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Understanding barriers and opportunities for adaptation planning in cities

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Understanding Barriers and Opportunities for Adaptation Planning in Cities

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Understanding Barriers and Opportunities for Adaptation Planning in Cities

Abstract: This paper analyzes barriers and opportunities for effective adaptation planning in cities. In particular, we focus on the preparation and adoption of adaptation strategies and action plans by urban planners. To guide the discussion, we develop a two-tier framework of variables influencing decision-making, which is based on bounded rationality. We argue that whether or not urban planners take action to foster adaptation to climate change depends on three first-tier variables: information, incentives and resources. In addition, we point out that each of these variables may itself be a function of a set of underlying second-tier variables, including the natural and socio-economic environment, actor-specific characteristics of the decision-maker, and the institutional environment. Within this framework, we specify barriers and opportunities for effective adaptation planning as hampering or promoting characteristics of these first- and second-tier variables. We apply and test the framework within the context of four case studies carried out in Lima (Peru), Santiago (Chile), Berlin and Sangerhausen (both Germany).

Keywords: Climate change adaptation, urban planning, barriers

1. Introduction

It is widely acknowledged that despite efforts to reduce greenhouse gas emissions anthropogenic climate change is going to occur (Solomon et al., 2007). Impacts of climate change are likely to be particularly severe in urban areas (ICLEI, 2011). This is primarily due to the high density of population and infrastructure investments and the concentration of administrative, economic and social functions. Impacts are aggravated by urban-specific land use characteristics, such as a high degree of surface sealing, which may impair rainwater drainage (Müller, 2012) and reinforce the urban heat island effect (Magee et al., 1999; Romero and Molina, 2008). Moreover, cities are strongly dependent on their hinterland, e.g., for food and water supply, which also makes them vulnerable to climate change impacts occurring there (Hunt and Watkiss, 2011; McEvoy et al., 2010).

These challenges imply an urgent need for cities to take adaptation actions. Adaptation is commonly defined as "[a]djustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities" (Parry et al., 2007). The main objective of adaptation policies is to "reduce the vulnerability of human and natural systems to a shift in climate regime" (Fankhauser, 2009).

Despite this urgency to adapt, climate-related strategies and actions at the urban level are still in their infancy. They have primarily been implemented in a limited number of pioneer cities (Annals of the New York Academy of Sciences, 2010; Carmin et al., 2009; Hardoy and Romero Lankao, 2011; Heinrichs et al., 2011; Hunt and Watkiss, 2011; London Climate Partnership, 2006; Mukheibir and Ziervogel, 2006; Penney and Wieditz, 2007; Revi, 2008). Moreover, most of these strategies focus on mitigation – i.e. on measures to reduce greenhouse gas emissions – rather than adaptation (Betsill and Bulkeley, 2007; Bulkeley et al., 2011).

Therefore, this paper aims to contribute to the understanding of factors influencing decision-making on urban adaptation: What are relevant barriers to effective adaptation action in cities – and what are possible opportunities for progress? Our analysis addresses planned adaptation which is carried out by local municipalities. Planned adaptation is understood as "the result of a deliberate policy decision, based on an awareness that conditions have changed or are about to change and that action is required to return to, maintain, or achieve a desired state" (Parry et al., 2007). In particular, we focus on the planning process for planned adaptation, i.e. the preparation and adoption of adaptation strategies and action plans by urban planners. This is what we refer to as "adaptation planning" throughout our paper. Addressing adaptation

planning in cities is particularly important as many basic services which may be affected by climate change – such as water supply or the provision of green spaces – are already managed by public administrations. Moreover, adaptation actions undertaken by companies and individuals ("autonomous adaptation") are often insufficient for a variety of reasons and require government intervention (Eisenack, 2009; Heuson et al., 2012; Osberghaus et al., 2010).

To understand barriers and opportunities for adaptation planning in cities, we develop a simple and quite general analytical framework based on bounded rationality. We argue that whether or not a municipal decision-maker takes action depends on three first-tier variables: 1) her information about the decision-making problem, 2) her incentives to act, and 3) her available resources. In addition, we point out that each of these variables may itself be a function of a set of underlying second-tier variables, including 1) the natural and socio-economic environment, 2) actor-specific characteristics of the decision-maker, and 3) the institutional environment. Within this framework, we specify barriers and opportunities for effective adaptation planning as hampering or promoting characteristics of these variables.[1] For example, a lack of information on climate change impacts would typically constitute a barrier for adaptation planning, while a proper understanding of the climatic vulnerabilities would be framed as an opportunity for effective decision-making. We apply the framework to understand and organize existing barriers and opportunities for adaptation planning in four selected cities: Berlin and Sangerhausen in Germany, Santiago de Chile and Lima in Peru. The heterogeneity of the case study cities (e.g., in terms of size economic development, and progress in adaptation planning) allows to test the suitability of the framework. Moreover, the empirical discussion is also meant to provide anecdotal evidence on barriers and opportunities in an analytical manner.

Our paper adds to a growing debate on barriers to adaptation. One avenue of this debate addresses possible typologies and frameworks to disentangle different types of barriers. There are several studies which propose one-dimensional lists of (categories of) barriers (Adger et al., 2009; Biesbroek et al., 2011; Burch, 2010a, b; Corfee-Morlot et al., 2011; Eisenack and Stecker, 2012; Füssel, 2007; Measham et al., 2011; Oberlack, 2012; Runhaar et al., 2012). While interdependencies between different categories of barriers are commonly pointed out in these studies, they do not become very explicit in the typologies and frameworks proposed.

[1] We apply a relatively broad concept of „barriers", which may be both insurmountable (often called "limits") or mutable (often referred to as "barriers" in the narrower sense) (Adger et al., 2007; 2009).

By synthesizing insights from these diverse conceptual contributions, we propose a two-tier hierarchy of barriers focusing more clearly on major (even though not all) functional relationships. For example, we argue that a lack of information (first-tier variable) on the impacts of climate change can be primarily attributed to the characteristics of one or more of the second-tier variables: (1) natural and socioeconomic conditions (e.g., the complexity of the ecological system), (2) actor-specific characteristics (e.g., the perceptions and mental models of the decision makers), and/or (3) the institutions (e.g., inappropriate arrangements for information exchange and resource allocation).

By introducing a hierarchy of barriers, our study relates to the work of Moser and Ekstrom (2010). They identify an overarching second-tier set of variables ("structural elements of adaptation") which is similar to ours. However, they differentiate the first-tier barriers along the different phases of the adaptation process (understanding, planning, managing). In contrast, our analysis focuses primarily on the understanding and planning phases and proposes a differentiation of barriers along the prerequisites for decision-making (information, incentives, resources). Berkhout et al. (2006) and Arnell and Delaney (2006) also develop a two-tier framework for the analysis of barriers. Yet, their approach focuses on autonomous adaptation by firms and includes elements (e.g., the market context) which are not relevant for adaptation planning by municipalities.

A second contribution made by our paper is the provision of empirical evidence on the existence and relevance of different types of barriers on the local level. There is certainly a significant amount of case studies on barriers to adaptation (see, e.g., Arnell and Delaney, 2006; Berkhout et al., 2006; Eisenack and Stecker, 2012; Inderberg, 2011; Koch et al., 2007; Næss et al., 2005; Steinhäuser et al., 2012). However, only some of them address the level of local decision-makers (Amundsen et al., 2010; Burch, 2010a, b; Crabbé and Robin, 2006; Measham et al., 2011; Runhaar et al., 2012), and the focus is primarily on adaptation in industrialized countries. Here, we offer a discussion and comparison of adaptation planning in municipalities in developing and developed countries within a unifying framework.

The paper is organized as follows: Section 2 introduces the analytical framework. Section 3 explains the basic properties of the case study cities and our empirical approach. Section 4 applies the framework for the joint discussion and comparison of existing barriers and opportunities in the four cities. Section 5 draws conclusions from the discussion.

2. Analytical Framework

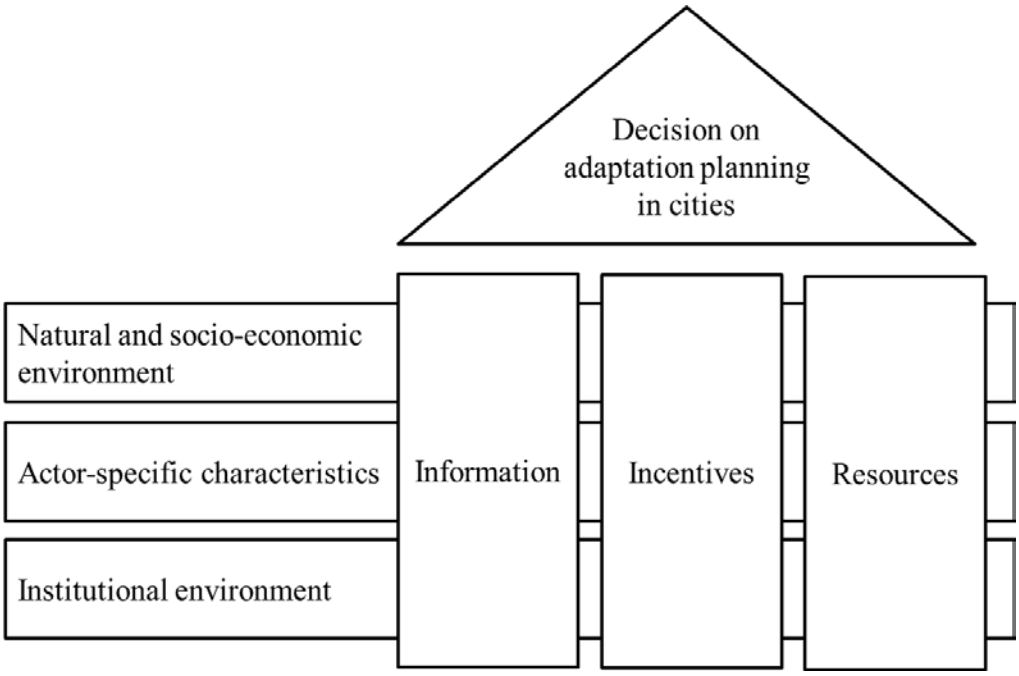
To understand and organize barriers and opportunities for adaptation planning by municipalities, this paper introduces a simple framework which rests on a bounded rationality approach to decision-making (see, e.g., Simon, 1959). We assume that the decision-maker is able to identify and specify alternative options for solving a specific climate change related problem. She has clear preferences with regard to these options. She is able to rank these options on this basis and will choose the most preferred accordingly. However, we acknowledge that in making these choices, decision-makers are subject to limitations related, inter alia, to information, resources and cognitive capacities.

We propose a two-tier hierarchy of variables that are important in this respect (see Figure 1). We argue that decisions are contingent on three first-tier variables: information, incentives and resources of the decision-makers. This differentiation is similar to that of Eisenack and Stecker (2012), who distinguish “missing operator”, “unemployed means” and “missing means” as important variables. We furthermore emphasize that these variables are themselves functions of three underlying and overarching second-tier (sets of) variables: the natural and socio-economic environment, actor-specific characteristics and the institutional environment. Related concepts in the literature refer to “structural elements” of adaptation (Moser and Ekstrom, 2010) or “moderators” of adaptation (Reser and Swim, 2011). Thus, our framework merges different conceptual approaches to classifying variables influencing decision-making in the field of (planned) adaptation in order to highlight major interrelations between different sets of variables. Obviously, there may also be interdependencies between the variables within each tier. These will be addressed where appropriate.

It is important to emphasize that our framework is meant to be of descriptive rather than normative character: We use it to identify possible barriers and opportunities but we are not arguing that overcoming these barriers necessarily leads to the desired levels of urban adaptation planning (see also (Moser and Ekstrom, 2010)).

The relevant first- and second-tier variables are introduced in detail in the following. For each case, it will be discussed to what extend they may hamper or promote adaptation planning by municipal decision-makers, i.e. under what conditions they constitute barriers or opportunities. For each second-tier variable it is explained how it may affect the first-tier variables.

Figure 1: Variables influencing decisions on adaptation planning in cities



Source: Own elaboration

2.1. First-Tier Variables

2.1.1. Information

To develop urban adaptation strategies, municipalities first of all require proper information about the decision-making problem. Such information includes assessments of regional and local climate change and scenarios of climate change impacts for their city. In addition, information on available adaptation options and costs and benefits of these options is needed (Füssel, 2007; Füssel and Klein, 2004). Empirical evidence shows that decision-makers typically lack such information, particularly at the local level and in developing countries (Crabbé and Robin, 2006; Koch et al., 2007; Measham et al., 2011).

2.1.2. Incentives

Appropriate incentives for decision-makers are a second prerequisite to take action. The expected direct benefits of adaptation measures have to outweigh the costs of planning and implementation. Adaptation policies also have to be consistent with other policy objectives (Yohe, 2001). Important competing objectives at the local scale include, inter alia, economic development, poverty alleviation or public safety (see, e.g., Koch et al., 2007; Measham et al., 2011). If co-benefits with other political objectives are low and/or corresponding conflicts are significant, adaptation measures may be hindered (Hallegatte et al., 2011).

2.1.3. Resources

Finally, well-informed and motivated decision-makers also need resources to plan and implement adaptation measures. Such resources include financial means, technologies, personnel, staff expertise and time (Moser and Ekstrom, 2010). Municipalities usually are extremely resource-constrained – due to their wide range of responsibilities. This often results in a reactive management with a focus on short-term technical fixes rather than a long-term integrated strategy to address adaptation (Crabbé and Robin, 2006; Measham et al., 2011).

2.2. Second-Tier Variables

2.2.1. Natural and Socio-Economic Environment

The natural and socio-economic environment encompasses the characteristics of climate change and its projected impacts (intensity, velocity, spatial and temporal scale), of the natural environment in general (e.g. natural setting, altitude and other geographical patterns), of a city's socio-economic system (e.g. patterns of demography and economic development), and of the adaptation technologies available. In this respect, natural and socio-economic conditions are understood as the non-institutional context within which municipalities have to take decisions.

Natural and socio-economic conditions may first of all impair the availability of information. Typically, for example, the complexity and variability climate change produce strong uncertainty and constrains predictions about possible impacts, especially at the local scale for urban areas (Wilbanks et al., (2007) and Hunt and Watkiss (2011)).

The natural and socio-economic environment also influences the incentives for adaptation planning. It is decisive for a city's exposure and sensitivity to climate change, and therefore determines the benefits from adaptation planning. Natural conditions also affect the spatial scale at which climate change related impacts have to be addressed – and certainly adaptation to some impacts, such as those associated with water supply, clearly goes beyond the scope of local decision-making. The necessity to coordinate actors and organizations at multiple levels for effective adaptation planning also increases the resources needed (Moser and Ekstrom, 2010). More generally, the availability of resources for decision-making is usually a function of the socio-economic context, in particular of the level of economic development.

2.2.2. Actor-Specific Characteristics

Actor-specific characteristics encompass perceptions, preferences, experiences and knowledge (Reser and Swim, 2011), which guide the behavior and decisions of municipal decision-makers. Gifford (2011) identifies seven overarching psychological barriers which may impede behavioral changes and action towards adaptation: limited cognition, ideologies, social comparison with other people, sunk costs, discredence of others' views, perceived risks of behavioral changes and a tendency to prefer easier options rather than more effective alternatives. The prevailing mental models are not only determined by psychological aspects but also by their interactions with natural and socio-economic conditions, e.g. personal experience with climatic extreme events, and the institutional environment, such as prevailing values and norms. Mental models act as filters determining which information is actually perceived and how it is interpreted and valued (Eisenack and Stecker, 2012; Moser and Ekstrom, 2010). Moreover, actors' characteristics are also decisive for their incentives to act. In particular, actors' preferences and concerns, their risk attitudes and their perceptions of self-efficacy and controllability of the adaptation problems may stimulate or hinder their action (Adger et al., 2009). The above characteristics in combination with more general skills (e.g. communication, facilitation and elicitation) and actors' integrity (e.g. openness to the issue, processes and solutions, self-reflexivity, creativity, willingness to take responsibility) are also important for the resources actors can obtain. They determine whether individuals are accepted and trusted by stakeholders as leaders in adaptation action. Leadership is particularly required in situations when a clear mandate or public demand for adaptation is absent. In such cases, progress in adaptation planning depends primarily on the ability of decision-makers to motivate and win other decisive actors over (Measham et al., 2011; Moser and Ekstrom, 2010).

2.2.3. Institutional Environment

Institutions are the rules which guide the interactions of actors and organizations (North, 1990). They can be of formal and informal character: Formal institutions are laws and regulations (Eisenack and Stecker, 2012; Moser and Ekstrom, 2010). Informal institutions include, for example, (organizational) routines (Berkhout et al., 2006) and more generally cultural and societal values and beliefs (Adger et al., 2009). Institutions determine, *inter alia*, the processes of information exchange, coordination and decision-making procedures and the allocation of responsibilities and resources (Ostrom, 1990).

How well an institutional framework is suited to promote adaptation planning by municipalities primarily depends on the horizontal and vertical integration of decision-making. Horizontal integration may occur within public administration ("mainstreaming") and beyond ("participation"). Vertical integration arises between local (i.e. urban), regional and national decision levels ("multi-level governance") (see, e.g., Corfee-Morlot et al., 2011).

Mainstreaming rests on the understanding that adaptation planning is not primarily an environmental issue, but rather part of a wider process of sustainable development with strong linkages to other important policy issues, such as poverty alleviation, health, public safety or economic development. Consequently, adaptation planning should be embedded into existing sectoral procedures and responsibilities of public decision-making (Adger et al., 2009; Measham et al., 2011; UNDP/UNEP, 2011). Mainstreaming is usually expected to increase the incentives for adaptation planning as it facilitates the identification of links to other (sectoral) policy objectives with a possibly higher political priority and potential co-benefits (Measham et al., 2011; UNDP/UNEP, 2011). Moreover, the integration of adaptation concerns into existing administrative tasks and activities is also likely to reduce the resources needed for adaptation planning (Füssel, 2007; Füssel and Klein, 2004) – although it requires a lead organization for coordination across sectors (Hunt and Watkiss, 2011). Preferably, the lead should be taken by an administrative unit which already has an accepted cross-sectoral mandate, such as planning or finance departments. Allocating the lead to the environment department may hinder mainstreaming as it may result in adaptation being understood as a primarily environmental problem (Measham et al., 2011; UNDP/UNEP, 2011).

Participation implies that adaptation planning is not only carried out by public administration but also allows an active role for representatives from business, science, non-governmental organizations (NGOs) and civil society in general. It requires trans-disciplinary boundary institutions which establish a science-policy interface by providing credible, legitimate and salient scientific and technical assessment to local decision-makers (Corfee-Morlot et al., 2011). Participation is particularly useful to make use of the knowledge of local stakeholders for the development of robust adaptation strategies (Adger et al., 2009). It may also foster financial and non-financial support from stakeholders and thereby reduce the public resources needed for municipal adaptation planning (Hunt and Watkiss, 2011).

Multi-level governance refers to the fact that adaptation planning at the city level is also influenced by decisions taken at the regional and national level. Multi-level governance may hamper but also promote local adaptation planning (Corfee-Morlot et al., 2011). On the one

hand, regional and national laws and regulations may produce perverse incentives for local decision-makers and result in maladaptation (Amundsen et al., 2010; Corfee-Morlot et al., 2011; Eisenack and Stecker, 2012). For example, national insurance schemes may diminish incentives to adapt at the local level as climate-related damages are covered by the state. On the other hand, multi-level governance can foster local adaptation planning, e.g. by transferring information and financial resources from national and regional to local levels. More importantly, national regulations can change the incentive structure of urban decision-makers by assigning a clear mandate for adaptation planning to the local level. The absence of such mandate is widely considered as an important barrier to proper adaption planning (Amundsen et al., 2010; Betsill, 2001; Bulkeley and Kern, 2006; Burch, 2010b; Corfee-Morlot et al., 2011; Koch et al., 2007; Measham et al., 2011; Næss et al., 2005). National regulation is also warranted to internalize external effects of local adaptation planning, which result in over- or under-adaptation (Eisenack and Stecker, 2012; Osberghaus et al., 2010).

3. Description of Empirical Case Studies

3.1 Empirical Approach

Case studies have been carried out in Lima (Peru), Santiago de Chile (Chile), Berlin and Sangerhausen (both Germany) to test our analytical framework and to gather evidence of barriers and opportunities for adaptation planning to climate change at the local level. Table 1 provides a brief overview of the main characteristics of these cities.

Table 1: Characteristics of the case study cities

	Lima	Santiago	Berlin	Sangerhausen
Inhabitants	8.5 Million [a]	5.4 Million [a]	3.5 Million [b]	29,679 [c]
Population dynamics	Fast growing [a]	Growing [a]	Stable [b]	Shrinking [c]
Area	2,794 km^2 [a]	840 km^2 [a]	892 km^2 [b]	0,21 km^2 [c]
GDP/capita (in US$, ppp)	7,899 (2005) [a]	16,826 (2008) [a]	35,052 (2010) [d]	23,884 (2010) [e]
Status of adaptation planning	Preparation of strategy completed, adoption pending (start of preparation in 2011)	Preparation of strategy advanced (start in 2010)	Strategy adopted (start of preparation in 2008)	Preparation of strategy completed, adoption pending (start of preparation in 2010)

[a] (Rehner et al., 2010)
[b] (Amt für Statistik Berlin-Brandenburg, 2011)
[c] (Statistisches Landesamt Sachsen-Anhalt, 2010)
[d] (Eurostat, 2010)
[e] (Landkreis Mansfeld-Südharz, 2011)

We have selected these cities because three of them are the political, economic and functional centers of their countries. Sangerhausen has been included in the comparison due to the fact that it is a German model city for urban adaptation to climate change. More importantly, the cities have been chosen for their heterogeneity in terms of size and population dynamics, development status (we include cities from a developing, an emerging and an industrialized economy) and progress in adaptation planning (see Section 3.2). By comparing cities with quite heterogeneous characteristics, we expect to learn more about the suitability of our framework.

In order to explore the barriers and opportunities for adaptation planning in the selected cities, we conducted expert interviews with representatives from the fields of administration, politics, science and NGOs (see the list of interviews in Annex 1). As the study employs a qualitative research design, the results do not claim to be representative. They rather provide anecdotal evidence. The interviews were semi-structured, followed a guideline for all cities but also left space for additional issues coming up. As a first step, the interviews were interpreted individually by employing the analytical framework outlined above. After that, we clustered and compared the results of the case studies to identify general barriers and opportunities for urban adaptation.

3.2 Status of Adaptation Planning by Municipalities

Our empirical analysis aims at understanding to what extent the characteristics of the variables identified in the framework have hampered or promoted advances in adaptation planning. In particular, we focus on the preparation and adoption of local adaptation strategies and action plans by urban planners. The current status of these advances is briefly outlined in the following.

The preparatory process for Lima's adaptation strategy started in December 2011 after the regional government had established the Metropolitan Environmental Commission. This commission brings together representatives from regional, municipal and district governments as well as the business sector, academics and NGOs. Within the commission a technical working group on climate change was founded and put in charge for developing the adaptation strategy. Additional experts, e.g. from international research projects, the Ministry of the Environment and the United Nations Development Program were invited to participate in this working group. The elaboration of the strategy was eventually primarily based on contributions made by NGOs, international research projects and a Peruvian scientific member of the IPCC. In addition, the Swiss AVINA foundation provided funds for an

external consultancy. The adaptation strategy was finalized in August 2012 and submitted to Lima's city council where its adoption is pending (MML, 2012).

Since 2010, Santiago has been elaborating an adaptation plan that is scheduled to be terminated in 2012. Major actors are the Regional Government and the regional entity of the Ministry for Environment. Other actors involved in the planning process are the regional entities of the Ministry of Public Works, the Ministry of Housing and Urbanism and the Ministry of Health as well as the municipalities of the Metropolitan Region of Santiago. Representatives of the civil society and scientists participate in the process through round table meetings. However, the planning process for the adaptation plan in Santiago is strongly pushed by an international cooperation project. The adaptation plan is supposed to be part of Santiago's Regional Development Plan which will be adopted by the Regional Government.

In Berlin the key instrument for adaptation planning is the "Urban Development Plan Climate", which was adopted by the Senate in 2010 and published in 2011. This strategic document draws on former activities concerning climate adaptation: In 2008 the Climate Protection Council, a group of 16 experts from climate science and energy industry, developed a questionaire concerning "Climate Adaptation in the Metropolitan Region Berlin – From Knowledge to Action". In response to this, the Senate Department for Health, Environment and Consumer Protection prepared a report on climate impacts for Berlin in 2009. This assessment was based on information concerning the city's sensitivity (e.g. concerning air pollution, bio-climate) documented in the city's "Environmental Atlas" since 1995. Additionally, the Senate Department of City Development developed an own model to analyse the city's bio-climate by combining projected future climate impacts on a micro-scale with health-related heat-island effects and published the maps in a report in 2010. The "Urban Development Plan Climate" eventually compiles this data depicting the city's vulnerable areas in 2050 concerning bio-climate (thermal stress), green and open spaces (organic carbon content), water quality and storm rainfall, and climate protection. It also provides an action plan with twelve adaptation projects that serve as good practice.

In Sangerhausen, as described for Santiago, a scientific (pilot) project facilitated the development of a local adaptation concept. The project, which was funded by the Ministry of the Environment of the State of Saxony-Anhalt, started in October 2010. The local adaptation concept as well as a manual on the development of local adaptation plans were published in November 2011. Actors from all relevant sectors and political and administrative levels participated in this process. Decision-makers from the state, the county and the municipal

level, as well as stakeholders representing the water and the agricultural sector, forestry, different business associations, agricultural cooperatives, relevant companies and representatives of the public were involved through workshops and expert interviews. Information exchange was further promoted by a website used to communicate intermediate data. The final results regarding the changing (local) climate conditions, the vulnerability of particular sectors, existing adaptation options and tools for their prioritization were communicated in a specific and appropriate manner to the different focus groups. A follow-up project financed by the German Federal Environment Ministry, which aims to disseminate these results and promote further mainstreaming of adaptation planning starts in the beginning of 2013.

4. Empirical Results

In this section, the analytical framework developed in Section 2 is applied to discuss and disentangle the barriers and opportunities for adaptation planning in the four case study cities which have been reported in the expert interviews. This Section is organized along the first-tier variables we identified: information, incentives and resources. For each of these variables, we discuss to what extent barriers and opportunities can be attributed to the underlying second-tier variables: natural and socio-economic environment, actor-specific characteristics and institutional environment.

4.1. Information

4.1.1 Natural and Socio-Economic Environment

In most of the cities under examination scientific information about future climate conditions is not available or characterized by high uncertainty at the local level. This observation is due to the general lack of knowledge in climate modeling and downscaling of global climate models. This lack can first of all be attributed to the complexity of the natural environment. In addition, the development status of the countries is a relevant factor in this context as far as scientific capacities are concerned. This may explain why access to information is especially a problem in developing and emerging economies, i.e. in Lima and Santiago. In Santiago, for example, experts point out that it is hard to develop an adaptation plan based on the existing assessments of local climate change impacts and that further downscaling of the projection data available at the regional level is needed (S04, S07). The lack of high resolution projection data is a major concern in Lima as well. Here the unpredictable development of the El Niño/Southern Oscillation (ENSO) phenomenon is regarded to be an additional challenge

for the assessment of local climate change impacts (L07). Therefore, information on climate impacts is been seen as diffuse, disperse or simply not available, constituting a major barrier to elaborating a local adaptation plan (L06).

In contrast to the situation in both South American cities, the availability of information on changing climate conditions in Berlin and Sangerhausen is comparatively good – as more scientific input is available and local climate changes are predictable with higher degrees of probability. In Berlin, for example, the "Environmental Atlas" including data on urban climate conditions has been published and regularly updated since 1995. Furthermore, in 2009 an integrated urban climate model was developed to improve the knowledge about the future development of climate-related vulnerabilities, such as heat stress. However, according to an employee of the public administration, available projection data can only be used to a limited extent for hydrological modeling due to methodological challenges (B03). Hence, the infancy of modeling hydrological cycles at global and regional level constitutes a major barrier for further adaptation planning in Berlin.

The same barrier is been identified in Sangerhausen. Although the city administration benefits from projections of the most relevant climatic parameters and sectoral vulnerability assessments commissioned by the State Ministry of the Environment, even decision-makers on the state level consider the information available at this stage of vulnerability assessments and regional downscaling of projection data to be of limited use to assess impacts of climate change and corresponding vulnerabilities on the local level. Moreover, information on sector specific impacts and extreme events is still incomplete and only recently subject of further studies (SGH07).

Due to information barriers associated with limited knowledge on climate change and impacts at the local level, information on the economic consequences of climate change is also hardly available up to now. With the exception of Sangerhausen, in none of the cities either economic evaluations of expected climate change impact or cost-benefit-analyses to evaluate and prioritize potential adaptation options have been applied. In Sangerhausen economic expertise has been involved in the development of the local adaptation concept. A methodological guideline for economic evaluation of adaptation measures has been developed and validated through in-depth case studies. The rationale behind this guideline is to empower decision-makers in the city administration to systematically assess positive and negative effects of adaptation measures without external support (SGH02, SGH05, SGH06).

In summary, natural conditions (highly complex climate change and climate change impacts) and socioeconomic factors (especially the development status and therewith research capacities) may explain the lack of information which has constrained adaptation planning in the cities under examination.

4.1.2 Actor-specific characteristics

Various actor-specific factors that negatively influence the level of information relevant for municipal decision-making have been identified. In Lima interviewees reported that due to the perception that major climate change impacts are only to be experienced in the distant future, citizens and administrative decision-makers often are not yet aware of the possible magnitude of climate change (L10, L03, L05) and the resulting need to react already in the short run in some sectors (L03, L05, L09, L10). In Santiago, experts stated similar perceptions being shared by political executives as well as urban and regional planners. Additionally, in Santiago climate change is regarded to be a topic rather belonging to the "realm of science" (S01, S05). As a consequence of this attitude, most of the political decision-makers at the national level would not be able to differentiate between the very distinct strategies to deal with the challenge of climate change, as for example mitigation, adaptation or climate system engineering (S07). Further downstream, on the local level, decision-makers as well as ordinary citizens often do not have access to information on climate change and its impacts (S01, S07). On the contrary, climate change has already been on the administrative and political agenda for many years in Berlin. In the beginning decision-makers primarily focused rather on mitigation than on adaptation activities. It is only within the last years that adaptation has gained importance at the expert and political level, inter alia due to the influence of the Stern-Report in 2006 and of the IPCC report in 2007 (B01). In retrospective, the personal contacts between the administrative staff and scientific institutions established over the years are seen as a major driver to enhance the availability of information and access to it (B05). Experiences in Sangerhausen send an ambiguous message: On the one hand, there is an increasing awareness of changing climatic conditions among the administrative staff due to the availability of information generated and distributed by initiatives on the State level. However, on the other hand, the lack of high-resolution data for the local level in combination with actor-specific characteristics, as for instance limited individual (processing) capabilities, hampers the consideration of adaptation issues on the local level. This becomes obvious, for example, when decision-makers confuse terms like "weather" and "climate" or "mitigation"

and “adaptation” (SHG04, SGH11) – a phenomenon also seen regularly in the Latin American case studies.

An important determinant for the access to and use of information by municipal decision-makers is their personal interest and commitment. These are vital factors for acting proactively or establishing and maintaining personal contacts to other administrative or external experts. This becomes particularly apparent in the Lima case. After the change of government in 2011 many former environmental activists moved from NGOs into leading positions within ministries and public administrations on the municipal level. Due to their background, these actors seem to have strong preferences for environmental protection and clearly push for action – despite existing information deficits and uncertainties (L09, L10). On the one hand, this environmental activism can be interpreted as an opportunity for adaptation action. On the other hand, ignoring uncertainties may also result in over- or maladaptation and constitute a barrier to attaining appropriate adaptation levels (L7).

4.1.3 Institutional Environment

A main institutional barrier often referred to by interviewees in Lima is the lack of a coordinating organization and the low level of inter-organizational cooperation. Although several actors have access to relevant information, they do only collaborate on specific issues (L06). This may be considered a main reason why adaptation mainstreaming is lacking. In addition, more internal communication and a “common language” are essential prerequisites for the development of a general adaptation strategy (L06). Similarly, in Santiago interviewees regarded the non-existence of a coordination organization which provides updated information on a regular basis as one of the principal barriers to adaptation (S02, S04, S05, S07). In contrast, in Berlin the task of moderating the adaptation process has been designated to the Division of Urban and Open Space Planning at the municipal Department for Urban Development and the Environment. One of its most relevant initiatives was the development of the “Urban Development Plan Climate” (B01). Additionally, the Geo-Information Unit is responsible for continuously updating the existing “Environmental Atlas” database. Despite these achievements, neither an institutionalization of a participatory process involving the general public nor a permanent dialogue between the different sectors has been established yet. This is a drawback of assigning this task to a single organization that selected relevant fields of action using a top-down-approach (B05). In Sangerhausen the development of the adaptation strategy for the city and the district followed a rather participatory approach. The fields of action have been identified in a bottom-up process. Information exchange and

the dissemination of recommendations have been ensured through forums and working committees.

In the Latin American cities multi-level governance has remained inadequate especially with regard to the mechanisms to generate and distribute climate change-related data. In Lima, for instance, the national government is reluctant to invest in information generation and distribution to improve the existing data basis (L03, L07). In addition, key organizations are not involved in the few existing research projects as they do not collaborate officially. Thus, information exchange often depends on informal meetings (L08). In Santiago a science-policy dialogue has recently been started. However, the absence of a permanent platform for such an exchange is seen as an important barrier (S05). Moreover, due to the complexity of administrative channels, trickling down information is time consuming and not always guaranteed (S02). In contrast, in Berlin better access to scientific information can be attributed to the specific institutional setting. Urban planners have the opportunity to ask for tailor-made expertise for specific projects by consulting the Geo-Information Unit (B05). In addition, a network consisting of different administrative bodies and various scientific organizations has been established (B04). It has to be mentioned that due to the congruency of the Federal State and the City of Berlin the complexity of multi-level governance processes is substantially reduced. In Sangerhausen assessments of climate change related impacts have been conducted under the leadership of the State Ministry of the Environment. However, this positive stimulus from the State level stands in contrast to the existing intra-institutional barriers, namely insufficient systematic distribution of information within the administration (SGH01, SGH04).

A further concern of the interviewees in the Latin-American case studies is related to the lack of an institutional memory. This is due to the fact that a significant share of employees in public administration is replaced in the course of the changes of government. Long-term planning can hardly be ensured under such circumstances as capacity needs to be rebuilt continuously (L05, S01, S04, S07). Therefore, information often has to be provided by external projects or NGOs (L11). Rotation of personnel and institutional memory were not addressed in the interviews in the German cities.

In our view, it is important to emphasize that many of the barriers mentioned in this Section on institutional aspects are strongly linked to the availability of resources (see Section 4.3). In the interviews we noticed, for instance, a very close connection between information deficits and a lack of personnel, finances and time.

4.2. Incentives

4.2.1. Natural and Socio-Economic Environment

It has been reported for all cities that the very characteristics of the climate system may create barriers to adaptation planning. On the one hand, the expected negative impacts of climate change, i.e. the possible benefits from adaptation, may in fact be limited – as has been pointed out particularly for Berlin (B05). On the other hand, the observability of (potentially significant) impacts may be hampered for a variety of reasons. First, the system's complexity results in a lack of understanding and significant uncertainty regarding adaptation benefits in all cities (see Section 4.1). Second, many impacts cannot be observed on a continuous basis but primarily when extreme events occur. In Lima, a primary driver of action is the existence of the ENSO phenomenon which appears every five to ten years (L07). Similarly, representatives of Sangerhausen's administration argue that awareness is correlated with seasonal weather trends, as these are understood by many people as indications of climate change (SGH03, SGH07). Third, many impacts occur in the future, i.e. benefits of adaptation materialize only in the long run. This is particularly problematic in the light of counter-supportive institutional framework conditions, such as short-term political cycles, that are mentioned for Lima (L08, L10), or short-term planning horizons of administrations, which are pointed out for Sangerhausen (SGH08).

In addition, the characteristics of the socio-economic environment usually imply that adaptation competes with other urgent societal and political objectives. Consequently, adaptation measures are less likely to be taken if there are no co-benefits. This issue is particularly raised by a variety of experts from Lima and Santiago (L08, L09, L10, L11, S01, S02, S06, S07). In Lima, for example, potential solutions of the most dominant concerns, public safety and traffic congestion, provide few co-benefits in terms of adaptation. In turn, the existence of co-benefits was an important driver for measures taken in Berlin, where many elements of the city's climate action plan had in fact already been in place before its adoption, e.g. to address demographic change (B01, B05), or are no-regret options which produce multiple benefits (B01, B02, B04).

4.2.2. Actor-Specific Characteristics

The individual attitudes of decision-makers are emphasized as important determinants of adaptation planning in all cities. In Chile representatives from different administrative levels attribute insufficient initiative by important policy-makers, inter alia, to a lacking willingness

to take responsibility and make political commitments (S01, S04, S05). For Sangerhausen an employee of a State ministry asserts that many local decision-makers are not yet aware of scientific insights on anthropogenic climate change and its impacts which are already available (SGH08). In contrast, actor-specific characteristics have been a driver of adaptation planning in Lima. Actors in charge of developing the local climate strategy and action plan have a background in environmental NGOs and a strong preference for environmental issues in general (L06, L08, L10). In Berlin the congruence of personal perspectives and beliefs of key actors involved in urban planning with the needs of climate change adaptation has been pointed out as a major factor promoting adaptation activities (B01).

4.2.3. Institutional Environment

In a multi-level decision-making context, an important institutional barrier is the lacking mandate for adaptation planning assigned by the national authorities to the municipalities. In Chile no legal norms and political instruments have been adopted to guide local policy-makers in the field of adaptation (S01, S04, S07). An employee of a ministry attributes this to Chile's neoliberal governance approach which prefers market-based solutions over state intervention (S02). Likewise, it is emphasized by experts in Sangerhausen that legally binding regulations for adaptation planning are still in their infancy (SGH04, SGH07, SGH08) and responsibilities are yet to be assigned explicitly to different organizations (SGH01, SGH10). Institutionalizing adaptation more formally would not only establish incentives to act but moreover send a signal that adaptation is a national priority (SGH03, SGH10). Initial steps taken in Germany are the inclusion of adaptation concerns in the Federal Building Code and the Water Framework Directive (B02, B03). However, the diffusion and enforcement of these norms is still pending (SGH04). A notable exception in terms of national guidance is Peru where a national law requires regional authorities to adopt an adaptation strategy and action plan (L09, L10).

The lacking coordination between urban and rural administrations as well as among the regions is raised as a specific issue of multi-level governance in Peru and Chile (L08, S02, S07). This deficit hampers the implementation of adaptation measures across administrative borders. This may be particularly detrimental for large-scale challenges associated with climate change, such as impacts on water supply.

What has been a driver for adaptation-related decision-making is the fact that many international programs which grant financial support have been linked to climate issues and made contingent on the adoption of local climate policies. In Peru, for instance, this refers to

funds provided by development cooperation (L09). In Germany, this is especially true for many EU programs (B02, B04).

A final set of barriers reported is linked to the institutional arrangements within local administrations. In Lima and Santiago experts from national ministries and NGOs complain about long-lived bureaucratic routines that hinder the integration of a new political issue such as adaptation (L09, S01, S02). Employees often refuse to carry additional responsibilities and work load resulting from the consideration of adaptation aspects. This effect is aggravated when employees have tenure and salaries do not include result-oriented components, as is argued in Lima (L06, L10). More generally, ministry employees in Chile and Saxony-Anhalt argue that lengthy administrative procedures for the approval of adaptation measures may distract political decision-makers (S02, SGH03, SGH10). In fact, we presume that many of these administrative barriers are associated with a lack of mainstreaming adaptation on the local level.

4.3. Resources

4.3.1. Natural and Socio-Economic Environment

For all case studies, even though only to a limited extent for Berlin, a lack of various types of resources (e.g. personal, financial) has been identified as a severe barrier to adaptation planning. First of all, this can be attributed to the general characteristics of the socio-economic environment, such as the patterns of economic development and growth, which are decisive for the availability of public funds. It has been pointed out for Sangerhausen, for example, that budget constraints are an outcome of austerity policies pursued at different political and spatial levels. However, even though financing proactive adaptation measures in general has become more complicated since the 1990s, there are examples of reactive adaptation processes for which additional resources have been provided by the State government. Such cases include adaptation actions aiming at diminishing repeated damages resulting from extreme weather events which are expected to occur more often under the conditions of climate change (SGH01, SGH02, SGH04, SGH07).

In addition, the characteristics of the socio-economic environment have a strong impact on the relative importance of adaptation needs as compared to other societal and political objectives – which in turn determines the allocation of a scarce public budget to different fields of action. In this respect, the availability of resources is strongly linked to the overall incentives for action (see Section 4.2). In Peru poverty reduction and adaptation processes in rural areas,

rather than in cities, are national priorities (L03, L06, L07, L10). Therefore, hardly any national funds are available for adaptation on the municipal level. Financial support is primarily provided by international donor organizations which set up pilot research projects in Peru (L06, L09, L10). The low importance of environmental issues as a whole at the local level in Lima is illustrated by the fact that the Environmental Department's financial resources account for only 3 % of the municipal budget (L06). In Santiago scarce public resources are primarily used to promote activities in export-oriented sectors like fishery or agriculture, rather than used for urban adaptation (S07). In Sangerhausen the overwhelming importance of promoting job creation in an economically underdeveloped region has a negative influence on the availability of financial resources for adaptation activities at the municipal level. However, few examples show that adaptation needs are considered in the context of ongoing planning processes, even though this consideration results in noticeable investment cost increases. Despite the high level of activities concerning climate adaptation in Berlin, the importance of this policy field is also still relatively small compared to ("hard") policy issues like economic development.

4.3.2. Actor-Specific Characteristics

For none of the cities under examination actor-specific characteristics have been reported to restrict the availability of resources.

4.3.3. Institutions

In general, the low degree of mainstreaming urban climate adaptation appears to be a major factor restricting the availability of resources for adaptation activities in Lima, Santiago and Sangerhausen. In Santiago, for example, there is no title for mitigation- or adaptation-related activities in the general budget of the national and local governments (S05, S06). As mentioned before, the situation in Berlin is slightly different. Here the institutional embeddedness of adaptation facilitates the provision of financial resources, e.g. for climate change-related analyses which have been used to develop an urban development strategy. As a consequence of the adaptation funds available, a comparatively high amount of personnel resources can be employed for support climate adaptation at the municipal level.

Effective mainstreaming of adaption is hindered by a lack of appropriate coordination across sectors (e.g., S02, S04, S05, S07, L08). Even where a coordinating organization has been established, challenges remain. In Lima several municipal and regional departments have been merged to a new environmental department, inter alia, to guide adaptation action at the

local level (L06). However, the fact that the environment department is in charge implies that adaption planning is still framed and perceived as a primarily environmental issue and consequently received only little political backing (L03, L06). Even in Berlin, where coordination has been assigned to the Department of Urban Development and Environment, the coordination and involvement of a multitude of different sectors and interests is still regarded very challenging (B05).

Participation has been found to be helpful to reduce the cost of adaptation planning. Examples include the integration of scientists (disposing of own international funds) in Lima (L08) and the engagement of private investors in climate sensitive restructuring projects in Berlin (B04).

Several issues associated with multi-level governance aggravate the lack of resources. Financial constraints in Santiago's public administration can be attributed to the national government's market-oriented economic policy approach, which is characterized by low levels of public spending and by minimized regulatory market policies (S01, S02, S07). Furthermore, the fiscal federalism is poorly developed in Chile. As a consequence, even the fulfillment of essential administrative responsibilities depends on transfers from the Common Municipal Fund (S05, S06, S07). In addition, the overlap of and the competition between numerous administrative levels make adaptation planning in Lima and Santiago particularly resource-consuming as significant financial and human resources have to be invested in coordinating the activities of the different actors (L05, L08, L10, L11, S02, S07). In contrast, adaptation action in Sangerhausen has clearly benefited from funds and support provided by State and Federal organizations. In particular, Ministry of the Environment of the State of Saxony-Anhalt has strongly promoted pilot projects related to adaptation.

5. Discussion and Conclusion

Our paper has examined barriers and opportunities for adaptation planning by municipal decision-makers in cities. The particular focus of our analysis has been on the process of preparing and adopting urban adaptation strategies and action plans. Our study aimed at making two contributions: First, we have developed and tested a simple decision-making framework to classify and disentangle variables whose characteristics may constitute barriers or opportunities for adaptation planning. Second, we have used the framework to provide and organize empirical evidence for the existence and relevance of different barriers and opportunities in four selected case study cities: Lima (Peru), Santiago (Chile), Berlin and Sangerhausen (both Germany).

Our empirical analysis has revealed that the framework we propose is quite suitable to understand the (lack of) progress in urban adaptation planning in varying contexts. Despite differences in spatial and demographical characteristics, level of economic development and current stage of the adaptation planning process, we have been able to attribute all barriers and opportunities mentioned by decision-makers of different organizations in these cities to the different variables pointed out in the framework. Therefore, we would argue that this framework can be applied to explain the (lack of) progress in adaptation planning in a wide range of cities worldwide, characterized by different sizes, demographic trends, and natural framework conditions.

Beyond the introduction of the analytical framework, our paper also provides empirical insights into barriers and opportunities for adaptation planning at the municipal level. Table 2 gives an overview of the empirical results. As our analysis has been based on qualitative data generated by the means of semi-structured expert interviews, our empirical findings are not representative but rather of anecdotal character.

There are several overarching findings, which are worth highlighting: First, with regard to the differences between industrialized countries and developing and emerging economies, our analysis suggests that the relevance or importance of the variables influencing the progress in municipal adaptation planning is rather insensitive to the level of economic development. The major differences can be rather explained by the varying *characteristics* of these variables across the cities analyzed. For example, the availability of resources and institutional capacity are decisive in both developed and developing countries. However, the lack of resources and the insufficiency of institutions are typically more severe in less-developed countries.

Second, our study has confirmed the importance of several institutional factors which are discussed in the literature. These aspects are particularly relevant as they typically constitute the starting point for policy recommendations.

- Mainstreaming of adaptation is an important challenge. Interviewees in all cities confirmed that adaptation planning is not primarily an environmental issue. However, it was also frequently argued that it is not yet sufficiently embedded into existing sectoral procedures. In addition, cross-sectoral coordination remains one of the most important challenges.

Table 2: Overview of empirical results

		Information	Incentives	Resources
Natural and socio-economic environment	Barriers	• Complexity of the climate system (L,S,B,SGH)	• Irregular observability of climate impacts (L,SGH) • Time scales of impacts (L,SGH) • High priority of other public concerns (L,S)	• General budget constraints (L,S,B,SGH) • High priority of other public concerns (L,S,SGH)
	Opportunities		• Co-benefits with other public concerns (B)	
Actor-specific characteristics	Barriers	• Lack of individual awareness (L,SGH)	• Insufficient willingness to take responsibility (S)	
	Opportunities	• High individual awareness (L,B,SGH), e.g. due to personal contact to scientists (B) or NGO background (L)	• High personal priority of adaptation (L,B), e.g. due to NGO background (L)	
Institutional environment	Barriers	• Lack of institutionalized information exchange at the city level (L,S) • Lack of guidance from national organizations (L,S) • Lack of institutional memory (L,S)	• Market-oriented national governance approach (S) • Overall lacking political mandate for adaptation assigned by higher administrative levels (S,SGH) • Insufficient diffusion and enforcement of adaptation-oriented norms (SGH) • Lacking coordination between urban and rural areas (L,S) • Organizational routines within administration (L,S,SGH)	• Market-oriented national governance approach (S) • Poorly developed fiscal federalism (S) • Overlapping and competing competencies of different governance levels (L,S) • Insufficient institutional embeddedness of adaptation needs (L,S,SGH) • Coordination by environmental department (L)
	Opportunities	• Departments and committees dedicated to information exchange at the city level (B,SGH) • Information provision by State authorities (B,SGH)	• Initial steps to require adaptation legally, e.g. national law on climate strategies (L) and German Building Code (B,SGH) • Financial assistance programs contingent on adoption of climate policies (L,S,B,SGH)	• Well-renown coordinating unit established (B) • Financial support from development cooperation (L) and European funds (B) • Participation of science (L) and business sectors (B)
Legend: L – Lima, S – Santiago, B – Berlin, SGH - Sangerhausen				

- With regard to multi-level governance, we have found that national and state-level guidance (to improve information), mandate and regulation (to set appropriate incentives) and financial support (to overcome resource constraints) are often essential for urban adaptation planning.
- Participation is gradually gaining importance in all cities and may help to overcome restrictions regarding information and resources. Experience shows that some initial steps have been taken in this context, e.g. via the collaboration with science and NGOs, but that a permanent and institutionalized participation of the civil society is still pending.
- Finally, existing bureaucratic routines and procedures have been found to be an important barrier.

Third, our analysis also confirms that there are several barriers and opportunities, which distinguish adaptation planning from other decision-making problems:

- The complexity of the natural environment (including the climate and environmental system) brings about large uncertainties regarding the local impacts of climate change. Objectives are hard to specify – and the effectiveness of adaptation measures to address these objectives is difficult to measure. This difficulty clearly impairs the incentives to invest in adaptation planning.
- There is a clear mismatch between the long time horizons of climate change impacts and the effects of adaptation measures (characteristic of the natural environment) on the one hand and the rather short-term, election-driven time horizons for municipal decision-making on adaptation planning (characteristics of the institutions) on the other hand. This mismatch causes another important barrier to effective adaptation planning: the incentives for urban planners to act are often limited as the costs of adaptation planning tend to arise in the short term while benefits often only materialize in the long run.
- Adaptation is a crosscutting planning issue. This implies that co-benefits and co-costs with other political objectives are decisive for urban planners' incentives to act and the availability of resources.

Fourth, we would argue that some of the barriers and opportunities we identified are specific to decision-making problems at the local level as compared to adaptation planning at the regional or national level:

- Local decisions on adaptation planning are framed by the institutional environment of higher administrative levels. In this context, an explicit national mandate to adopt local

adaptation strategies and the transfer of resources to develop these strategies may enhance opportunities for adaptation planning in municipalities substantially.

- Cities are also vulnerable to climate impacts occurring in their hinterland, e.g. concerning water supply. Institutionally, adaptation to such impacts is beyond the scope of municipal adaptation planning. Thus, there may be spatial mismatch between the natural and institutional environment. A proper governance framework would require coordination mechanisms between urban and rural areas. The absence or difficulty to set up such mechanisms can be regarded as another important barrier to effective adaptation planning at the local level.

Annex: Overview of Interviews

City	Interviewee	Index	Date
Lima	Employee of a Ministry	L01	19 October 2011
	Employee of a Ministry	L02	19 October 2011
	Employee of a Ministry	L03	20 October 2011
	Employee of a Ministry	L04	20 October 2011
	Employee of a Ministry	L05	20 October 2011
	Employee of the Administration	L06	20 October 2011
	Scientist	L07	24 October 2011
	Scientist	L08	21 October 2011
	Member of a NGO	L09	17 October 2011
	Member of a NGO	L10	21 October 2011
	Member of an international NGO	L11	24 October 2011
Santiago	Employee of a Ministry	S01	18 January 2012
	Employee of a Ministry	S02	24 January 2012
	Employee of a Ministry	S03	27 January 2012
	Employee of a Ministry	S04	27 January 2012
	Employee of the Administration	S05	23 January 2012
	Scientist	S06	18 January 2012
	Member of a NGO	S07	24 January 2012
Berlin	Employee of the Administration	B01	25 January 2012
	Employee of the Administration	B02	3 February 2012
	Employee of the Administration	B03	3 February 2012
	Employee of the Administration	B04	23 February 2012
	Employee of the Administration	B05	24 February 2012
Sangerhausen	Employee of the Administration	SGH01	20 April 2011
	Employee of the Administration	SGH02	20 April 2011
	Employee of the Administration	SGH03	26 April 2011
	Employee of the Administration	SGH04	26 April 2011
	Employee of the Administration	SGH05	26 April 2011
	Employee of the Administration	SGH06	12 May 2011
	Employee of a Ministry	SGH07	12 May 2011
	Employee of a Ministry	SGH08	12 May 2011
	Employee of a Ministry	SGH09	12 May 2011
	Employee of a Ministry	SGH10	12 May 2011
	Employee of a Ministry	SGH11	12 May 2011

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