

# Analyzing Urban Adaptation Strategies to Climate Change: A Comparison of the Coastal Cities of Dhaka, Lagos and Hamburg

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## *Abstract*

*In research on climate change and urban studies mega-cities are commonly referred to as actors prone to the risks of climate change. They have also an increased responsibility for developing policies for the reduction of greenhouse gas (GHG) emissions (mitigation). Comprehensive studies about the political role of cities towards adaptation to climate change are rare. Mega-cities are referred to as problem causers and problem solvers. On the one hand, cities are highly affected by and therefore vulnerable to the impacts of climate change. Mega-cities in delta and coastal regions are especially prone to sea-level rise or extreme weather events. While cities increasingly engage in mitigation activities to reduce GHG emissions, urban awareness of the necessity to develop and implement adaptation strategies and measures emerge slowly. The engagement of cities in adaptation varies in the degree to which strategies and measures are developed and implemented: Some particularly European cities display a distinct problem awareness, develop and implement long-term adaptation strategies and voluntarily engage in transnational collective governance arrangements; other cities, predominantly in the developing world, possess a weak problem awareness, develop and implement short-term adaptation strategies, and have only started to engage in collective governance arrangements. This paper applies a participatory approach and assumes that certain socio-political conditions within mega-cities – namely local values, social learning and modes of governance – influence urban behavioral modifications towards adaptation activities. The empirical section focuses on adaptation in the two mega-cities of Dhaka and Lagos. It confronts empirical findings with measures in the city of Hamburg – a city which does not correspond to the type of a mega-city.*

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### **1) Introduction**

Increasing urbanization has stimulated the rise of mega-cities with ten or more million inhabitants. Most of these cities are located in developing countries. This paper highlights the potential effects of climate change on mega-cities and on big cities which do not correspond to the type of a mega-city and it explores options for urban adaptation. Mega-cities have commonly been identified as contributors to global anthropogenic greenhouse gas (GHG) emissions. Cities occupy two percent of the world's land mass and contribute more than two-thirds of global GHG emissions. But cities should not only be blamed for their role as problem causers. They can also contribute substantially to problem-solving. The analysis of mega-cities as key areas of research in climate change makes it necessary to accept their

Janus-faced character: On the one hand, cities contribute more than two-thirds of the world's global GHG emissions; on the other hand, cities are especially vulnerable to the impacts of climate change. For example, cities which are located in delta areas are vulnerable to natural disasters such as flooding which can result from sea level rise or extreme weather events. The impacts of climate change which unfold on the level of cities and city regions require developing new policies for urban governance and management issues (The World Bank 2009: XIV). City governments and their communities are particularly responsible for responding to the impacts of climate change. The research focuses predominantly on the engagement of cities in activities for the mitigation of climate change. But the reduction of GHG emissions is only one among the important tasks which cities will be confronted with over the next decades. Natural disasters which will result from, or which will be facilitated by, climate change can undermine or destroy the achievements made by development aid policies or local policies for urban development during the last decades. Therefore, cities need to take stronger efforts which focus on the adaptation to climate change.

Current adaptation activities of cities extremely vary in the degree to which strategies and measures are developed and implemented: Some European cities realize the need to develop and implement long-term policy measures, and collectively share best practice on the international level. Other cities outside Europe (many of them are located in the developing world) have just begun to form an awareness of the need to adapt to climate change. In most cases, measures of these cities focus on short-term projects and on unilateral ad-hoc adaptation strategies. This empirical observation needs further investigation. Comprehensive studies about the political role of mega-cities towards the adaptation to climate change are rare. Most of the research focuses on urban mitigation activities and treats cities either as problem causers or problem solvers (Satterswaite 2008; Revi 2008).

This paper aims to reduce this gap. It analyzes behavioral differences in urban climate change adaptation activities and identifies the conditions under which mega-cities or other big cities are likely to develop and implement policies for the adaptation to climate change. Such policies will have to concentrate on a broad variety of possible effects. The following analysis will explore urban policies which aim to adapt to impacts of climate change such as sea-level rise, flooding or extreme weather events that occur in mega-cities of coastal areas. The analysis will focus on social factors and disregard other approaches emphasizing the availability of financial and technical resources or institutional aspects as possible factors for the development and implementation of adaptation strategies. It will be argued, that the existence and use of social institutions, values, participation and social learning in a mega-city

is a crucial factor for the development and implementation of adaptation policies. These social institutions and capabilities make it possible to integrate key social actors in business, government and civil society in social learning processes and contribute to develop and implement adaptation strategies to climate change - for instance through systematic coordination activities, disaster management, and sustainable economic development.

In the following, the paper takes several steps. In section 2, we highlight the rise of mega-cities and conceptualize cities as political actors. In section 3, the impacts of climate change on, and vulnerability of, coastal cities will be described. Section 4 differentiates behavioural options which cities have at their disposal for adaptation to climate change. Section 5 is aware of the complex processes which influence the development of mega-cities. We admit that we can take these complex processes only to limited extent into account. The section offers an analytical framework for further empirical comparison with regard to the impact of social institutions and capabilities factors on the development and implementation of adaptation strategies in different mega-cities. It introduces hypotheses and causal factors which are likely to influence urban adaptation activities. The empirical examination in sections 6-8 explores the explanatory value of the analytical framework by comparing social processes and adaptation measures in the mega-cities Dhaka (Asia) and Lagos (Africa) with developments in the city of Hamburg (Europe) – a city which does not correspond to the type of a mega-city.

## **2) The Rise of Mega-cities**

By 2030, two-thirds of the world's population will live in cities or urban areas. The growing global demand for cheap labour has induced migration from rural areas to the coastal provinces (Van der Ploeg and Poelhekke 2008). The emergence of cities located in coastal areas is partly government planned as in the case of China (Au and Henderson 2006). This trend of increased urbanization strengthens the development of mega-cities. This particular type of city or urban agglomerate has at least 10 million or more inhabitants. In many cases, mega-cities are highly vulnerable to climate change due to their geographical location as coastal cities or because of their fundamental lack of social or sanitary infrastructure. The majority of mega-cities is located in developing countries which are especially sensitive for the impacts of climate change: 'Low- and middle-income nations now have three-quarters of the world's urban population. They also have most of the urban population at greatest risk from the increased intensity and/or frequency of storms, flooding, landslides and heat waves that climate change is bringing or will bring' (Satterswaite 2008: 3). The cities which are most

vulnerable to climate change are located in the Middle East, Northern and sub-Saharan Africa, Asia, the Pacific region, Latin America and the Caribbean (Carius et al. 2008: 34f). Global climate change can be a threat to many mega-cities. It has stimulated several local and international initiatives to combat the adverse effects of climate change such as the C40 Initiative representing the 40 most important cities in the world. Cities such as Toronto or Los Angeles are important actors in climate change policy (Schröder and Bulkeley 2008). The coalition of major cities has begun to influence global negotiations for the development of a new GHG-Protocol which shall replace the Kyoto Protocol of 1997. All in all, cities consume 75 per cent of the world's energy. They are responsible for 80 per cent of carbon dioxide emissions.

Mega-cities are commonly referred to as important causers of the problem as well as actors which can significantly contribute to problem-solving. Mega-cities are political spaces which can be determined by severe social, political and ethnic conflicts. But mega-cities also owe human capital and potentials which can make significant contributions to sustainable development, urban planning, and ecological or economic development (Kraas and Nitschke 2006: 20-21). Mega-cities can be understood as key players in the debate on climate change (Satterswaite 2008: 3). They are important geographical, social and political entities for the development and implementation of strategies for mitigation and adaptation (Cities Alliance 2008; United Cities and Local Governments 2007), through, for instance, strategies focussing on investments in infrastructure and 'urban management strategies' (Revi 2008). Urbanization must not only be seen as a disadvantage. It can offer new opportunities for economic and social development. Agglomeration can attract firms and workers and thus lead to the evolution of larger and better functioning local and regional markets. In some respects, urbanization can partly increase the individual wealth of many people. But it is also accompanied by many negative social side-effects involving the evolution of slums, hunger, poverty, lacking access to education or health care, political chaos and lawlessness which determine living conditions of a large portion of the population in mega-cities, especially in developing countries. The benefits of mega-cities depend on dedicated governments (Van der Ploeg and Poelhekke 2008: 15) because corruption, political strife, and instability make all policies, including adaptation measures to climate change, difficult to develop.<sup>1</sup> In extremely large cities of over 10 million inhabitants the high population density often results in infrastructure, labour and housing markets problems if urban governance fails to keep up with

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<sup>1</sup> This finding relates not only to cities from developing countries. Research on the political culture in Polish cities has shown, that politicians are often perceived as corrupt and uninterested in the common good and political practice is perceived in terms of pushing some shady group interests as represented by competing cliques (Swianiewicz 2006: 254).

urban migration to these cities. Especially in the developing world, climate change impacts and natural disasters facilitate these problems.

### *Conceptualizing Mega-Cities*

The analysis of factors influencing the adaptation of mega-cities to climate change makes it necessary to combine approaches to urban research and urban sociology with a participatory approach that emphasizes the role of local values, social learning and modes of governance. Urban research analyses the complex growth dynamics of 'world cities' and the internal and external relations of various city-regions (Friedmann and Wolff 1982). The emergence of 'world cities' is closely linked to economic interdependencies in the globalized world. The evolution of world cities is not a completely new phenomenon. Ancient Athens and Rome have both been centers of major social, economic, political and cultural dynamics. Some of these urban dynamics in ancient times also determine the world cities in the modern world. But mega-cities in the modern world differ in many respects from historical precursors. Modern mega-cities are many times larger than major cities of the past. They are the result of a global trend of urbanization. In addition, the conceptualization of mega-cities has to take into account sociological and urban research referring to cities as transnational actors which build networks and cut across national structures in order to promote and protect their own interests.

From this perspective, 'world cities' are tightly interconnected with each other through the activities of urban social networks, through decision-making and finance and they constitute a worldwide system of control over production and market expansion. Accordingly, the character of economic, social, and spatial urbanizing processes defines life in cities and simultaneously reflects the mode of their integration in the world economy (Friedman and Wolff 1982: 58). Similarly, focussing on the political economy of cities from a sociological perspective, Saskia Sassen proposes a triumvirate of leading 'global cities' (London, New York, and Tokyo) (Sassen 2000), which have changed their transnational and international roles and hold a key position in a new geography of centrality. These cities have key command and control functions in the operations of the world economy (Sassen 1998). As centres of multinational corporations, global cities constitute advanced services and information-processing activities, and are characterized by deeply segmented social spaces with great varieties of poverty and wealth. Accordingly, cities play an influential role in globalization and decentralisation processes, sometimes even independently of nation states.

Urban studies pointed out the special role of national and local actors as well as institutions in mediating, contesting, and shaping the particular products of economic changes in particular cities (Knox and Taylor 1995; Eade 1997). However, all former approaches seem to conceptualize cities as distinct units of analysis which subsume and reflect broader economic, societal or political processes. Relating to findings in urban sociology we intend to open the ‘black box’ of cities by looking for social institutions, values, participation and social learning processes as factors which are influencing urban governance *within* cities. According to Martina Löw and Helmuth Berking, cities are independent spheres of social, political, and cultural life. The authors introduce an analytical perspective that underlines the ‘own logic of the cities’ (Berking and Löw 2008) which allows for analyzing processes within cities such as lifestyles or the emergence of slums as distinctive ways of urban living. In this regard, the authors rightly criticize the reductive way cities are sometimes referred to as something different, for instance reflecting societal subsystems and prevailing conflicts of greater societies, laboratories of modernity or results of capitalism. Looking for processes *within* cities we find mega-cities experiencing increased economic stress and cultural alienation with the global economy producing benefits for the urban elites, whereas most citizens face rapidly deteriorating urban environments, social living-conditions and exclusion from political participation (Badshah and Perlman 2002: 549).

Our puzzle focuses on the impact of various social factors on the capability of mega-cities to adapt to climate change. It is assumed that variation in the degree to which mega-cities are capable to adapt to climate change depends on social institutions, values, participation and social learning. Following a diversified approach that looks for social learning processes and urban governance *within* cities predisposing adaptation to climate change, we aim to develop a deeper understanding of the (partly informal) dynamics in mega-cities and their impacts on adaptation to climate change. In doing so, we explicitly neglect a purely rationalist driven argument as put forward in city planning research arguing that ‘in the long run, it is the demand-side that forge the shape of cities’ (Skaburskis 2006: 233) and that only the marketplace decides which ideas and solutions in city planning succeed (Rybczynski 2009: 95). More useful to our study are results from research on US-American cities linking regulatory efforts from local government to urban growth dynamics. As Edward Glaeser, Joseph Gyourko and Raven Saks show, the growth of some US cities reflects their pro-growth regulatory environments whereas the more limited growth in for instance coastal California since 1970 represents an increasingly restrictive regulatory environment (Glaeser et al. 2005). Additionally, Glaeser points out the influence of civil society actors: ‘Starting in the 1960s,

neighbourhood groups and environmental activists have been increasingly able to raise hurdles for new (city) development. Environmental impact reviews and large minimum lot sizes make it harder to build' (Glaeser 2009: 29).

### **3) Climate Change Impacts on Coastal Cities**

The United Nations' Intergovernmental Panel on Climate Change (IPCC) demonstrates in the Fourth Assessment Report of 2007 that, as global temperatures rise, several effects could be more frequent, such as extreme weather events and droughts, rapid sea level rise, breakdown of the marine food chain and worst of all, feedback effects like large releases of methane from thawing permafrost, or large scale dieback of forests. According to Working Group II, examples of natural systems badly affected by climate change have been observed at varying levels of confidence and 'observational evidence from all continents and most oceans shows that many natural systems are being affected by regional climate changes, particularly temperature increases' (WGII 2007a: 8). According to the Climate Change Working Group of the UNEP Finance Initiative (CCWG), the impacts of climate change cause huge economic costs and are worse in developing countries, where capacities to manage disasters are lower (CCWG 2006: 3). Many places are threatened by flooding and heavily populated coastal cities are particularly endangered. With focus on coastal systems and low-lying areas Working Group II reports that coasts are projected to be exposed to increasing risks, including coastal erosion, due to climate change and sea-level rise (WGII 2007a: 12). Coastal areas, especially heavily-populated mega delta regions in South, East and South-East Asia, will be especially affected by increased flooding from the sea and, in some mega deltas, flooding from rivers (WGII 2007a: 13). The effect will be exacerbated by increasing human-induced pressures on coastal areas. Coastal wetlands including salt marshes and mangroves are projected to be negatively affected by sea-level rise especially where they are constrained on their landward side, or starved of sediment. Densely-populated and low-lying areas where adaptive capacity is relatively low, and which already face other challenges such as tropical storms or local coastal subsidence, are especially endangered. Adaptation for coasts will be more challenging in developing countries than in developed countries, due to constraints on adaptive capacity' (WG II 2007: 12).

Mega-cities are highly vulnerable to the impacts of climate change – especially, if they are located in developing countries. Natural disasters that result from, or which are facilitated by, climate change can undermine decades of growth in urban regions through a single catastrophic event. Low-lying cities situated near major rivers, deltas and estuaries are



especially vulnerable to sea level rise (Stern 2006). As shown by Montreux and Barnett analyzing Funafuti – the main island of Tuvalu – floods badly impact the living conditions of local communities which are forced to migrate in response to climate change (Mortreux and Barnett 2009). Several anticipated climate-related changes can affect cities in coastal areas: i) an accelerated sea level rise of up to 60 cm or more by 2100, ii) a further rise in sea surface temperatures by up to 3°C, iii) an intensification of tropical cyclones, iv) larger extreme waves and storm surges, v) changes in precipitation and run-off, and vi) ocean acidification (IPCC 2007). These effects will be intensified by increasing human-induced pressure on coastal regions. Population densities in coastal areas are about three times higher than the global average and have a special impact on land-use and hydrological changes (Small and Nicholls 2003). Densely populated deltas and low-lying coastal urban areas are key societal hotspots of coastal vulnerability, occurring where the stresses on natural systems coincide with low human adaptive capacity and high exposure. Within this paper, we focus on three coastal cities differing not only in their vulnerability to global climate change but also in their adaptive capacities.

#### **4) Cities' Options to Adapt to Climate Change**

Adaptation activities can be anticipatory or reactive, planned or spontaneously and are commonly referred to as 'adjustments in ecological-socio-economic systems in response to actual or expected climatic stimuli, their effects or impacts' (Smit et al. 2000: 225). Early approaches to adaptation took a top-down perspective, moving from global climate model scenarios to sectoral impact studies and then to assessments of adaptation options (Van Aalst et al. 2008: 165). Currently, the focus lies on people's vulnerability, livelihood, coping and adaptive capacity and seeks to foster participatory local adaptation to climate change: 'Adaptation at the community level means being able to maintain (and preferably improve) the current living standards in the face of expected changes in climate trends and the intensity and frequency of severe events that may affect people's livelihoods. It is important to investigate the strength of people's current resilience and capacity to adapt. Such capacities typically involve a range of coping measures such as access to extended networks of mutual assistance and other forms of social capital, cropping adaptations informed by local knowledge of climate indicators, adjustments to expected slow-onset floods, drought preparedness in semi-arid areas (Van Aalst et al. 2008: 170)'.

Several general and city-specific criteria have been developed that cities have at their disposal to adapt to climate change. The Working Group II to the Fourth Assessment Report

of the Intergovernmental Panel on Climate Change (IPCC FAR) in the ‘Summary for Policymakers’ (WGII 2007a) and the ‘Technical Summary’ (WGII 2007b) can be used as a starting-point for analysing urban adaptation strategies. The IPCC FAR identifies behavioral options for adapting to increased rainfall and flooding for vulnerable sectors such as food, fibre and forestry. Measures for the protection of crops suggested by the IPCC include the creation of polders, to improve drainage, to adjust plantation and harvesting schedules and to float agricultural systems. In a social dimension, public utility infrastructure and services should be improved. The IPCC further underlines the importance to implement protection measures for water resources including flood forecasting and warning. It also highlights the need of regulation through planning legislation and zoning. Moreover, insurance should be promoted and vulnerable assets should be relocated. Relating to human health, structural and non-structural measures should be implemented such as early-warning systems, disaster preparedness planning, and effective post-event emergency relief. With a focus on industry, settlement and society flood protection infrastructure should be improved by flood-proof buildings and a change of land use in high-risk areas by managed realignment. Moreover, flood hazard mapping and flood warnings should be implemented and community institutions have to be empowered.

With a special focus on cities, another approach dealing with adaptation strategies and measures was released in 2009 by the World Bank that introduced a primer<sup>2</sup> on reducing vulnerabilities to disasters called ‘Climate Resilient Cities’ (The World Bank 2009). This primer intends to guide local governments in the East Asia Region ‘to better understand the concepts and consequences of climate change, how climate change consequences contribute to urban vulnerabilities, and what is being done by city governments in East Asia and around the world to actively engage in learning, capacity building, and capital investment programs for building sustainable and resilient communities’ (The World Bank 2009: XIV). As a key task for urban governance, the adaptation to climate change requires the consideration of disaster risks management and the climate change agenda as essential components of urban development in the management of urban areas, their growth and spatial planning. Next to the activities of the IPCC and the World Bank, cities behavioral options also comprise city-city cooperation in transnational initiatives such as the C40 initiative or the Clinton Climate Initiative (CCI). City-city interactions can facilitate best practise sharing, can be used to gain

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<sup>2</sup> The primer is the outcome of a ‘Green Cities’ technical assistance project led by the World Bank’s East Asia and the Pacific Region Sustainable Development Department (EASSD), with collaboration and co-funding from the Global Facility for Disaster Reduction and Recovery (GFDRR) and the United Nations International Strategy for Disaster Reduction (UN/ISDR).

assistance and support, or can improve cooperation with other actors on the transnational level. The most important initiative, the C40, represents a cooperative effort of 40 participating and 17 affiliated leading world cities<sup>3</sup> willing to play a central role in tackling climate change. Participating cities accept the responsibility of cities for causing climate change and express their will to engage in mitigation and adaptation activities. In October 2008, the C40 agreed upon 13 Joint Actions for implementation by participating cities at the C40 Tokyo Conference on Climate Change: Adaptation Measures for Sustainable Low Carbon Cities held on 22 – 24 October 2008. For the first time large cities of the world were invited to share and discuss information on adaptation measures to climate change. The C40 Joint Actions include three important actions related to the risk of flooding by coastal cities:

- Joint Action 6<sup>4</sup> includes the promotion of flood control measures to adapt to effects of climate change,
- Joint Action 7<sup>5</sup> focuses on establishing evacuation and information delivery systems for disasters, and
- Joint Action 8<sup>6</sup> suggests climate adaptation connecting Delta cities.

## **5) Framework for Analysis - Hypotheses and Possible Causal Factors**

### *Local Values, Social Learning and Modes of Governance*

Which conditions contribute to adaptation of mega-cities to climate change? Various approaches can be used for exploring this research question. The availability of financial or technical resources or the level of economic development are one among several necessary conditions which influence the adaptation to climate change. Variances that occur with regard to the development of adaptation measures between mega-cities in developed countries or in

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<sup>3</sup> A complete list of participating and affiliated cities can be found on the C40 Website: <http://www.c40cities.org/cities/>, date accessed 29 August 2009.

<sup>4</sup> C40 Joint Action 6 suggests structural measures, such as flood defence walls and barriers, storm drains, flood resilient building design, urban drainage etc.; non-structural measures, such as not putting flood vulnerable development on flood plains, raising public awareness, flood warning system, insurance, business continuity measures etc, and information exchange and various technical exchanges, e.g. receiving and sending trainees and inspection groups, [http://www.kensetsu.metro.tokyo.jp/c40/act6\\_E/action06.html](http://www.kensetsu.metro.tokyo.jp/c40/act6_E/action06.html), date accessed 30 August 2009.

<sup>5</sup> C40 Joint Action 7 promotes enhancing the urban disaster management capability through information exchange, an information database on measures taken by cities for disaster mitigation, and public education; educational activities to raise public awareness on disaster mitigation, providing information on flood and storm surge mechanisms and impact of rising sea levels, and how to evacuate, <http://www.c40tokyo.jp/en/action07.html>, 30 August 2009.

<sup>6</sup> C40 Joint Action 8 suggests the exchange of ideas, strategies and technical solutions between cities, such as in the C40 initiative, <http://www.c40tokyo.jp/en/action08.html>, date accessed 30 August 2009.

the developing world may to a large degree result from unequal distribution of such resources. The financing of adaptation measures in developing countries which are lacking these resources is one among the many different important issues which must be resolved in negotiations about a new climate change regime between the developed world and developing countries (Roberts and Parks 2007). The allocation of financial or technical resources is an important factor. We argue, however, that resources alone are not the decisive factor that can be used for explaining behavioral differences that occur between cities. Even if there would be adequate international support and donations in terms of financial and technical resources, we cannot assume that urban adaptation would automatically work out properly because of poorly governed cities and the fact that the use of resources not always serves the common good or purpose. Therefore, applying a bottom-up perspective, we take a closer look at factors within cities which can also account for different levels of adaptation measures that occur between mega-cities.

The type of political system that exists on the city level or the mode of governance which is used for developing and implementing such measures are other crucial factors. Urban studies differentiate two ideal types of political rule and considered the role of democratic versus autocratic political rule as a possible factor that accounts for achieving effective governance solutions (Garcia 2006). In democratic rule making, effective urban governance is about the capacity to get things done in the face of complexity, conflict and social change: organizations, notably but not only urban governments, empower themselves by blending their resources, skills and purposes with others. The capacity to get things done no longer lies (if it ever did) with government power and authority in one place (Kearns and Paddison 2000: 847). Our analysis directs the focus not directly on the type of political system. We take the type of political system as a starting point for exploring the impact of socio-political factors on the level of mega-cities on adaptation measures. The analysis applies a bottom-up approach in contrast to a scenario-based top-down approach (Smit and Wandel 2006: 285) to examine policy processes *within* mega-cities facilitating adaptation to climate change.

The following framework introduces three conditions - *local values*, *social learning* and *modes of governance* – that facilitate urban climate change awareness and preparedness and thereby make adaptation strategies and measures likely to be undertaken as parts of local policy and decision-making processes. It is important to note that the analytical framework does not introduce distinctive criteria to evaluate the effectiveness of adaptation strategies. It allows, however, for systematic comparison to identify those characteristics of communities

and their environments that contribute to adaptation and what should best be done in a practical sense. In particular, our comparative analysis applies a participatory approach and focuses on a set of factors that belong to social factors as a general independent variable. The participatory approach relates to the urban social and institutional context that either facilitates or inhibits the participation of social actors.

Public awareness and debate can influence fulfilment of political goals on different levels of policy-making. Seyla Benhabib (1995 and 1997) illustrates that a modern understanding of public spheres can be distinguished from Hannah Arendt's traditional conception in two respects: *i*) it takes into account that modern political discourse is no longer primarily based on face-to-face-exchanges but on *impersonal* communication; *ii*) it is *de-bordered* in the sense that it goes beyond the territorial boundaries established by nation-states. In a de-bordering world, the 'anonymous public conversation' that characterizes the modern public sphere takes place in a de-nationalized context where communication between stakeholders performs across national boundaries, cultures, and languages. This implies that participation in public debate which unfolds in urban regions is not only limited to urban stakeholders but can also be influenced by external actors. The knowledge about the impact of climate change on coastal regions or about adaptation strategies is to a large extent generated and disseminated by transnational experts. This implies that public debate about the issue is embedded in a transnational discourse and processes of knowledge building that can affect public awareness on the level of urban areas.

More generally, the participatory approach depends on the existence and strength of social actors to articulate their needs and interests. If civil society is weak, there is little to counterbalance the strength of local government (Swianiewicz 2006). It rests on voluntary associations, consultations with urban inhabitants, and a general public acceptance and awareness of the need to adapt to climate change. However, as Hubert Heinelt and Michael Haus have shown, incompetently introduced mechanisms of participation in decision-making may jeopardise the interests of minorities since, due to the lack of capabilities or financial means, these minorities may be unable to present their opinions effectively (Heinelt and Haus 2005). The following analytical framework assumes that *local values* (public attitudes toward environmental issues), *social learning* (existence of public debate) and the use of *modes of governance* will facilitate urban awareness and preparedness toward climate change which are likely to influence behavioural modifications towards adaptation in cities (see Table 1).

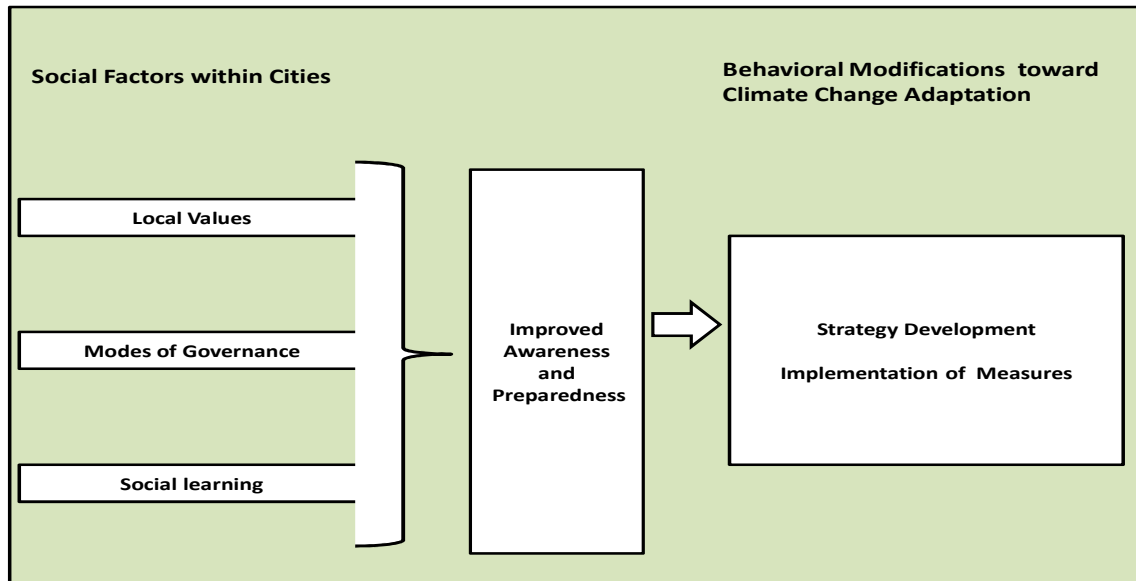


Table 1: Framework for Analysis

*Local values* comprise a general social consciousness towards environmental issues within cities. The more local values tackle environmental issues, the more likely a city engages in climate change adaptation activities. *Modes of governance* comprise different urban policy styles ranging from rather hierarchical to non-hierarchical modes. The existence of a non-hierarchical or a hierarchical governance mode can change the character of democratic or autocratic forms of political rule and thus be additional important factors which can help to explain the development and implementation of urban policies. The more a city places emphasis on non-hierarchical governance, the more likely a city engages in climate change adaptation activities. *Social learning* implies opportunities for information sharing and debate between key social actors on the local, national or transnational level. It implies the inclusion of key social actors, the modification of cognitive structures resulting in the change of behaviour. The more a city provides opportunities for social learning, the more likely a city engages in climate change adaptation activities. This participatory approach suggests that social actors (local communities, private firms, city administrations) not only have the right to be informed about the ramifications of climate change, but also are capable of generating solutions likely to work at their level (Rojas Blanco 2006: 141). In order to adequately assess urban adaptation activities, information must, therefore, be specific to regions and communities, and will need to include people's own assessments (Huq and Reid 2003: 7). This implies that the existence and participation of civil society is the breeding ground for the

evolution of each of these social factors. The evolution of a societal sphere on the domestic level has been described by political theorists as a process that involves separation of society from the state with common identities shaping new forms of societal community-building (Cohen and Arato 1992). Municipalities and authorities as well as regional and city parliaments are exposed to political demands or pressure by the societal sphere. The activities of non-governmental actors outside political institutions or their contribution to the development and implementation of policies represent different forms of social participation which can influence the success or failure of policies on the domestic or global level. In our analysis, civil society will be understood as a complex entity. The analysis of participation can not be limited to non-profit interest groups. It will also take into account the role of commercial actors (e.g., private firms) which can have a special interest in protecting their facilities against the impacts of climate change or which are very sensitive about the costs incurring in connection with adaptation measures.

Three coastal cities – the two mega-cities of Dhaka and Lagos, and Hamburg as a big European city – have been selected for assessing the explanatory value of the analytical framework. The criteria that governed the selection of these cities involve measurable attributes such as geographical location in coastal areas and varying social, political and economic conditions. In this regard, ‘vulnerability’ of mega-cities or big cities is treated as a starting rather than an end-point for analysis (O’Brien et al. 2004: 3).

## **6) Case Study: Dhaka**

Dhaka serves as an example of a coastal mega-city prone to climate change impacts. The city has started to engage in adaptation activities on the local and transnational level. As one of the rapidly urbanising mega-cities of South Asia, Dhaka has - together with its metropolitan area - a population of over 12 million inhabitants (BBS 2009: 7). The vulnerability of the city results from damaging and costly flooding, both from the rivers that bound it<sup>7</sup> and from erratic rainfall that generates runoff that is beyond the capacity of the drains. In recent history, Dhaka experienced major floods in 1954, 1955, 1970, 1974, 1980, 1987, 1988, 1998 and 2004, due to overflowing of surrounding rivers. Of these, the 1988, 1998 and 2004 floods were the most damaging in central and south western city districts (Alam and Rabbani 2007: 86). Nearly 50 percent of the city people live in low lying areas where water-logging and drainage congestion due to river floods and excessive rainfall during the monsoon cause serious

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<sup>7</sup> Dhaka is primarily surrounded by three rivers, the Buriganga on the south-west, the Turag on the north-west and the Balu on the north-east.

damage and immense social and economic effects on local communities. During recent floods, especially urban poor suffered from lack of water and food, degradation of sanitation conditions, and other serious damage (C40 Cities Climate Leadership Group 2009b: 17).

#### *Adaptation activities of Dhaka*

On the city level, as part of a large-scale structural adjustment strategy the ‘Greater Dhaka Flood Protection Project’ (GDFPP) was established in 1989 as a coordinated effort involving the Bangladesh Water Development Board, the Dhaka City Corporation, the Dhaka Water and Sewage Authority, the Rajdhani Unnaon Kartipokho, Civil Aviation Authority of Bangladesh, and Bangladesh Army. In the following decade, most city structures were constructed or improved: The western part of Dhaka, as the urbanized part of the city, became encircled by embankments and flood walls. Important components of the flood protection measures are: Approximately 30 kilometres of earthen embankment along the Tongi canal and the Turag and Buriganga rivers, approximately 37 kilometres of raised roads and floodwalls, a total of 11 regulators along the embankment at the outfall of *khals* (canals) to the surrounding rivers, one regulator and 12 sluice gates on the *khals* at the crossings with the Biswa, DIT, Pragati Sarani and Mymensingh roads and the railway line at Uttar Khan, one pumping station at the outfall of the allyanpur *khal* into the Turag River and another at the outfall of the Dholai *khal* to the Buriganga River (Alam and Rabbani 2007: 94).

Although embankments in the western part of Dhaka helped to protect more than 50 percent of the city from the floods in 1998 and 2004 and saved people and property from complete inundation, they simultaneously caused water logging and internal drainage congestion, which becomes severe during heavy rainfall. This may be due to inadequate pumping facilities and a lack of proper planning and design of infrastructure (Alam and Rabbani 2007: 94). The city’s surface drainage system is ineffective even without extreme weather events and especially ineffective during floods. Another side-effect of building measures relates to agriculture which is still the most common economic activity in Dhaka. The construction of embankments has negative effects on harvest rates because agriculture within the embankments needs annual flooding to grow. According to Chowdhury, the poorly governed problems resulting from the flood protection measures stimulated urban poor to settle in floodplains with the consequence of *bastee* formation in flood-prone areas as a reaction to the government’s structural adjustment policies (Chowdhury 2003). Most



problems in the implementation of building measures to adjust to the risk of flooding result from the absence of coordinated policy strategies such as a land use plan for Dhaka.<sup>8</sup>

Next to building measures, Dhaka also shows some engagement in adaptation activities on the transnational level. The city is a participant of the C40 initiative. In 2008, one official representative of the Dhaka City Corporation joined the C40 conference in Tokyo where adaptation measures for cities have been discussed and agreement has been reached with regard to the implementation of 13 Joint Actions<sup>9</sup> for urban adaptation to the impacts of climate change. The representative from the Dhaka City Corporation did not engage in the presentation of best practices in a conference session nor did Dhaka participate in the C40 Joint Actions as other officials from developing countries did (C40 Cities Climate Leadership Group 2009a: 4). Input from the scientific community was provided by the Bangladesh Centre for Advanced Studies (BCAS) contributing to the symposium 'The Growing Threat of Climate Change and Adaptation Measures for a Low Carbon City'. One representative highlighted Dhaka's interest and need to engage in adaptation: 'Due to global warming, temperatures in Dhaka exceed 40°C at times, and are affecting the health especially of the poor. Dhaka is therefore extremely interested in participating in the joint action' (Mallick cited in C40 Cities Climate Leadership Group 2009c: 33).

### *Modes of Governance*

Looking for the modes of governance prevailing in Dhaka, city officials<sup>10</sup> often make use of hierarchical non-inclusive steering instruments relating to a top-down policy approach towards urban governance. Therefore, Dhaka is not solely prone to flooding, but also suffers

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<sup>8</sup> Future building measures in Dhaka, especially the construction of the eastern embankment, have to be undertaken with a proper approved land use plan. Otherwise the city will further grow in an unplanned manner and proper drainage provision will be absent which in the long run will make urban life more miserable in those areas due to water logging and drainage congestion.

<sup>9</sup> For further information on the C40 Tokyo Conference see: <http://www.c40tokyo.jp/en/10.html>, 29 August 2009.

<sup>10</sup> The government of Bangladesh has divided administrative, regulatory and utility competences among different ministries, departments and agencies, with specific mandates and responsibilities. The Dhaka City Corporation (DCC), Dhaka Water and Sewerage Authority, Dhaka Electric Supply Authority, Titas Gas Limited, Bangladesh Telephone and Telegraph Board, Rajdhani Unnyan Kortripakhkha and Dhaka Electric Supply Company are responsible for providing utility services to different sectors, including the domestic, industrial and commercial sectors. Relating to adaptation, the DCC, under the Ordinance 1983, is responsible for 13 compulsory functions also obliged to carry out any activities given by the central government. The functions of the DCC are: animals; articles of food and drinks; building control, culture, development, education, public health, public safety, social welfare, streets, trees, parks, gardens and forests, urban planning, water supply and drainage, [http://www.dhakacity.org/Page/About/Link\\_1/2/List\\_id\\_1/23/Subid\\_1/43/Functions\\_of\\_DCC](http://www.dhakacity.org/Page/About/Link_1/2/List_id_1/23/Subid_1/43/Functions_of_DCC), date accessed 11 September 2009.

from deficits in urban governance. Failures in city planning, infrastructure and the city's health care system facilitate social and economic problems. Although there are more than 40 canals within Dhaka's city area that could have remarkable contribution in drainage service, the whole system is not functioning properly due to encroachment of these canals and improper management and overload of sewage (UNEP 2005: 19). This diagnosis corresponds with findings that show various governance deficits in Dhaka's urban governance system (Rahman 2002) referring to badly managed impacts of floods with negative effects on the city's water, sanitation and health systems or on local industries.

Local government also makes use of hierarchical steering managing the rapidly formal and informal city growth and urban migration dynamics. Currently, 30-50 percent of the urban populations are either homeless or inadequately housed in informal settlements due to their inability to break into the formal economic sectors of the cities to which they have migrated. Informal settlements are termed with the special indigenous word *bastees* which describes the phenomenon of expanding slums and squatter settlements in Bangladesh, parts of India and Pakistan (Rahman 2002: 270). Stimulated by unemployment in rural areas, urban migration increased and accelerated the rate of *bastee* formation<sup>11</sup> in Bangladesh after independence in 1971. Currently, Dhaka faces a growing demand for the provision of new land for *bastees* which, however, predominantly emerge in flood-prone areas. Although the National Housing Policy (NHP) of Bangladesh recognises the right of the poor to proper housing, the local government, however, fails and ignores these policy provisions.

Local government often practices forced eviction and uses hierarchical top-down regulation. The inhabitants of *bastees*, the *basteebashees*, increasingly organize and gradually become aware of their rights.<sup>12</sup> Policies have been framed and programs have been announced in the areas of urban development and housing. But hardly any of these measures have been implemented by local government (Rahman 2001: 59-60). The prevailing hierarchical steering mode implies that key social actors, especially Dhaka's urban poor, are not given the opportunity to participate in governance processes.

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<sup>11</sup> Estimating the rate of *bastee* formation in Dhaka is not an easy task because *bastees* are often mobile in character and some even disappear over time.

<sup>12</sup> The change has been taking place due to the two-pronged involvement of several NGOs and their programs. For instance, the Coalition for the Urban Poor (CUP), a coalition of NGOs working in Dhaka since 1989, is taking a stand against all *bastee* eviction (Rahman 2001: 56). The CUP is a networking organization of more than 90 (53 are general member and 37 are chapter member) NGOs, both national and international, including donor agencies working in the urban areas in Dhaka and other major cities of the country, with special emphasis on the interests of the urban poor. It organises resistance from within the threatened community, provides legal aid, and consults with and seeks assistance from professionals and community based organisations, <http://www.cupbd.org/welcome.htm>, date accessed 11 September 2009.

### *Local Values*

Due to experienced destructive floods, the Ministry of Environment and Forests, the Dhaka Water Supply and Sewage Authority and the Bangladesh Water Development Board became increasingly aware of environmental issues and carried out several measures which shall improve environmental quality and manage floods, including addressing drainage congestion. In 1988 the government of Bangladesh conceived a Flood Action Plan (FAP) to control flood damages for the whole country. To provide protection for the highly urbanized western part of Dhaka, flood protection structures were constructed to surround the Greater Dhaka City area. The urgent flood protection and drainage plan included enclosing the Greater Dhaka area with flood embankments, reinforced concrete walls and drainage, and flood regulation structures such as sluices and pumping stations. In this regard, local government shows a growing environmental consciousness.

A similar finding goes to local communities. As the analysis of 300 households in eastern Dhaka shows, the perception to hazards and environment by urban poor that settle floodplains depends in a complex manner on their socio-economic living conditions. The survey found a widespread environmental awareness among the inhabitants of the city and a general support for structural embankments. But the surveyed inhabitants also underlined the detrimental impacts of the embankments on the environment (Chowdhury 2003). However, because of local government's non-inclusive policy approach and the arbitrary measures it carries out - such as forced eviction of urban settlements to recover canals and canal banks that are informally settled - local communities are constrained to engage.

### *Social Learning*

Social learning activities in Dhaka predominantly rely on private self-regulatory activities such as flood management by transnational NGOs, private firms and community-based organizations that support urban poor with food, water, medicines, temporary shelters and relief during floods. In the 2004 flood, many individuals came forward to help flood-affected people, and NGOs have provided health and sanitation in many areas and also health services for poor pregnant women who normally do not get attention during relief operations (Alam and Rabbani 2007: 95). Moreover, community leaders (including rich people) sometimes allow urban poor to stay on their lands during floods. However, all these activities predominantly comprise ad hoc measures and rest on self-help strategies. With a special focus on climate change, there is still a need of increased systematic adaptation strategies and

measures backed by awareness and preparedness at local and community levels about the frequency, intensity and impacts of climate disasters: ‘A large number of people of Dhaka may still be unaware about the environment, how it gets polluted and why it should be protected. Slum dwellers are living in a unhygienic condition and polluting through regular activities i.e. burning of biomass, unsanitary practices etc. Lack of awareness and services have identified as major cause behind it. Many farmers in the city area use pesticides but they are not aware of the harmful effects of these in the long run and how these should be handled and applied to the fields’ (UNEP 2005: 32).

### *Evaluating Dhaka’s adaptation activities*

Although there is an increased awareness towards environmental issues in Dhaka, people lack detailed knowledge about the concrete impacts of climate change and of possible adaptation strategies and measures. Accordingly, early warning and regional information sharing about flood and disaster are necessary to improve. On the local level, drainage congestion and inadequate facilities for pumping water from inside the embankment existing flood management measures have to be qualified as inadequate to address future flooding, which is anticipated to be more frequent and intense. Therefore, the development of early warning systems in Dhaka is urgently needed, along with other measures to increase the living conditions of the urban poor.

Applying the assumptions from the participatory approach, Dhaka seems to be on its way to realize the need to take action, coordination and cooperation, but, compared to other cities, still on a low level. Flooding in Dhaka is a fact all social actors face once in every 5 to 7 years. According to the C40, measures for Dhaka’s urban poor in times of disaster are an extremely important issue, which demands stronger relief aid by the central government, local governments, hospitals, and private companies, in the form of food, medical supplies, and temporary shelters (C40 Cities Climate Leadership Group 2009b: 17-18). Moreover, stable mechanisms to ensure food, water and medicine supply for the poor during floods is needed. Economically, employment opportunities for poor people during prolonged flood are urgent. Another aspect is the requirement of active city planning to prevent people settling in vulnerable areas. In this regard, all sectors need to combine their efforts to improve vulnerable communities creating a framework for regional sharing of information on floods and disasters, ensuring stable supplies of food, water and medicine, supporting local business actors, and strengthening the governmental framework (Mallick cited in: C40 Cities Climate Leadership Group 2009b: 18).

## 7) Case Study: Lagos

Lagos is an African coastal mega-city where the variability, frequency, and intensity of extreme weather events are likely to increase.<sup>13</sup> As one of Nigeria's most vulnerable coastal lowland cities, Lagos is highly affected by sea-level rise, coastal erosion, salt water intrusion, and flooding<sup>14</sup> (Commission for Africa 2005: 51). Mainland Lagos – also known as Eko – together with its two additional main islands Ikoya and Victoria currently constitutes the mega-city with approximately 11 million inhabitants (Ernst 2008). The city is a typical example of what the UN refers to as a steady process of 'over-urbanization' because urban population growth in Lagos considerably exceeds its economic growth (UN-Habitat 2003: 106). The high population density is the result of Lagos' location on the west coast of Africa. Its geographical position has fostered the development of trade within its hinterland as well as with the neighbouring international states and of rural-urban migration which accounts for up to 75 percent of the population increase (Adelekan 2009: 6). During the rainy season between April and October, many parts of Lagos are susceptible to flooding. Major causes of floods in built-up areas are uncontrolled expansion of impermeable surfaces due to increasing urbanization resulting in increase runoff volume, runoff responses under high intensity rainfall, building on floodplains, lack of storm water drainage, failure to maintain existing drainage systems and weak institutional capacity of the urban administration (Adelekan 2009: 9).

The increased demand for land by rural migrants leads to the development of slums which are lacking basic infrastructure and are characterized by environmental pollution. Almost 70 percent of Lagos' population live in slums. The majority of slum communities are located in the oldest settled areas of mainland Lagos and especially in marshy areas and areas near the lagoons (Adelekan 2009: 6). This rapid urban growth is caused by rural poverty and urban migration: 'As people crowd into African cities, human impacts on urban land surfaces and drainage intensify' (Douglas et al. 2008: 188). Similar to Dhaka, Lagos faces the problem of urban migration from rural areas and informal settlements that locate on the shoreline and

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<sup>13</sup> More than one-quarter of Africa's population resides within 100 kilometers of a sea coast, with 12 percent of the urban population living within the land area that may be badly affected by a 10 meter sea-level rise (Douglas et al. 2008: 192).

<sup>14</sup> There are several examples of flooding in African urban areas with hundreds of dead, destroyed houses and infrastructure, and thousands of homeless people: In 2000 in Mozambique; in 2002 in Rwanda, Kenya, Burundi, Tanzania, and Uganda; in 2006 in Ethiopia (Douglas et al. 2008: 190), and, actually, in September 2009 caused by erratic rainfall in Ghana and Burkina Faso, <http://www.spiegel.de/panorama/0,1518,647275,00.html>, date accessed 07 September 2009.

former mangrove areas highly prone to flooding. Urban activities such as construction, paving, soil compaction and the removal of vegetation alter the land surface and water pathways. Originally covered with mangrove swamps, Lagos has experienced significant land cover changes due reclamation activities to secure more land for urban development. Land reclamation was achieved through filling up of swamps and floodplains, and destruction of mangroves and wetlands have generally reduced the flood storage capacity of the urban land. Rapid and largely unplanned urban growth has resulted in land use changes and subsequent changes in the hydrological fluxes in the urban watershed thereby increasing flood hazard and risk in many parts of the metropolis (Adelekan 2009: 7).

#### *Adaptation activities of Lagos*

During floods, urban settlements near to drainage canals are most vulnerable. On the local city level, the main assistance to urban poor comes from family and social networks including community members. Lagos has some potential in terms of resources and know how as the city has ‘the largest concentration of multinationals and commercial institutions and is home of to about 60 per cent of Nigeria’s non-oil economy’ (Adelekan 2009: 6). But the city fails to develop and implement a coordinated adaptation strategy: From 1998-2001, for instance, a joint project called *Reducing the impact of flooding in Lagos, Nigeria*<sup>15</sup> between the Nigerian Institute for Oceanography and Marine Research, Lagos State Ministry of Environment and Physical Planning (Department of Drainage), the United Nations Educational, Scientific and Cultural Organization (UNESCO), and the Coastal Regions and Small Islands (CSI) platform addressed the problem of flooding in Lagos. From 1998 to 1999 the project aimed to determine the causes of flooding in Lagos and the implications of tidal and sea-level changes as well as societal impact on the efficiency of drainage channels to discharge flood waters. From 2000 to 2001 the project intended to reduce the impacts of flooding on settlements through public information and awareness-raising campaigns.<sup>16</sup> In a report released in August 2000 the main drainage channels of Victoria and Ikoyi Islands in Lagos and their response to tidal and sea level changes were investigated.<sup>17</sup> The report found two factors responsible for the problems of drainage blockage and flooding: Engineering problems, whereby some of the canals have reverse flows, while the other is attitudinal, evident in the dumping of refuse in canals and other drain channels by Lagos inhabitants. The study revealed several additional problems such as clogging of the drainage channels by domestic waste and blocking of some

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<sup>15</sup> <http://www.unesco.org/csi/act/lagos/lag.htm>, date accessed 03 September 2009.

<sup>16</sup> <http://www.unesco.org/csi/act/lagos/summary22.htm>, date accessed 11 September 2009.

<sup>17</sup> <http://www.unesco.org/csi/act/lagos/drains.htm>; date accessed 05 September 2009.

channels by buildings, low gradient of the channels and variable channel width from head to outfall, collapsed drainage channel walls, reverse gradients in most channels such that when heavy rains coincide with high tides, and tidal waters flow back into the channels through the outlets causing excessive flooding. Drainage channels were identified as ineffective because they were either blocked by sand or refuse because inadequate refuse containers leading to dumping of refuse in the drainage canals by inhabitants.

Although the results from the report were submitted to the Lagos State Ministry of Environment and Physical Planning and made several recommendations including rerouting, repairing, fencing and screening of several channels, construction of new channels, increasing beach height, and a public awareness campaign to discourage dumping of solid refuse in the drainage channels (UNESCO 2001), only some steps have since been undertaken by local government to involve social actors.<sup>18</sup> Lagos increasingly addresses the issue of climate change adaptation on the transnational level. The city officially participates in the C40 initiative and attended the C40 conference 2008 in Tokyo with four official representatives from the Lagos State Ministry of Transport, the Lagos State Ministry of Environment, the Lagos State Waste Management Authority, and from the Climate Change Unit of the Lagos State Ministry of Environment (C40 Cities Climate Leadership Group 2009a). The representatives participated in some sessions and panel discussions on urban adaptation strategies (C40 Cities Climate Leadership Group 2009c). Compared to the international engagement of Dhaka, Lagos supports the C40 more actively also joining the 13 Joint Actions and engaging according to Action 6-8, whereas Dhaka shows no engagement in the C40 Joint Actions at all.

### *Modes of Governance*

Due to Lagos' prevailing modes of governance, local government fails to cope with the growing urban population in terms of labour, infrastructure, housing, economic investments, health and welfare, respectively the 'people's most minimal needs' (Tyndall Centre for Climate Change Research 2004: 13). Since flooding of communities is highly linked to

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<sup>18</sup> To stimulate the active participation of social actors a media and public forum was conducted in 2000 with more than 200 participants, including several government agencies, print media, radio and television stations. To increase public awareness some societal actors - the Nigerian Institute for Oceanography and Marine Research, UNESCO Abuja-Office, and Clean-up-Nigeria - stated activities in 2001 focusing on the proper disposal of refuse and the regular cleaning of drainage channels. Posters, handbills and pamphlets have been prepared and distributed. Street discussions near the drainage channels and discussions on radio and television have been held, <http://www.unesco.org/csi/act/lagos/forum.htm>, date accessed 11 September 2009.

infrastructures and poor management of the environment, the vulnerability of poor urban population is highly linked to poor urban management and government inability to deal adequately with the issues (Adelekan 2009: 15). A combination of official neglect and corruption, extreme poverty and rapid population growth through migration and immigration has made Lagos one of the world's fastest growing and most disturbing examples of urbanisation. The basic problem is that the influx of new inhabitants is largely uncontrolled and is completely exceeding the capacity of existing infrastructures (Tyndall Centre for Climate Change Research 2004: 13). Lagos' city administration often follows a 'management by delay policy' lacking attention to basic infrastructural needs such as waste management and the construction and maintenance of drainage channels (Douglas et al. 2008: 190-200).

Limited access to municipal waste removal services leads inhabitants frequently to use sewers as a place to dump their refuse resulting in blocked drains and diversion of natural flows. All these factors increase local runoff and facilitate higher flood frequency, magnitude and duration, which causes property damage, wreaks havoc on other infrastructure such as erosion of roads, and leads to human suffering. Moreover, local government makes use of a hierarchical policy approach and fails to involve key social actors in decision-making processes. Therefore urban poor often fear to be evicted from land sites deemed to be vulnerable to floods without any compensation and accommodation: 'This has been aptly exemplified by the demolition of Maroko, a major slum located on the Victoria Island in 1991 upon forceful eviction of the over 300,000 residents by the Lagos state government' (Adelekan 2009: 15).

### *Local Values*

Regarding local values, ActionAid undertook a 'Participatory Vulnerability Analysis' (PVA) in 2006, investigating the urban poor's experiences of climate change impacts and disaster management policies in five African cities – Accra (Ghana), Kampala (Uganda), Lagos (Nigeria), Maputo (Mozambique), and Nairobi (Kenya) (Action Aid 2006). According to ActionAid, the inhabitants of the low-lying coastal slum settlement of Iwaya/Makoko in Lagos perceive that the climate is changing and flooding is becoming more frequent. Local people are concerned about property damage and the effects on child health in an area with totally inadequate sanitation. Floodwaters can carry all sorts of organic waste into people's homes (ActionAid 2006: 4). According to ActionAid, both slum dwellers and local government in Lagos believe the constant clearance of the drainage channel running through Iwaya/Makoko would prevent the pooling of water from other parts of the city. Standard



drainage facilities along major streets within Iwaya/Makoko would help to solve the flood problem. Slum dwellers have also suggested using sand to raise the entire area to a higher level. As one interviewee stated: 'There has not been assistance from anyone. Neighbours cannot assist because everybody is poor and vulnerable. I am planning to quit this place because it is horrible living here. Government should sand fill this place' (Rotimi Zacheaus, cited in ActionAid 2006: 4).

Surveyed inhabitants also perceive the following causes of increased flooding in Lagos: The changes in the levels of high tides in the Lagos lagoon and the Atlantic Ocean affect certain streets; the indiscriminate erection of structures by residents leads to impediments to the flow of water, and the subsidence of coastal land, insufficient depth and capacity of the drainage channels to carry all the urban runoff causes overflows and bank collapse (Douglas et al. 2008: 196). Although there seems indication for a growing awareness towards environmental problems among local communities, only few inhabitants agreed that the indiscriminate dumping of wastes into the lagoon leads to the blockage of drains. According to Douglas et al. 'this reluctance to accept waste dumping as a cause suggests an unwillingness to recognize personal responsibility' (Douglas et al. 2008: 196).

### *Social Learning*

Social learning activities in Lagos predominantly take place on an individual basis. Self-help measures in local communities comprise to stay indoors, clearing blocked drainage channels, sand filling of rooms in flooded houses, move to neighbours, evacuate water with buckets etc. According to Adelekan exploring city development with particular reference to growth of slums and the impacts of climate change on inhabitants of four selected urban poor communities along the coast of Lagos (Makoko, Ilaje, Ijora-Oloye and Marine Beach-Apapa), flooding is perceived the most important problem among surveyed communities (Adelekan 2009). From a list of problems encountered in the communities, flooding was ranked as the foremost problem. Other problems mentioned are bad roads, pollution, and infestation by mosquitoes, neighbourhood insecurity, poor power supply, unemployment and prevalence of diseases (Adelekan 2009: 12). The interviewees highlighted several causes for flooding such as overpopulation of the communities, inadequate drainage system, increase in water level of lagoon, overflowing of rivers, blockage of canals due to improper waste disposal, sand filling activities in communities, neglect by government, and supernatural factors (Adelekan 2009: 13).

The most important finding relating to social learning is that only few respondents (0,8 percent) mentioned changing climatic conditions to be a contributing factor to the occurrence of floods (Adelekan 2009: 13). Moreover, only one coastal community stated that it had received some form of assistance during floods from government (10,8 percent) and religious organizations (6,5 percent), all other interviewees from the three other coastal communities had not benefitted at all from such sources (Adelekan 2009: 15). The city government, however, shows increasing engagement to open for debate more recently. In April 2009 the Lagos State government of Nigeria, through the state Ministry of the Environment organised a three-day Maiden Summit on Climate Change titled *Reclaiming the Environment: Challenges and Consequences of Climate Change*.<sup>19</sup> Experts from all across the globe converged to deliberate on the threatening impact of global warming and the way forward for Lagos. Remarkably, the Lagos commissioner for Environment, Dr. Muiz Banire, stated that the summit was aimed at raising public awareness on climate change and the danger it posed to man. Further on, the commissioner pleaded for the development of appropriate mitigation and adaptation strategies. He further stated that the situation in Lagos has been worsened in the past by poor urban governance, outdated plans and lack of long-term planning horizon.

#### *Evaluating Lagos' adaptation activities*

In the face of more frequent and intense extreme weather events Lagos needs to embark on a strategy including up-to-date real-time weather monitoring, early warning systems, and a comprehensive assessment of the impacts of climate change on city development. Lagos also has to increase its efforts of intensifying awareness about climate change to the grassroots, promoting and sustaining adaptation issues. Although Lagos has developed some policies, including indigenous knowledge and diverse livelihood support systems for coping with climate change impacts in the city, these measures still have to be improved. Adaptation in Lagos apparently suffers from a non-inclusive urban governance approach and the unwillingness of local government to engage in the provision of basic public goods such as integrated drainage systems in informal settlements, which are often regarded as being outside

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<sup>19</sup> The summit was attended by over 700 participants drawn from various stakeholder groups in both the public and private sectors, including members of the Lagos State House of Assembly, Commissioners and Special Advisers, Ambassadors, members of National Assembly, Permanent Secretaries and Directors of various Ministries in the State, Local Government Chairmen and other Local Government functionaries, traditional leaders, academia, development partners, international and national experts. Others are representatives of non-governmental organisations, World Bank, World Health Organisation (WHO), British Council, Clinton Foundation, the media, and men of the corporate world (Odueme 2009).

accepted urban regulation and planning systems (Douglas et al. 2008: 191). Lagos needs to develop a future coordinated action plan to adjust the impacts of climate change including increased partnering with non-state actors from business and civil society.

Moreover, social learning opportunities should be established to raise climate change awareness and knowledge about actions that Lagosians can take to combat the adverse impact of climate change (Odueme 2009). Local government should establish fund mechanisms for research on climate change and its impacts in order to provide required data and knowledge to drive intervention strategies. It also should increase collaborative efforts with international organisations and development partners in Nigeria such as UNDP, the World Bank, AFDB, DFID, British Council, and others to develop and implement community-based adaptation strategies and measures. In a more inclusive governance context, all relevant stakeholders should be identified and the capacities of civil society should be strengthened. In infrastructural development local government should develop and implement a master plan such as the plans of some of the coastal states in Nigeria to guarantee quality control in building infrastructures like road, drainage and bridges. A general discourse should be intensified and facilitated by the government through education and enlightenment campaigns on climate change issues.

Another initiative called AfricaAdapt<sup>20</sup> might be an opportunity for Lagos to increase building awareness through social dialogue. Established in 2009, AfricaAdapt seeks to facilitate the flow of climate change adaptation knowledge for sustainable livelihoods between researchers, policy makers, civil society organisations and communities who are vulnerable to climate variability and change across the continent. The network, funded by the UK Department for International Development and Canada's International Development Research Centre, is a collaborative effort between the UK-based Institute of Development Studies and three African research organisations – Environment and Development in the Third World, the Forum for Agricultural Research in Africa, and the Climate Prediction and Applications Centre. It focuses on Africa's most marginalised communities aiming at making them able to share their experiences of adapting to climate change thanks to a new fund that seeks to promote knowledge sharing across the continent. In June 2009, AfricaAdapt launched a *Knowledge Sharing Innovation Fund* offering grants of up to US\$10,000 to projects testing new ways of sharing knowledge, such as theatre performances and radio

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<sup>20</sup> For detailed information about AfricaAdapt and its projects see <http://www.africa-adapt.net/aa/Default.aspx>, date accessed 08 September 2009.

broadcasts. However, until now there is no engagement of Lagos in any project of AfricaAdapt.

### **8) Case Study: Hamburg**

The Free and Hanseatic City of Hamburg serves as an example of a coastal European city adapting to climate change. The city of Hamburg has 1.8 million inhabitants and its population is considerably smaller compared with the two mega-cities of Dhaka and Lagos. The German city differs significantly from the two mega-cities also in other respect. It is located in a highly developed country and one of the economically strongest cities in Germany. The metropolitan area of Hamburg is one of the most dynamic and competitive areas in Germany and Europe. Hamburg is the economic center of Northern Germany with a dynamic economy and Hamburg Harbour, a large deep-sea port for container shipping, as the major commercial and trading center of the city. Its vulnerability results from several factors: First the temperature in northern Germany is predicted to rise from about 1.5 to 3.5°C by the end of the 21<sup>st</sup> century. Consequences may be more extreme weather events like heat waves and thunder-storms in summer time and storms with intense rainfall in autumn and winter, less precipitation in summer as well as more precipitation in winter.

Due to its geographical location between North Sea and Elbe River, Hamburg is flood-prone from inland as the Elbe River carries more melt- and rainwater. The city is confronted with storm tides with enhancing water levels (about 13 to 23 cm by 2030 and 48 to 82 cm by 2085) from the North Sea in the medium term as the IPCC predicted sea level rise about 18 to 59 cm with significant higher figures for North Sea coasts (Alcamo et al. 2007). Hamburg is highly affected by the risk of flooding. However, compared to other cities in southern Germany, Hamburg's vulnerability is less drastic but nonetheless the city needs to adjust to climate risks that may badly affect society, eco systems and the local economy. Climate change impacts may also increase existing social tensions among the metropolitan area of Hamburg and the surrounding regions and concern the demands of the economy on one hand and the needs for environmental protection on the other (KLIMZUG-NORD 2009). Infrastructure and buildings are endangered by floods and storms. Moreover, climate change impacts may cause economic risks in the case of sea level rise and the expected reduction in upstream water quantities in summer time which may jeopardize Hamburg Harbour because of increasing upstream transportation of sediments with larger dredging quantities.

#### *Adaptation activities of Hamburg*

Hamburg has developed a strategy to cope with climate change impacts and initiated a flood-protection program along the Elbe River ‘to ensure the long-term safety of the population’ (Bürgerschaft der Freien und Hansestadt Hamburg 2008: 103). Local government perceives climate change as a serious challenge for urban governance relating to flood defences, water management and port planning. Moreover, the fields of agriculture and forestry, nature conservation, health, and urban planning start to deal with this issue.

In recent years, Hamburg developed and implemented a pro-active environmental policy. The city has been awarded in January 2009 by the European Commission as European Green Capital 2011. On the transnational level, Hamburg participates in the city network *Climate Alliance of European Cities* and developed a climate protection concept in 2007 committing itself to a CO<sub>2</sub> emissions reduction target of 40 percent by 2020 (versus baseline 1990). Even if Hamburg in this regard focuses on mitigation, the documents *Hamburger Klimaschutzkonzept 2007 – 2012* and *Fortschreibung 2008/2009 des Maßnahmenkatalogs zum Klimaschutzkonzept 2007-2012* include a section *Climate Consequence Management* with several adaptation measures such as precipitation and waters, urban planning and nature conservation. In 2008, Hamburg’s political decision makers increasingly addressed adaptation developing a more systematic approach compared to the first concept developed in 2006. Whereas the first version included seven specific adaptation measures, its update included three additional measures recognizing the necessity for a sophisticated overall Hamburg strategy for adaptation to climate change as ‘the predicted consequences of climate change cannot be completely mastered with the current strategies and the available manpower’ (Bürgerschaft der Freien und Hansestadt Hamburg 2008: 103).

The development of an overall strategy has begun in 2009. Through stakeholder involvement in strategy development, Hamburg intends to interlink societal plans with one another and in particular with urban planning and land use planning to avoid conflicts of interest. To gain more expertise on adaptation technologies and methods, Hamburg also participates in the *KLIMZUG-NORD*<sup>21</sup> project aiming at developing adaptation strategies for the metropolitan area of Hamburg. The project runs from 2009 until 2014 and is determined to work out some priorities and solutions for the metropolitan area within a framework up to the year 2050. Hamburg also started planning and implementing several specific adaptation measures including *precipitation and waters, nature conservation, and heat waves* focussing

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<sup>21</sup> For detailed information about the Klimzug-Nord project see <http://klimzug-nord.de/index.php/lang/en/page/2009-07-21-Targets>, date accessed 11 September 2009.

either on a short, medium or long term perspective.<sup>22</sup> Most of Hamburg's adaptation activities relate to the category of *precipitation and waters*. The city started to implement some building measures improving its public installations for flood control.<sup>23</sup> In 2006, Hamburg's earth dikes covering a distance of 103,3 km in total were improved and raised by 1 meter on average (LSBG 2007: 2-3). To gain detailed information on flooding risks, Hamburg examined the reference water levels for future flood safety e. g. taking account of storm flood scenarios with changed inputs such as broader wind fields and more changeable air pressure gradients. In order to meet the requirements of the European Commission, Hamburg started to discuss additional inland flood protection measures. The Hamburg Agency of Roads, Bridges and Waters (LSBG) currently works in the EU project Strategic Alliance for Water Management Actions (SAWA) to develop a strategy for implementation of the EC Flood Directive. On the other hand, the LSBG intends to define the location and extent of flood-prone areas.<sup>24</sup>

The development of an ecological tidal Elbe management is another important aspect of Hamburg's adaptation measures in the field of precipitation and waters. The city started specific planning of a pilot project to secure maritime ship access to Hamburg Harbour in the long-term by maintaining existing and creating new shallow-water areas in the urban region of Hamburg so that both, environment and economy, can sustain. Another field of action in Hamburg is the surface water drainage and rainwater management. Within the context of the EU project *Urban Water Cycle*, Hamburg identifies areas for possibilities of decoupling rainfall water from the sewage network. Furthermore, together with the HAMBURG WASSER competence network the LSBG is working on a new rainwater management system for Hamburg and already prepared a seepage map in this context. To increase urban awareness and knowledge about rainwater management and flood defences, Hamburg has published several information brochures, developed a travelling exhibition and organized some information events that explain general problems and give an orientation on what measures can be taken on the individual level. On the transnational level Hamburg does,

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<sup>22</sup> However, only one measure of the precipitation and waters has been implemented yet. The vast majority of Hamburg's adaptation measures are more or less in an early planning stage.

<sup>23</sup> Hamburg started working on its inner city flood prevention and adaptation of particular buildings, but these measures have not been completely finished until 2009: 2.4 km of dikes in the inner city still need to be raised and 20 of 73 buildings still need to be adapted (LSBG 2009). These building operations are Hamburg's most advanced adaptation measures and 520 million € of overall estimated 650 million € have already been spent in order to realize these improvements concerning flood control (LSBG 2009).

<sup>24</sup> This measure holds some serious conflict potential as other services and private-sector organisations in that the designated flooding areas will be subject to certain restrictions. E. g. building development within these areas will be prohibited (Bürgerschaft der Freien und Hansestadt Hamburg 2008: 104).

surprisingly, compared to Lagos and Dhaka, not engage in the C40 initiative compared to two German cities - Berlin as a C40 participating city and Heidelberg as a C40 affiliated city.<sup>25</sup> However, Hamburg engages in several European initiatives.

### *Modes of governance*

One of the most important inclusive policies of Hamburg relating to adaptation which also serves as an illustrative example of the city's non-hierarchical governance approach is KLIMZUG-NORD.<sup>26</sup> KLIMZUG NORD is a project funded by the German Federal Ministry of Education and Research (BMBF) which supports the development of innovative approaches to climate change adaptation in the 'KLIMZUG' initiative. This initiative stresses the regional aspect of climate adaptation and takes into account that the implementation of climate adaptation is to be achieved through regional networks between science, companies, administration and public agencies. KLIMZUG wants to pool the strengths of stakeholders by cooperative networks and to integrate anticipated changes in processes of regional planning and development.<sup>27</sup> The KLIMZUG-NORD project aims at strategic approaches to climate change adaptation in the Hamburg metropolitan region and seeks to develop techniques and methods for diminution of climate impacts and for the adaptation of society and economy to the increased risks from climate change, to develop strategies and concepts with which these methods can be integrated in regional planning and development processes, to present the cost, the effectiveness and the efficiency of these strategies and approaches for civil society, environment and economy, and to create a master plan of management of climate effects and change in the Hamburg metropolitan region for the period 2050. KLIMZUG-NORD focuses on three main topics – estuary river management, integrated urban development, and sustainable cultivated environment – and is a cooperative effort of six universities, six research institutes, 11 agencies and authorities, close facilities as well as 10 companies from the metropolitan region of Hamburg.<sup>28</sup>

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<sup>25</sup> <http://www.c40cities.org/cities/>, date accessed 13 September 2009.

<sup>26</sup> <http://klimzug-nord.de/index.php/lang/en/page/2009-07-21-Targets>, date accessed 13 September 2009.

<sup>27</sup> <http://www.klimzug.de/en/160.php>, date accessed 13 September 2009.

<sup>28</sup> The KLIMZUG-NORD partnering organizations are: Technische Universität Hamburg-Harburg, Universität Hamburg, HafenCity Universität Hamburg, Hochschule für Angewandte Wissenschaften Hamburg, Leuphana Universität Lüneburg, Fachhochschule Lübeck, Max-Planck-Institut für Meteorologie Hamburg, GKSS Forschungszentrum, Hamburgisches WeltWirtschaftsinstitut (HWWI), Forschungszentrum Jülich, LIAG Hannover, ECOLOG Hannover, Bundesanstalt für Wasserbau Hamburg, Deutscher Wetterdienst, Landwirtschaftskammer Niedersachsen, Landesbetrieb für Küstenschutz, Nationalpark und Meeresschutz (LKN) Husum, Niedersächsischer Landesbetrieb für Wasser, Küsten- und Naturschutz Lüneburg, BSU Hamburg, Landesbetrieb Straßen, Brücken und

### *Local Values*

According to Kempe, Hamburg has a long and formative history of flooding: ‘After the terrible storm surge in February 1962 when 315 people had lost their lives, the commemorative speech of the mayor of Hamburg, Nevermann, made at the funeral ceremony became an important media event. In his address Nevermann spoke of a ‘higher power’ and an ‘unpredictable natural disaster’. On the one hand he mourned the loss of an original relation between man and nature through alienation caused by technical progress and the march of civilization. On the other hand he promised the development of more effective and advanced techniques to cope with future floods’ (Kempe 2007: 350). Water has given Hamburg wealth and glory and, at the same time, had brought danger and misfortune, as its mayor Hennig Voscherau pointed out in his speech at the public memorial ceremony in February 1992, remembering the flood of 1962. The same argument is put forward by the current mayor of Hamburg, Ole von Beust. This indicates that the remembrance of the flood of 1962 plays a crucial and decisive role for the identity of the city state of Hamburg (Kempe 2007: 351). According to Gandy, the level of recycling for household waste is significantly higher in Hamburg compared to London: ‘The higher level of recycling in Hamburg can be accounted for by three main factors: a higher density of recycling facilities combined with the use of more sophisticated collection systems such as a dual-bin service for putrescible wastes; a unified administrative structure for waste management under direct control of an elected regional government; and finally, a system of proportional representation in local government allowing environmentalist political demands to be directly translated into public policy’ (Gandy 1994: 481). A current indication for a general consciousness towards environmental issues in Hamburg is the fact that, according to data from the Auto Club Europa (ACP), customers from Hamburg show the highest environmental awareness in their buying behaviour of new cars compared to other Federal States in Germany.<sup>29</sup>

### *Social Learning*

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Gewässer Hamburg, Biosphärenreservatsverwaltung Niedersächsische Elbtalau, Bundesanstalt für Geowissenschaften und Rohstoffe Hannover, Landesamt für Bergbau, Energie und Geologie Hannover, SCHUBZ Umweltbildungszentrum Lüneburg, AQUA-STOP, TuTech Innovation, Hamburger Stadtentwässerung, IBA Hamburg, TÜV Nord, HPA Hamburg, Hamburger Feuerkasse, Elastogran, Brunsbüttel Ports, VHS Region Lüneburg, Hiss Reet.

<sup>29</sup> <http://www.inar.de/blog/vermishtes/20090821/umweltbewusstsein-von-neuwagenkaeufern-uneinheitlich.html>, date accessed 11 September 2009.



Hamburg offers several learning opportunities and institutionalizes social dialogues such as the initiative *Hamburg lernt Nachhaltigkeit* (HLN)<sup>30</sup> aiming at social learning in the field of sustainability. Initiated in May 2005 by the Hamburg Senate, the HLN is a cooperative effort of administration agencies, NGOs, unions, and individuals interested in sustainability education services. As the first Federal State in Germany, Hamburg annually publishes an Action Plan (Hamburger Aktionsplan (HHAP)) to realize the goals of the HLN and to support the UN decade *Education for Sustainable Development (ESD)*. The flood of 1962 has been a traumatic event which fostered the evolution of strong beliefs on the part of policymakers and the local public that the city should take the necessary steps required to prevent such flood disasters in the future.<sup>31</sup>

### *Evaluating Hamburg's adaptation activities*

Hamburg's prior adaptation focus lies on precipitation and waters. Hamburg has and is still developing a comprehensive urban adaptation strategy away from selective ad-hoc measures. However, their strategy lacks some aspects such as the already experienced increase of heat periods in summer time. Another area is the protection from storms and the protection of high buildings with improved entrenchments (Germanwatch 2007: 6-7). Even though adaptation strategy development has just begun, it is noteworthy that Hamburg has developed a comprehensive approach focusing on adaptation activities on the mid and long term. Strategy development follows an inclusive policy approach between local government and various key social actors such as scientific organisations, private firms, and local NGOs.

## **9) Conclusions**

What lessons can be learned from the empirical case studies? As the preliminary findings suggest, there is a need for a certain degree of awareness and preparedness of climate change impacts causing or facilitating natural disasters in administrative agencies as well as in local communities. The awareness and preparedness of relevant social actors within cities facilitates urban adaptation. However, social conditions differ between the cities analyzed. Whereas Hamburg offers facilitating conditions for participation and social learning, Dhaka and Lagos include restricting conditions, because of a lack of committed government agencies, governance gaps in urban planning and implementation and a lack of learning opportunities for the urban poor. One important constraint faced by the two mega-cities of

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<sup>30</sup> <http://www.hamburg.de/nachhaltigkeittlernen/1351454/weltdekade.html>, date accessed 12 September 2009.

<sup>31</sup> See also Der Spiegel, 16 February 2005.

Dhaka and Lagos is a lack of civil organization and collective will-formation and public competition among interest groups which could raise public attention for the problem and politicize the issue of adaptation measures on political agendas. It became obvious that local and transnational societal and economic actors are very important for stimulating public debate about adaptation and implementation. .

## References

*Action Aid* 2006: Climate Change, Urban Flooding and the Rights of the Urban Poor in Africa. Key Findings from Six African Cities, London.

*Adelekan, Ibidun O.* 2009: Vulnerability of Poor Urban Coastal Communities to Climate Change in Lagos, Nigeria, Paper presented at the Fifth Urban Research Symposium 2009, Marseille, <http://www.urs2009.net/docs/papers/Adelekan.pdf>.

*Alcamo, Joseph/Moreno, José /Nováky, Béla/Bindi, Marco/Corobov, Roman/Devoy, Robert/Giannakopoulos, Christos/Martin, Eric/ Olesen, Jorgen, Shvidenko, Anatoly* 2007: Europe. Climate Change 2007: Impacts, Adaptation and Vulnerability, Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson (Hrsg.) Cambridge: Cambridge University Press, 541-580.

*Alam, Mozaharul/Rabbani Golam* 2007: Vulnerabilities and Responses to Climate Change for Dhaka, in: *Environment and Urbanization* 19: 1, 81-97.

*Au, Chun-Chung/Henderson, Vernon* 2006: How Migration Restrictions Limit Agglomeration and Productivity in China, in: *Journal of Development Economics*, 80: 2, 350-388.

*Badshah, Aklhtar A./Perlman, Janice E.* 2002: Mega-cities and the Urban Future: A Model for Replicating Best Practices, in: *Bridge, Gary/Watson, Sophie* (Hrsg.): *The Blackwell City Reader*, Blackwell Publishing: Oxford, 549-559.

*Bangladesh Bureau of Statistics Planning Division, Ministry of Planning Government of the People's Republic of Bangladesh (BBS)* 2009: Statistical Pocket Book of Bangladesh 2008, [http://www.bbs.gov.bd/dataindex/pby/pk\\_book\\_08.pdf](http://www.bbs.gov.bd/dataindex/pby/pk_book_08.pdf).

*Benhabib, Seyla* 1995: Modelle des öffentlichen Raums, Hannah Arendt, die liberale Tradition und Jürgen Habermas, in *Benhabib, Seyla: Selbst im Kontext: Kommunikative Ethik im Spannungsfeld von Feminismus, Kommunitarismus und Postmoderne*, Frankfurt a. M., 96-130.

*Benhabib, Seyla* 1997: Die gefährdete Öffentlichkeit, in *Transit* 13, 26-41.

*Berking, Helmuth/Löw, Martina* (Hrsg.) 2008: *Die Eigenlogik der Städte. Neue Wege für die Stadtforschung*, Campus Verlag: Frankfurt a.M.

*Bürgerschaft der Freien und Hansestadt Hamburg* 2008: Haushaltsplan 2009/2010 - Fortschreibung des Hamburger Klimaschutzkonzepts 2007 – 2012, Einzelplan 6 der Behörde für Stadtentwicklung und Umwelt, Hamburg, Drucksache 19/1752.

*Carius, Alexander/Tänzler, Dennis/Maas, Achim* 2008: Climate Change and Security. Challenges for German Development Cooperation, Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), Eschborn.

*Chowdhury, M. Rashed* 2003: The Impact of 'Greater Dhaka Flood Protection Project' (GDFPP) on Local Living Environment – The Attitude of the Floodplain Residents, in: *Natural Hazards* 29: 3, 309-324.

*Cities Alliance* 2008: Cities Alliance - Cities without Slums Annual Report 2008, Washington D.C.

*Climate Change Working Group of the UNEP Finance Initiative (CCWG)* 2006: Adaptation and Vulnerability to Climate Change: The Role of the Finance Sector, CEO Briefing, [http://www.unepfi.org/fileadmin/documents/CEO\\_briefing\\_adaptation\\_vulnerability\\_2006.pdf](http://www.unepfi.org/fileadmin/documents/CEO_briefing_adaptation_vulnerability_2006.pdf).

*Cohen, Jean L./Arato, Andrew* 1992: Civil Society and Political Theory, Cambridge, MA.: MIT Press.

*Commission for Africa* 2005: Our Common Interest. Report of the Commission for Africa, London.

*C40 Cities Climate Leadership Group* 2009a: Report of the C40 Toyo Conference on Climate Change. Outline of the Conference, <http://www.c40tokyo.jp/en/pdf/report/01.pdf>.

*C40 Cities Climate Leadership Group* 2009b: Report of the C40 Toyo Conference on Climate Change. Opening Keynote Lecture and Symposium, <http://www.c40tokyo.jp/en/pdf/report/02.pdf>.

*C40 Cities Climate Leadership Group* 2009c: Report of the C40 Toyo Conference on Climate Change. Sessions, <http://www.c40tokyo.jp/en/pdf/report/03.pdf>.

*Douglas, Ian/Alam, Kurshid/Maghenda, Maryanne/McDonnell, Yasmin/McLean, Louise/Campbell, Jack* 2008: Unjust Waters: Climate Change, Flooding and the Urban Poor in Africa, in: *Environment & Urbanization* 20: 1, 187-205.

*Eade John (Hrsg.)* 1996: Living the Global City: Globalization as Local Process. Routledge: London.

*Ernst, Sonja* 2008: Lagos. Hyperwachstum - ungebremst und informell, Bundeszentrale für Politische Bildung, Berlin, <http://www.bpb.de/themen/QM9XLD.html>.

*Friedmann, John/Wolff, Goetz* 1982: World City Formation: An Agenda for Research and Action, in: *International Journal of Urban and Regional Research*, 6, 309-344.

*Gandy, Matthew* 1994: A Comparative Overview of Recycling in London and Hamburg, in: *Waste Management and Research*, 12, 481-494.

*Garcia, Marisol* 2006: Citizenship Practices and Urban Governance in European Cities, in: *Urban Studies*, 43: 4, 745- 765.

*Germanwatch* 2007: Klima und Klimaschutz in Hamburg: Informationen, Projekte und Adressen rund um die Klimaexpedition, Hamburg, <http://www.germanwatch.org/klima/hh07.pdf>.

*Glaeser, Edward L.* 2009: Growth: The Death and Life of Cities, in: Inman, Robert P. (Hrsg.): *Making Cities Work. Prospects and Policies for Urban America*, 22-62.

*Glaeser, Edward L./Gyourko, Joseph/Saks, Raven E.* 2005: Urban Decline and Durable Housing, in: *Journal of Political Economy* 113: 2, 345-375.

*Huq, Saleemul/Reid, Hannah* 2004: Mainstreaming Adaptation in Development, in: *Institute for Development Studies Bulletin* 35: 3, 15-21.

*Huq, Saleemul/Reid, Hannah* 2003: The Role of People's Assessments, in: *Tiempo. Global Warming and the Third World*, 48, 5-9.

*Kearns, Ade/Paddison, Ronan* 2000: New Challenges for Urban Governance, in: *Urban Studies* 37: 5-6, 845-850.

*Kempe, Michael* 2007: 'Mind the Next Flood!' Memories of Natural Disasters in Northern Germany from the Sixteenth Century to the Present, in: *The Medieval History Journal* 10: 1-2,

327-354.

*KLIMZUG-NORD* 2009: Our Targets, Hamburg, <http://klimzug-nord.de/index.php/lang/en/page/2009-07-21-Targets>.

*Knox, Paul L./Taylor, Peter J. (Hrsg.)* 1995: *World Cities in a World System*, Cambridge University Press: New York.

*Kraas, Frauke/Nitschke, Ulrich* 2006: Megastädte als Motoren globalen Wandels. Neue Herausforderungen weltweiter Urbanisierung, in: *Internationale Politik*, November 2006, 18-28.

*Landesbetrieb Straßen, Brücken und Gewässer (LSBG)* 2009: *Hochwasserschutz in Hamburg – Baumaßnahmen 2009*, Hamburg, <http://www.hamburg.de/contentblob/1429172/data/hws-broschuere2009.pdf>

*Landesbetrieb Straßen, Brücken und Gewässer (LSBG)* 2007: *Hochwasserschutz in Hamburg – Bauprogramm 2007*, Hamburg, <http://www.safecoast.org/editor/databank/File/Construction%20programme%20Hamburg.pdf>.

*Mortreux, Colette/Barnett, Jon* 2009: Climate Change, Migration and Adaptation in Funafuti, Tuvalu, in: *Global Environmental Change* 19: 1, 105–112.

*O'Brien, Karen/Eriksen, Siri/Schjolden, Ane/Lynn, Nygaard* 2004: What's in a Word? Conflicting Interpretations of Vulnerability in Climate Change Research, CICERO Working Paper Nr. 4, Center for International Climate and Environmental Research, Oslo.

*Odueme, Stella* 2009: Nigeria: Faces of Lagos Initiative on Climate Change, in: *Daily Independent (Lagos)*, 9 April 2009, <http://allafrica.com/stories/200904090197.html>

*Rahman, Mohammed M.* 2002: Baste Eviction and Housing Rights: A Case of Dhaka, Bangladesh, in: *Bridge*, Gary/Watson, Sophie (Hrsg.): *The Blackwell City Reader*, Blackwell Publishing: Oxford, 270-278.

*Rahman, Mohammed M.* 2001: Baste Eviction and Housing Rights: A Case of Dhaka, Bangladesh, in: *Habitat International* 25, 49-67.

*Revi, Aromar* 2008: Climate Change Risk: An Adaption and Mitigation Agenda for Indian Cities, in: *Environment and Urbanization* 20: 1, 207-229.

*Roberts, Timmons J./Parks, Bradley C.* 2007: *A Climate of Injustice: Global Inequality, North-South Politics, and Climate Policy*, MIT Press, Cambridge.

*Rojas Blanco, Ana V.* 2006: Local Initiatives and Adaptation to Climate Change, in: *Disasters* 30: 1, 141–147.

*Rybczynski, Witold* 2009: Space: The Design of the Urban Environment, in: *Inman, Robert P. (Hrsg.): Making Cities Work. Prospects and Policies for Urban America*, 94-122.

*Saskia Sassen* 2000: *The Global City*: New York, London, Tokyo, Princeton: Princeton University Press.

*Sasika Sassen* 1998: *Globalization and Its Discontents*, New York: New Press.

*Satterswaite, David* 2008: *Climate Change and Urbanization: Effects and Implications for Urban Governance*, Diskussionspapier United Nations Expert Group Meeting on Population Distribution, Urbanization, Internal Migration and Development, UN/POP/EGM-URB/2008/16, New York.

*Schröder, Heike/Bulkeley Harriet* 2008: *Governing Climate Change Post-2012: The Role of Global Cities Case-Study: Los Angeles*, Tyndall Centre for Climate Change Research Working Paper 122.

*Skaburskis, Andrejs* 2006: New Urbanism and Sprawl: A Toronto Case Study, in: *Journal of Planning Education and Research*, 25, 233-248.

*Small, Christopher/Nicholls, Robert J.* 2003: A Global Analysis of Human Settlement in Coastal Zones, *Journal of Coastal Research* 19: 3, 584-599.

*Smit, Barry/Wandel, Johanna* 2006: Adaptation, Adaptive Capacity and Vulnerability, in: *Global Environmental Change* 16, 282–292.

*Smit, Barry; Burton, Ian; Klein, Richard; Wandel, Johanna* 2000: An Anatomy of Adaptation Climate Change and Variability, in: *Climatic Change* 45: 1, 223–251.

*Stern, Nicholas* 2006: The Stern Review on the Economic Effects of Climate Change. Report to the British Government, Cambridge: Cambridge University Press.

*Swianiewicz, Pawel* 2006: City Political Culture. What is Expected from Policy Actors? in: Heinelt, Hubert/Sweeting, David/Getimis, Panagiotis (Hrsg.): *Legitimacy and Urban Governance. A Cross-national Comparative Study*, Routledge: London, 243-264.

*The World Bank* 2009: Climate Resilient Cities. A Primer on Reducing Vulnerabilities to Disasters, The World Bank, Washington D.C.

*United Cities and Local Governments* 2007: Final Declaration of the Congress of Jeju 'Island of World Peace - Changing Cities are Driving our World', 31. Oktober 2007, Jeju.

*United Nations Educational, Scientific and Cultural Organization (UNESCO)* 2001: Study of Main Drainage Channels of Victoria and Ikoyi Islands in Lagos, Nigeria and their Response to Tidal and Sea Level Changes, Nigeria, <http://www.unesco.org/csi/act/lagos/drains.htm>.

*United Nations Environment Programme (UNEP)* 2005: Dhaka City State of Environment Report 2005, Dhaka, <http://www.rrcap.unep.org/reports/soe/dhaka-soe-05/2-1dhaka-resource.pdf>.

*United Nations Human Settlements Programme (UN-Habitat)* 2003: The Challenge of Slums. Global Report on Human Settlements 2003, London.

*Van Aalst, Maarten K./Cannon, Terry/Burton, Ian* 2008: Community Level Adaptation to Climate Change: The Potential Role of Participatory Community Risk Assessment, in: *Global Environmental Change* 18: 1, 165-179

*Van der Ploeg, Frederick/Poelhekke, Steven* 2008: Globalization and the Rise of Mega-Cities in the Developing World, CESInfo Working Paper Nr. 2208, Center for Economic Studies, München.

*Working Group II of the Intergovernmental Panel on Climate Change (WGII)* 2007a: Summary for Policymakers, <http://www.ipcc-wg2.gov/AR4/website/spm.pdf>.

*Working Group II of the Intergovernmental Panel on Climate Change (WGII)* 2007b: Technical Summary, <http://www.ipcc-wg2.gov/AR4/website/ts.pdf>