CHAPTER 1

Climate adaptation governance in cities and regions: framework conditions, theoretical concepts and research questions

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For some years now, politicians have been negotiating agreements on cutting down global greenhouse gas emissions and thus limiting global warming to 2°C, and due to the extent and reach of climate change this challenge will certainly keep international diplomacy busy also in the next decades. However, parallel to this we are already experiencing global warming and its impacts. Already today, all over the world vulnerable population groups, settlement structures and land uses are in particular at risk of being seriously harmed. And climate change and its consequences will continue to develop long after global greenhouse gas emissions will have started to decline. Thus, adapting to climate change and its impacts will continue to be necessary even if we are able to reach the most optimistic climate mitigation goals and scenarios. Against this background, it is important to acknowledge that climate change mitigation and adaptation require not only piecemeal approaches and iterative changes but in many ways fundamental transformation of living, producing and working:

> *The objective is to put in motion a fundamental transformation in the way we use and produce energy, how we plan our cities, how we manage land and how we prepare for a changing climate and cooperate to minimize its disruptive effect. Transformation takes strategy. You need to know your destination if you are serious about reaching it.*
>
> *(Thorgeirsson, 2015)*

Progressing global warming and urbanization are two of the global processes that will shape the 21st century. They bear the risk of cities and urban agglomerations increasingly experiencing severe climate effects as cities concentrate (vulnerable) population, structures and processes more and more and climate change impacts intensify. However, the density of people, economic activities, organizations and institutions in cities and urban agglomerations also bear potential

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interaction promoting cultural and economic creativity, entrepreneurship and innovation and thus creating and shaping future transformational change.

This book explores the link between governance approaches and adaptation to climate change on the level of cities and regions. Climate change adaptation will be analysed from a perspective of organizing, administering and implementing local and regional adaptation policies using different instruments and forms of coordination. In this regard, the following questions are of interest: How do cities and regions face the challenge of adapting existing and creating new and innovative forms of governance tailored to specific local or regional situations, challenges and needs concerning climate change? How do public actors of local and regional authorities interact and cooperate with different private and societal actors? Which roles do different stakeholders play and how is citizens' engagement in climate adaptation enabled? Which mix of formal and informal instruments, of regulation, cooperation and communication and of organizational change can be identified within various modes of governance at local and regional levels with regard to climate adaptation, and which new arrangements come to the fore?

To approach these questions, the book gathers 20 case studies analysing different aspects of climate adaptation governance in cities and regions across the globe. Together they provide a snapshot of current practices of local and regional adaptation governance. Approaching these with different analytical lenses identifies a range of interesting questions for future research and debate.

The need for transformational climate change adaptation

Climate change is a thread to sustainable development (IPCC (Intergovernmental Panel on Climate Change), 2014a: 1106). Global climate change and its impacts with potentially catastrophic consequences (IPCC (Intergovernmental Panel on Climate Change), 2012) are the result of spatially and temporally short-sighted actions and decisions (Nelson, 2010: 497) that have let to unsustainable practices, processes and systems. The spatial patterns of many cities and city regions reflect this lack of sustainability, thus, resulting in urban systems that consume vast amounts of resources and exceed natural regeneration rates while degrading the environment.

There are widespread impacts attributed to global climate change. Physical, biological and human systems are influenced by global warming with occurring extreme events being linked to men-made climate change (IPCC (Intergovernmental Panel on Climate Change), 2014c: 47–53). These include heat waves, increasing frequencies and intensities of heavy rainfall events as well as increasing flood risks due to sea level rise and extreme rainfall and discharges in rivers (IPCC (Intergovernmental Panel on Climate Change), 2014c: 53). Thereby, the

specific impacts of climate change and extreme events depend on non-climatic factors such as exposure and vulnerability (IPCC (Intergovernmental Panel on Climate Change), 2012: 238). Thus, impacts from climate-related extremes such as the disruption of food production and water supply, damages to settlements and infrastructures as well as consequences for human well-being, morbidity and mortality reveal the vulnerability of ecosystems and human systems to climate change (IPCC (Intergovernmental Panel on Climate Change), 2014c: 53). Urban areas exacerbate some of the potentially significant climate impacts due to the concentration of infrastructure and the high density of population. For cities and urban areas, effects of sea level rise, extreme events such as wind storms and storm surges, heat extremes, floods from heavy rainfall events as well as the availability of water and other resources are considered to be the most important effects of climate change (Hunt and Watkiss, 2011: 14–16).The vulnerability of the cities and regions to climate change impacts and other biophysical and societal stressors (IPCC (Intergovernmental Panel on Climate Change), 2014a: 182) are consequences of the long-existing unsustainable societal structures and processes. However, risks not only directly result from climate change and climate change impacts but also from socio-economic processes that influence vulnerability and exposure (see Figure 1.1). Therefore, development pathways, measures for climate mitigation and adaptation as well as governance questions of steering and regulation can alleviate but also increase climate change risks (IPCC (Intergovernmental Panel on Climate Change), 2014a: 26). Thus, developing suitable arrangements of Climate Change Governance (Knieling and Leal Filho, 2013) is a crucial part for managing climate change risks.
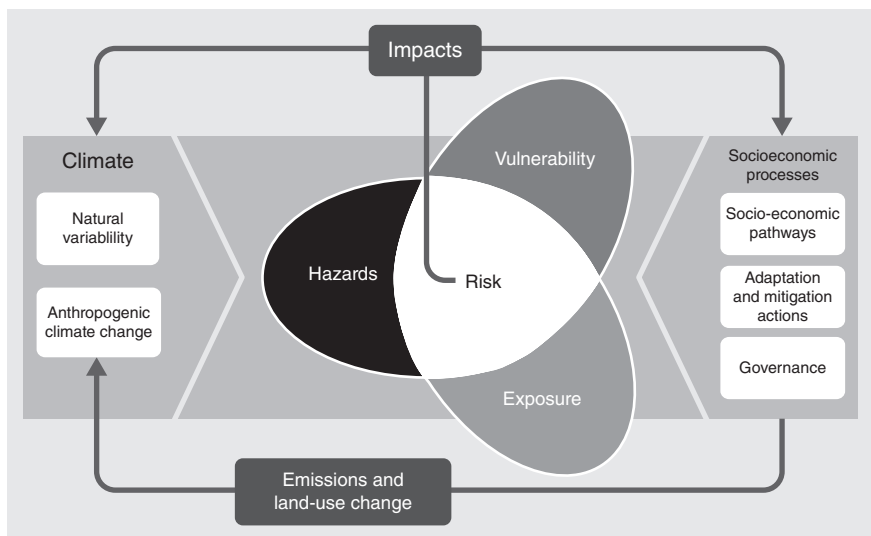

Figure 1.1 Managing risks from climate change impacts (IPCC (Intergovernmental Panel on Climate Change), 2014a: 26).

Against this background, over the last years the international scientific community has recognized that adaptation to the consequences of climate change is a parallel strand of dealing with climate change. Therefore, climate change adaptation does not only require physical measures to protect and adapt settlements and infrastructures to climate impacts but fundamental approaches which – besides political agreements, strategies and measures – include behavioural changes of individuals and, in principle, the re-definition of the society's relationship with the environment (Adger *et al.*, 2009a: xiv). Thus, climate change adaptation is inherently connected with the quest for sustainability (Davoudi *et al.*, 2009: 15).

For understanding adaptation to climate change within a broader societal framework, governance and transition theory offer suitable approaches. In recent years, transition theory has gained broad attention (Geels, 2001, 2005; Grin *et al.*, 2010; Kemp and Loorbach, 2003; Rotmans *et al.*, 2001). It suggests that dealing with persistent problems, which result from a system's unsustainability, such as climate change and the need for climate change adaptation, requires 'fundamental changes in the societal system and its subsystems' (Franziskani *et al.*, 2012: 21), that is transitions. These fundamental changes may result in the transformation of the overall system and the creation of a fundamentally new system configuration (Grin *et al.*, 2010: 11; Park *et al.*, 2011: 3). Thus, the transformation of a system is the result of cumulative effects of various actions of a multitude of actors affecting technology, economy, institutions, behaviour, culture, ecology and paradigms, introducing regime shifts and consequently new regimes (Kates *et al.*, 2012: 7157; Kemp and Loorbach, 2003: 7; Pelling, 2011: 85). Therefore, climate change adaptation is not just a reactive act of reducing and dealing with environmental risks but involves a fundamental societal change to a more sustainable system. Scientific literature suggests that this requires a specific type of transformative change, which enhances the system's 'capacity for desired values to be achieved given perceived or real changes in the present or future environment' (Park *et al.*, 2011: 5).

Transformative change, as defined by IPCC (Intergovernmental Panel on Climate Change) (2014a: 1107), comprises a 'fundamental change in a system, its nature, and/or location that can occur in human institutions, technological and biological systems'. It involves challenging values and norms as well as interests and (power) relations that have led to the current, unsustainable system (O'Brien, 2011: 668ff.; Pelling, 2011: 97). In order to emphasize this, comprehensive approach transformational adaptation is often contrasted with incremental adaptation of small steps reacting to changing conditions (Kates *et al.*, 2012; Park *et al.*, 2011; Rickards and Howden, 2012). Scientific literature suggests that incremental and transformative adaptation and change may be interlinked (Park *et al.*, 2011: 3). However, system attributes required for transformation may be different from those required for incremental change in terms of its ability to deal with complexity and uncertainty (Rickards and Howden, 2012: 246).

Transformation processes that follow the goal of sustainable development are 'deliberate transformations' (O'Brien, 2011: 670ff.), which are purposefully initiated and influenced by a small group of societal actors (O'Brien, 2011: 670). However, transformative climate adaptation is not a process that can be definitely directed in the one or the other direction. Rather, it is the result of purposive, directed measures as well as autonomous, emerging change (Nelson, 2010: 489). Therefore, both collective adaptation, which is explicitly planned, and autonomous adaptations by individuals and organizations are needed to cumulate to transformational change (Kates *et al.*, 2012: 7156). Adaptation has to be oriented towards a long-term perspective with a focus on the opportunities and benefits of adaptation (Rickards and Howden, 2012: 243) instead of only reacting to current changes and avoiding negative impacts. Furthermore, adaptation is understood as a co-evolutionary process of human and natural systems where societal changes occur together with natural changes instead of just as in reaction to these (Rickards and Howden, 2012: 241).

Moreover, innovation and social learning are crucial concepts within transformational adaptation processes (Nelson, 2010: 489). Double- and triple-loop learning, which question and reframe the assumptions and values that underlie society, are seen as basic elements of transition processes (IPCC (Intergovernmental Panel on Climate Change), 2012: 53ff.; Nelson, 2010: 499; Pelling, 2011: 84, Rickards and Howden, 2012: 241), one of the goals of adaptation is cognitive change (Pelling, 2011: 84). Overall, transformational adaptation cannot follow a prescriptive approach. It is understood as a dynamic process that emerges from various individual actions (Nelson, 2010: 489) that might cumulate into system transformation.

Transformation towards climate-resilient systems

Transformational climate adaptation targets at establishing 'climate resilient development pathways' as development trajectories for future development (IPCC (Intergovernmental Panel on Climate Change), 2014a: 1112). Based on the underlying assumption that sustainability becomes increasingly difficult if not impossible to reach when effective climate change mitigation and adaptation strategies and measures are not in place (IPCC (Intergovernmental Panel on Climate Change), 2014a: 1110; WBGU (German Advisory Council on Global Change), 2011: 62f.), pursuing climate-resilient systems becomes key for sustainable development. Thereby, not only the transformative process of change but also the concept of resilience as envisaged system state involves specific characteristics and challenges for influencing these long-term oriented processes. Scientific literature suggests that transformative climate adaptation is likely to have to overcome different and more challenging barriers than

incremental adaptation actions due to its long-term orientation and the scope and scale of change required (Moser and Ekstrom, 2010: 22026). It is thus very likely that transformational adaptation requires different characteristics of the institutions and individuals involved. Transformational climate adaptation needs a higher adaptive capacity, substantial resources and a higher level of willingness to adapt than short-term oriented adaptation measures (Rickards and Howden, 2012: 246f.). Thus, awareness, commitment and leadership are considered to be crucial (IPCC (Intergovernmental Panel on Climate Change), 2014a: 1113; Kates *et al.*, 2012: 7159). Furthermore, learning processes that question practices, roles, responsibilities and norms as well as pro-active, collective action may be highly relevant for transformational adaptation (Rickards and Howden, 2012: 247). Moreover, transformational changes may call for a stronger role for government to intervene in and correct market failures as they become aware in the field of climate change (Rickards and Howden, 2012: 246f.) and play an active role as facilitator and guardian for long-term oriented solutions (Grin *et al.*, 2010: 2).

Overall, transformational climate change adaptation is a societal challenge that includes a variety of measures and interventions, the coordination and cooperation of various actors in politics, administration, economy, science and civil society as well as adequate organizational structures, processes and instruments. Thus, the design and implementation of transition processes is a governance issue that involves deliberate individual and collective action (Adger *et al.*, 2009b: 5), which leads to the second theoretical concept that is of interest when analysing, understanding and conceptualizing climate adaptation governance.

Understanding of governance

In this regard, the governance concept represents the coordination of social systems and particularly the complex relationships between stakeholders and the role of the government in these coordination efforts. It includes both the capacity of the state to steer society and economy through political brokerage, goal and priority definition as well as the coordination and self-governance of various formal and informal types of public–private interaction within policy networks (Peters, 1997: 59; Pierre, 2000: 3). The term is used in political and social sciences and characterized by a certain degree of ambiguity in its conceptualization (Bovaird, 2005: 220; Pierre, 2000: 3, Rhodes, 1996: 652). Applying a narrow understanding of the term, governance is the contrary of government and signifies softer forms of regulation, which include private stakeholders in problem resolution processes. In this context, governance results in blurring the boundary between state and society (Kooiman, 2003: 139). Following a broader understanding, governance is seen as a generic term that tries to capture all social-political arrangements within which public and private actors aim to solve

societal problems or exploit opportunities (Kooiman, 2003: 139). Based on this understanding, the coordination of social action includes all co-existing forms of collective regulation. As analytical concept (e.g. Jordan *et al.*, 2005), it offers a perspective on complex reality ,which allows to derive abstract, analytical categories for comparative or reconstructive analyses of decision- and policy-making as well as policy-implementation (Bellamy and Palumbo, 2010: xv). Moreover, it is also used as a basis for normative statements. Here, good governance refers to societal norms and values such as transparency, democratic responsibility and liberal democracy to guide governing techniques (Bovaird, 2005: 221; Rhodes, 1996: 656).

In many cases, the notion of governance refers to a 'new […] style of government' (Bellamy and Palumbo, 2010: xi), which has occurred in the last 30 years as institutional responses to changes such as the deregulation of financial markets and neo-liberal reforms of the public sector as well as the lower strength of the state's power, capacity and capabilities to ensure political control and social support (cf. Pierre, 2000). Thus, new forms and mixes of instruments and forms of regulation and steering are part of 'alternative strategies through which the state can articulate and pursue the collective interest without necessarily relying on coercive instruments' (Pierre, 2000: 2). This induces a shift away from hierarchical forms of organization to the adoption of different forms of network governance, the re-definition of the relationship of state and civil society in a more participatory and cooperative way and a shift from hard law to soft steering in the form of positive incentives and targets for policy implementation (Bellamy and Palumbo, 2010: xi).

Governance modes and instruments

The governance concept is used to differentiate types of state–society interaction and goal implementation based on the question of who (i.e. which actor(s), institution(s), level(s)) defines societal goals and the means (i.e. instruments, approaches, processes) to reach these goals (Jordan *et al.*, 2005: 483f.). Different governance modes can be identified in a continuum between 'command-and-control' intervention by central governments, the deliberate self-regulation within actor networks and the independence and competition of autonomous market actors. In hierarchical governance structures, regulatory policy instruments, laws and rules are key for the coordination of actors and activities by administrative order (Howlett, 2009: 77; Rhodes, 1996: 653). Actor relationships are characterized by dependency and guidance within a formal structure of authority (Powell, 1990: 300). Government selects both the societal goals as well as the means to reach these (Jordan *et al.*, 2005: 484). In arrangements of network governance, on the other hand, the collaboration and voluntary self-regulation of interdependent actors results in flexible networks of

different societal actors. Relationships are based on trust, bidirectional communication, equality and mutual adjustment (Rhodes, 1996: 653). Coordination is realized through dialogue, information, different kinds of incentives and self-regulation (Bellamy and Palumbo, 2010: xvii). Market as third type of governance mode is characterized by the competition and price orientation of independent actors (Rhodes, 1996: 653). Actor relationships are more transient than in network organizations; actors orient their activities towards market prices and monetary incentives (Bellamy and Palumbo, 2010: xvii). In reality, however, different modes of governance often exist in parallel and mixes or hybrids of governance arrangements can be observed, which are constantly being reconfigured. Thus, reality is characterized by governance complexity and 'crowded' policy domains (Keast *et al.*, 2006).

The need for governance arrangements for climate change adaptation

In order to successfully adapt to climate change, it is necessary to understand the nature of the problem which to react to. In the case of climate change, this is particularly challenging as it represents a 'multi-hazard phenomena' (Birkmann *et al.*, 2010: 188) as well as a 'wicked problem par excellence' (Termeer *et al.*, 2013: 27). As such climate change is ill-defied with a final solution being impossible. Rather, alleged solutions of wicked social problems create new problems and problem perceptions (Rittel and Webber, 1973: 160ff.). Therefore, the continuous process of dealing with the wicked problems and wicked solutions of climate change needs to acknowledge the following challenges: Organizations and administrative structures usually do not match with climate impacts but rather cross boundaries and affect the formal responsibility and competence of various institutions, sectors and actors. Climate change adaptation 'lacks a well-institutionalized policy domain' (Termeer *et al.*, 2013: p. 30) and is characterized by only weakly defined responsibilities, procedures and routines. Therefore, 'comprehensive, coordinated strategic approaches' (Fröhlich and Knieling, 2013: 11), which integrate different areas of expertise, promote bottom-up approaches and develop a comprehensive approach across different levels, are needed. Furthermore, a broad variety of approaches and solutions is necessary, which addresses different aspects of the wicked problem climate change and reflects the problem perception and interests of the different actors involved in and necessary for problem solution (Fröhlich and Knieling, 2013: 11f.). Dealing with climate change requires different types of knowledge and dealing with inherent uncertainties and ambiguities (Termeer *et al.*, 2013: 31). Moreover, climate adaptation needs long-term oriented thinking and action which exceed established decision-making periods (Fröhlich and Knieling, 2013: 12). Thus, integrating intergenerational justice into institutional

frameworks and decision-making is key for appropriate political processes and institutions to deal with climate change (Siebenhüner *et al.*, 2013: 1). In addition, as indicated earlier, as climate adaptation should contribute to transformational processes of societal change the promotion of innovation and social learning through the direct interaction and cooperation of different actors is necessary (Collins and Ison, 2009: 363f.). Thus, social learning that changes the understanding of 'communities of practice' (Reed *et al.*, 2010) and results in institutional modification becomes crucial in adaptive strategies (Pelling *et al.*, 2008: 870). As institutions are the informal constraints and formal rules of political, economic and social interaction (North, 1991: 97) changing these is 'the core in achieving transformative change' (Siebenhüner *et al.*, 2013: 2).

This leads to the conclusion that successful climate adaptation needs to acknowledge the inherent wickedness of 'climate change' (Rittel and Webber, 1973: 161; Termeer *et al.*, 2013: 36). Climate adaptation is not only a technical matter but also a 'complex social interaction process' (Van Nieuwall *et al.*, 2009: 7f.) that requires the rethinking of governing processes. Dealing with the challenges outlined earlier makes climate adaptation a complex and challenging governance issue of coordinating and steering individual and collective action for implementation (Adger *et al.*, 2009b: 5; IPCC (Intergovernmental Panel on Climate Change), 2014a: 886ff.).

Climate adaptation governance in cities and regions

As mentioned earlier, climate change is likely to result in more severe impacts in cities and (urban) regions due to the high density and concentration of population, infrastructure and building structures (UCCRN (Urban Climate Change Research Network), 2011: 78). Climate change impacts are highly localized and contextual in nature and so is climate adaptation (IPCC (Intergovernmental Panel on Climate Change), 2014a: 888). Specific consequences of climate change depend on the relative vulnerabilities of population groups, ecosystems and urban infrastructures. Thus, adaptation action and governance have to differ accordingly (Hunt and Watkiss, 2011: 14–15). Cities and regions are crucial levels for adaptation planning and implementation. They 'are uniquely situated to understand local contexts, raise local awareness, respond to citizens' and civil society pressures, and work to build an inclusive policy space' (IPCC (Intergovernmental Panel on Climate Change), 2014a: 577). Therefore, it is necessary to design specific governance mechanisms to promote implementation 'within specific cultural, political and administrative context of given countries or cities' (Birkmann *et al.*, 2010: 204). Urban and regional development and planning 'are strongly rooted in and restricted to the cultural contexts […] of a society' (Knieling and Othengrafen, 2009: xxiii). Thus, not only territorial but also cultural contexts characterized through political, legal and planning

traditions, responsibilities, concepts of justice, as well as attitudes, beliefs and values shape and influence climate adaptation at the level of cities and regions.

- Cities and regions that are already characterized by environmental damages, poverty, weak institutions and insufficient infrastructures are particularly vulnerable to future climate change impacts (UCCRN (Urban Climate Change Research Network), 2011: 78). Overlapping local problems and challenges result in increasing pressure for adaptation. From this arises the request for urban development strategies that integrate sustainable development with climate mitigation and adaptation (IPCC (Intergovernmental Panel on Climate Change), 2014a: 557). The formal and informal policy instruments used in the context of urban and regional development and planning are important means for dealing with and moderating climate change impacts on the levels of cities and regions. The following three principles for local and regional climate adaptation strategies and plans can be derived from international literature: Increasing the adaptive capacities of local communities through the utilization of local knowledge is key to local climate adaptation strategies (IPCC (Intergovernmental Panel on Climate Change), 2014a: 876). Next to specific structural measures further aspects such as access to technologies, infrastructures, resources and social equality are part of an integrative climate adaptation (EEA (European Environment Agency), 2012: 62).
- Planning and strategy development processes for climate adaptation should involve local actors in the development of effective climate adaptation measures. Participation increases the acceptance as well as the chance of implementation of local adaptation actions. Especially bottom-up processes that utilize the engagement of citizens and local initiatives bear the potential of integrating climate adaptation with further local processes and can thus create and/or exploit synergies (IPCC (Intergovernmental Panel on Climate Change), 2014a: 876–877).
- Climate adaptation requires iterative planning and decision-making processes (see Figure 1.2) that are based on the evaluation of planning steps, processes and outcomes as well as continuous reflection and learning. This allows the reaction on changing framework conditions and new knowledge (EEA (European Environment Agency), 2012: 74ff.; IPCC (Intergovernmental Panel on Climate Change), 2014: 876).

Worldwide, a growing number of adaptation plans and strategies have been developed on different spatial scales. However, there has been a lack of actual implementation (IPCC (Intergovernmental Panel on Climate Change), 2014a: 888). In fact, various institutional barriers hinder adaptation planning and implementation as 'adaptive capacity signals potential but does not guarantee adaptive action' (IPCC (Intergovernmental Panel on Climate Change), 2014a: 886). Overall, five institutional barriers and enablers for climate adaptation implementation

Figure 1.2 Planning cycle for climate adaptation (EEA (European Environment Agency), 2012: 74).

can be identified across developing and developed nations (IPCC (Intergovernmental Panel on Climate Change), 2014a 887 f.):

1 The lack of multi-level coordination between political and administrative levels results in unclear roles and responsibilities. Adaptation planning and implementation on the level of cities and regions has to be supported by policy frameworks, regulations, incentives and codes that anchor, guide and promote climate adaptation in local and regional structures and processes.

2 Key actors initiate and sustain the appropriate momentum for change as advocates, leaders or change agents (WBGU (German Advisory Council on Global Change), 2011). These play an important role in showing direction, motivating others, building coalitions and play thus a key role in driving change especially in the absence of strong national policy frameworks.

3 Cross-sectoral cooperation and integration on horizontal level is necessary to institutionalize climate adaptation in local administrational structures. Facilitating cross-sectoral interaction, exchange and institutional learning is necessary to drive institutional change for climate adaptation.

4 On the policy agenda of decision-makers, long-term oriented climate adaptation measures compete with other more short-term oriented and more tangible political concerns over scarce resources. This often results in a lack of resources for the actual implementation of adaptation measures.

5 The coordination between and cooperation with governmental agencies and
the private sector can increase the efficiency of climate adaptation planning
and implementation. Private stakeholders bear valuable knowledge and
resources to co-create implement change.

   This implies that local and regional governance arrangements have to signif-
icantly contribute to overcome the institutional barriers of climate adaptation
and promote or establish the enablers listed earlier in order to facilitate actual
implementation. Therefore, local and regional governance arrangements face
the challenge of promoting learning among various actors, improving cross-level
coordination of action, enhancing the participation of stakeholders and citizens,
mainstreaming adaptation into urban and sectoral planning as well as land-use
management and enhancing monitoring and evaluation of planning and imple-
mentation (IPCC (Intergovernmental Panel on Climate Change), 2014a: 578;
889; Birkmann *et al.*, 2010: 203). This book aims at providing an international
snapshot of how cities and regions deal with the challenges of climate adaptation
outlined earlier through local and regional governance arrangements. It intends
to offer insights into local and regional practice and to reflect experiences with
regard to the theoretical framework of transition and governance.

Chapter overview

The book is divided into three main parts examining specific aspects of climate
adaptation governance on local and regional levels of municipalities and (urban)
regions: exploring theoretical concepts and bases, hierarchical as well as informal
and corporative forms of coordination. *Section I* provides a view on local and
regional climate adaptation governance from the angle of theoretical concepts
and understandings: The concept of resilience is explored as basis for climate
adaptation planning, decision- and policy-making as well as the importance
of knowledge generation and integration. Specific attention is given to the
roles of research and political leadership in climate adaptation on local and
regional levels.

   Dale, Vella, Potts, Voyce, Stephenson, Cotrell, King, Babacan, Boon and *Gooch* shed
light on the improvement of social resilience through a systemic approach for
building regional- and subregional-scale resilience to climate change. Based on
the case study of four particularly vulnerable regions of Tropical North Queens-
land, Australia, the authors suggest an indicators-based framework for support-
ing adaption planning applicable in vulnerable regions across developed and
developing nations.

   Lu outlines the role of spatial planning in promoting urban resilience in Tai-
wan. Based on two cases in Kaohsiung, she highlights how local decision-making
addresses the issue of climate-related flood risk and how extreme events often

support a reformation of the framework of local collaboration and policy-making.

Plante, Vasseur and *DaCunha* concentrate on the resilience of coastal communities in Atlantic Canada and their capability to define adaption strategies to climate change. The authors examine the role of participatory action research (PAR) as a tool for enhancing governance capacity of communities trying to develop and implement adaption strategies by taking in account the long-term sustainability of communities operating in a critical but vulnerable ecosystem.

Bardsley, Hugo and *Wiseman* explore the integration and application of valid knowledge as guides to climate adaption processes. From the perspective of regional adaption case studies in South Australia and Asia, they argue that narratives on future risks are successfully assisting regional governance organizations to develop responses to complex changes as part of their planning processes.

Serrao-Neumann, Marques di Giulio, Costa Ferreira and *Low Choy* present a conceptual model that illustrates how intervention research can aid climate change adaptation. Using the case studies of the urbanized coastal areas of São Paulo (Brazil) and North Queensland (Australia), a framework enabling both adaptive capacity and climate risk understanding through the interactive and participative process and the types of knowledge generated by intervention research is introduced.

Hjerpe and *Storbjörk* discuss the role of political leadership on local climate adaption. Based on the examples of six municipal councillors in Swedish municipalities, they elaborate modes of leadership used and envisioned by political leaders in governing climate adaption, illustrating that different modes of political leadership can be more effective and dominant in different phases of the adaption policy cycle.

Section II focuses on hierarchical forms of coordination within local climate change adaption processes. The contributions offer experiences from different sectors and spatial scales in different cities and regions around the world. Government intervention to deal with flood risks from rising sea levels, storm surges and heavy precipitation events constitute one focus, next to hierarchical interventions for climate adaptation on regional level and to deal with specific challenges from climate impacts.

Rauken deals with the challenges increasing precipitation poses with regard to urban flooding through surface water. Her contribution illustrates the development of regulatory frameworks encompassing the different aspects of surface water handling as suggested by the Norwegian government. In this context, the author pleads for a more holistic regulatory approach that is apt to overcome collective action problems.

Leal, Diaz and *Hurlbert* argue that effective climate and water governance must be polycentric and adaptive in order for climate change adaption processes to succeed. With special regard to the property interest in water, the authors explore

the role of laws and legal mechanisms in climate governance. They suggest that laws need to be flexible so as to building adaptive capacity and to incorporating a multitude of stakeholders.

Bertrand, Richard and *Laurrue* focus on the ways in which climate change adaption is addressed at the French regional level and on governance forms that are produced. By analysing the institutional arrangements and regional governance on climate adaption, they illustrate the current state of the climate change adaption issue and underline the discrepancies between the national, regional and local implementation scale.

Lorenzoni, Benson and *Cook* outline the extent to which re-scaling of English adaption governance with regard to flood management is resulting in more collaborative outcomes, particularly on a regional basis. On the basis of a historical analysis of flood management in the United Kingdom, they examine the policy-shift from central agency control to local committees, reflecting a partial shift from government to governance, although local actors still have only restricted influence on decision-making processes.

Kazys, Rimkus und *Naujekaite* present findings in climate change adaption process governance on local and regional levels in Lithuania. The authors broach the issue of existing knowledge gaps on climate change adaption within the nation as well as the discrepancies concerning its implementation on different levels. A description of the role of local stakeholders as well as successful examples of collaboration between various stakeholders is provided.

Howes and *Dedekorkut-Howes* assess the changing fortunes of climate change adaption governance for Australia's Gold Coast based on the findings of an ongoing research. The authors shed light on the lack of government action to adequately address the challenges posed by climate change adaption and on the importance of community action and business in building resilience. They provide an insight to the potentials of community-led actions for climate adaption.

Coiacetto concentrates on the role of the private real estate development sector in climate change adaption. Considering development frequently being misunderstood, he examines some basic concepts about development with regard to climate change adaption, in order to provide an account on the academic void in international comparative research on development and climate change.

Simatele analyses the role of assets that facilitate and contribute towards building the adaptive capacity and resilience of the urban poor against severe weather condition caused by climate change in the context of Zambia. The study focuses on the so-called Participatory Climate Change Asset Adaptation Framework and the Rapid Risk Institutional Appraisal in order to analyse the impacts of climate change on poor individuals and communities in the absence of institutional support.

Section III deals with informal and corporative forms of coordination within climate change adaption processes outlining the influence of networks and participatory approaches. It becomes clear that informal and cooperative approaches

to climate adaptation can complement formal instruments and responsibilities in order to adapt cities and regions to climate change.

Winsvold, Hjeltnes, Klausen and *Langeland* examine the organizational structures of climate change adaption in the City of Bergen, Norway. Analysing traditional hierarchical structures of public government and networks of public and private actors, they outline the particular impact these structures have on climate change adaption and how they interact. Based on the data from interviews and policy documents, the authors identify synergistic and adverse effects of these interactions.

Gram, Bedsted and *Hastrup Clemmensen* focus on the participatory process carried out in Kalundborg Municipality, Denmark, in order to prepare for a municipal Climate Change Adaption Plan. They analyse the influence of the process by focusing on how the municipality incorporated local views and suggestions into their short- and long-term adaption planning and policy work.

Burton and *Mustelin* analyse the approaches of different levels of government to public participation in climate change adaption governance in the metropolitan region of South East Queensland, Australia. Drawing on an analytical framework on participating stakeholders, on the level or scale of participation, as well as on the terms of engagement, the authors suggest an approach to designing more effective participation and engagement processes.

Kaufman discusses governance challenges in the context of 'Legacy' cities in the United States. Analysing the example of the Vibrant NEO 2040-initiative that sought to produce a vision for Northeast Ohio but failed to produce an implementable strategy, the author describes the lessons learnt from the Cleveland's Legacy experience and suggests governance strategies for cities facing economic and climate change challenges.

Kelman explores climate change adaption governance for Small Island Development States (SIDS), both with and without government. Employing participatory development research as a key governance technique for addressing climate change adaption in SIDS, the author examines the aspects of power in governance and of conflict or cooperation influencing governance as being illustrative of climate change adaption governance for SIDS.

Stanley describes climate adaption achievements in small coastal towns in four Australian states exploring the necessary processes for positive adaption outcomes. Highlighting the role of community in decision-making and in achieving successful adaptation, she underlines the need for strong integrated governance arrangements supported by community as well as the requirement of orientation towards a core set of goals and building a shared vision and strategies by the community.

Drawing on examples from the Baltic Sea Region, *Lange Scherbenkse* and *van Well* shed light on the importance of transnational cooperation on climate change adaption as a basis for transnational learning of cities and regions. Based on data and information gathered within the BaltCICA-project, the authors identify

learning processes and outcomes and suggest a strategic approach in order to make learning and capacity building more explicit.

Overall, the contributions gathered in this book provide a snapshot of the current state of discussion and praxis of climate adaptation governance in cities and regions in five continents. They give insights from scientists all over the world into a still evolving field of research and outline future needs for inter- and transdisciplinary research. The book targets researchers, practitioners and experts of urban and regional administrations working in sectors and fields relevant for climate adaptation. It aims at raising interest and awareness for the non-technological governance side of climate adaptation and its relevance for successfully dealing with climate change impacts. Thus, the results from the case studies presented in this book contribute to building knowledge on the theory, concepts and praxis of climate adaptation governance in cities and regions and hopefully support successful practical climate adaptation in urban and regional contexts.

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