories might be equally appropriate to study institutional constraints for social learning. Closely related to the distinction between formal and informal institutions is a focus on the interaction between agency and structure. Giddens' structuration theory (Giddens 1979, 1984) explores how individual capacities interact with structural arrangements. Structuration theory can provide an alternative to the shadow and canonical system approach and might add important insights on how constraints on individual and collective behaviour shape social learning.

Methodologically, opportunities for future research lie within the use of social network analysis (Scott 1991; Wasserman and Faust 1994; Cross, Borgatti and Parker 2002). Findings from this study point to the importance of both formal and informal networks for social learning. Social network analysis might be applied, for example, to map out more systematically how informal networks cut across the formal cascade of heatwave risk management outlined in the National Heatwave Plan. The empirical analysis in this thesis suggested that informal relationships in many ways add to, or sometimes even substitute formal risk planning networks. The scope of this "hidden network", however, could be outlined more clearly through the use of social network analysis, rather than through the analysis of expert interviews in this thesis.

Future research can increase the resolution of the analysis by drawing on psychological research on individual and collective behaviour and decision-making. Seminal research in psychology has shown, for example, that judgement and decision-making under uncertainty is systematically biased (Tversky and Kahneman 1974), and that this also applies to individual and public perceptions of risk (Slovic 1987). Such findings raise questions as to whether biases in individual decision-making translate into biased organisational behaviour, too. On a large scale, and in the context of climate change adaptation, this sheds light on the question of whether societies are free to choose between equally available adaptation pathways, or whether biases in risk perceptions and collective judgement systematically exclude particular options. Exploring this question appears to be impor-

tant for an effective adaptation of disaster risk management to future and unknown risk contexts.

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Appendix A - Interview guides

Theme	Primary Questions	Secondary Questions	To Capture
Heatwave planning in the organisation	What are the main actions through which you address heatwaves, and since when do you work on this issue?	I have seen that you have XX in place (e.g. a borough extreme weather plan/ heatwaves on the risk register/ a NHS heatwave plan). Can you elaborate?	Level of heatwave planning
	Would you say that overall, heatwave planning is a relevant issue on your agenda?	Do you think heatwaves are a major risk? Do you feel that people see heatwaves as an important issue?	Risk perception
Motivation for heatwave planning	What motivated the actions you just described?	Are these actions related to the DH National Heatwave Plan/the London Resilience Heatwave Plan? Are the actions mandatory in a specific context?	Drivers of heatwave planning
Risk planning actions taken by other organisations	Who else is working on heatwaves in your borough? Do you work with them? Do you feel that you have a good knowledge what actions others are taking?	Do you know if the colleagues from Public Health/Emergency Planning/ Environment are working on heatwaves?	Coordination
Platforms for collaboration with other risk planning stakeholders	Where do you work with others?	Is the Borough Resilience Forum an effective platform of coordination and co-operation? What role does exchange with colleagues from other boroughs play?	
End of Interview	Before we finish, do you wish to add anything? Can you recommend any additional contacts for me to speak to?		Relevant questions asked? Snowball sampling

Table 10: Sample interview guide, sampling interviews

Table 11: Sample interview guide, main interviews

Theme	Primary Questions	Secondary Questions	To Capture
Heatwave planning in the organisation	Can you elaborate on your responsibility in the organisation, and how it relates to heatwave planning?	Do you work with the National Heatwave Plan?	Level of heatwave planning
	Did you have any work around the recent level 3 heatwave alert?	Who did you work with on heat during the level 3 alert? Was there anything notable?	
Determinants of change in heatwave planning	Were there any changes to heatwave planning in the organisations recently? Can you give an example?	Was there a notable event that had an impact on planning? Were there any changes in national regulations? Did you observe change somewhere else?	Drivers of heatwave planning
Pathways and constraints for change in heatwave planning	What do you think are key ingredients for bringing about change?	Which actors were involved in bringing about the change process you just described? At which forums did you coordinate with other actors to organise the change?	Barriers to heatwave planning
Implications of change	What were the implications of the change processes you just described? Was the change process successful?	Did you achieve your goal with this change process? If not, what would you do differently in the future?	Implications of change
End of Interview	Before we finish, do you wish to add anything?		Relevant questions asked
	Can you recommend any additional contacts for me to speak to?		Snowball sampling

Table 12: Sample interview guide, final interviews

Theme	Primary Questions	Secondary Questions	To Capture
Heatwave planning in the organisation	Can you elaborate on your responsibility in the organisation, and how it relates to heatwave planning?	Do you work with the National Heatwave Plan?	Level of heatwave planning
	Did you have any work around the level 3 heatwave alert last year?	Who did you work with on heat during the level 3 alert? Was your work more focused on response or prevention?	
Role of informal institutions	What role do networks and social relationships play for your work? Do informal networks support your work? Do you think this work conceals dysfunctionalities in risk planning?	Can you give an example?	Informal support to formal risk planning
Change in heatwave planning towards social, environmental, and technical risk dimensions	What role do preventive aspects play in heatwave planning in your organisations? Do you look at social, environmental, and technical issues, too?	What you do think would a paradigm shift in heatwave planning look like? Would it be about a better integration of preventive planning, rather than just response?	Transformation
Drivers or barriers	What are drivers, what are barriers to paradigm shifts in heatwave planning?	What role do events play? What role does a culture of firefighting play? What role does risk perception play?	Determinants of transformation
End of Interview	Before we finish, do you wish to add anything?		Relevant questions asked
	Can you recommend any additional contacts for me to speak to?		Snowball sampling

Appendix B - Information sheet for participants

Figure 10: Information sheet for participants

INFORMATION SHEET FOR PARTICIPANTS

REC Reference Number REP(GSSHM)/12/13-24

KING'S
College
LONDON

Can we learn to be resilient? Learning in heatwave risk management in London, UK

We would like to invite you to participate in this postgraduate research project. You should only participate if you want to; choosing not to take part will not disadvantage you in any way. Before you decide whether you want to take part, it is important for you to understand why the research is being done and what your participation will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information.

The research is conducted in the context of a PhD thesis of Thomas Abeling, postgraduate research student at King's College London. The PhD project is embedded in an European Union funded research project called "emBRACE – Building Resilience Amongst Communities in Europe". It explores community resilience towards natural hazards. As part of this project, the PhD project of Thomas explores the role of learning in institutional and organisational risk management towards heat stress in London, UK. It will gather information on heatwave risk management, primarily within London, but also involving important national stakeholders in the UK, for example Public Health England. On your request, you can obtain a copy of the final report and will have full access to the results of the study.

We seek a wide range of participants who contribute directly or indirectly to heat risk management in London. This includes, but is not limited to, council officials from London's 33 boroughs, representatives of the National Health Service, from the social services, from the London Resilience Forum, from national organisations like the Department of Health and Public Health England, as well as voluntary and community care organisations.

You are invited to participate in a short, informal interview of about 30-60 minutes at a venue that is most appropriate for you. Interviews will usually not be recorded. However, we might take notes during the interview. No particular risks are anticipated for participation in the study[1]. You can withdraw from your consent to participate in the study until 01 September 2014. If you withdraw your consent to participate, all data obtained through the interview will be deleted. If you are asked to participate in an online survey, please note that it might be possible for us to access data from partially completed questionnaires, e.g. if you have navigated away from the online survey before submitting your answer. Be assured that any data that is obtained without being explicitly submitted to the researcher (through the final "submit" button of the survey) is not considered for the study, as it is assumed that you did not give your consent to take part in the study.

The study aims at maintaining confidentiality and anonymity and will adhere to the regulations of the UK Data Protection Act 1998. Unless you provide explicit consent to have your name and position mentioned in the study, either orally or in written form (e.g. via email of the King's College London "Use, Retention, and Reuse of Participant Contributions" form), the study will contain no personal information or reference to you that would allow for your identification. A coding system will be applied to encrypt any information otherwise attribut-

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[1] Should you nevertheless suffer any harm as a direct result of taking part in this study you can apply for compensation under the King's College London's 'No Fault Compensation Schemes'. For further information on this please contact Mr. Mark Pelling, PhD, mark.pelling@kcl.ac.uk, Department of Geography, King's College London, The Strand, London WC2R 2LS, UK.

able to you. Your organisation and department will be disclosed if you agree to this, otherwise this information will also be encrypted and anonymised.

The research will be examined as a PhD dissertation at King's College London. Data will be stored until the confirmation of the award by King's College London, and will be archived to allow for publication of results in academic journals. Publication of research results in academic journals will be based on anonymised data, only. To adhere to the regulations of academic publishing, anonymised data from the study might be shared with other researchers. You will have, upon request, full access to the study results and can obtain an electronic copy through the researcher.

For any questions relating to the study, interviews and the dissemination of results, including requests to withdraw from the study, please feel free to contact:

Thomas Abeling
thomas.abeling@kcl.ac.uk
King's Building
Strand, London WC2R 2LS
UNITED KINGDOM

It is up to you to decide whether to take part or not. If you decide to take part you are still free to withdraw from the study at any time and without giving a reason.

If you have any questions or require more information about this study, please contact the researcher using the following contact details Thomas Abeling, thomas.abeling@kcl.ac.uk, King's Building, Strand, London WC2R 2LS, UNITED KINGDOM

If this study has harmed you in any way, you can contact King's College London using the details below for further advice and information: Mark Pelling, PhD, mark.pelling@kcl.ac.uk, Department of Geography, King's College London, The Strand, London WC2R 2LS, UK

Can we learn to be resilient? Institutional constraints for social learning in heatwave risk management in London, UK

by Thomas Abeling

Against the background of an expected increase in magnitude and frequency of climate change related hazards such as heatwaves, the capacity of organisations to critically reflect on the appropriateness of established risk management practices for future risk contexts emerges as an important aspect of disaster risk reduction. In the United Kingdom (UK), the 2013 Assessment Report on the Implementation of the Hyogo Framework calls for a paradigm shift in risk management away from emergency preparedness and response towards preventive risk planning and vulnerability reduction.

This study investigates the prospects and challenges for such fundamental policy shifts, drawing on the concept of social learning and on theories of social and organisational change. It focuses on the example of local heatwave risk management in London. Empirical evidence stems from 49 semi-structured expert interviews with risk planning officials from London local authorities, health and social care organisations. Findings suggest that the interaction of formal and informal institutions has limited social learning in heatwave planning to incremental changes that reinforced the status-quo. Informal networks and trust relationships between risk managers compensated for formal heatwave planning arrangements that were perceived by some officials as dysfunctional.

This support from informal institutions to formal strategies undermined opportunities for paradigm shifts in risk planning. It suggests that social learning can be associated with rigidity of established risk management strategies, rather than with their change. In the context of heatwave planning in London, missed opportunities for paradigm shifts concerned a consolidation of reactive risk management approaches that focused on the health implications of heat stress. This consolidation undermined the development of preventive risk management approaches that consider social, environmental and technical risk dimensions.

The results of the analysis raise questions about the desirability of learning as an adaptive strategy in the context of climate change. The thesis suggests that learning is not necessarily beneficial for transformation if it is enacted through organisational systems that are inertial and resistant to change.