

CLIMATE CHANGE AND AFRICAN CITIES IN PLANNING EDUCATION

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BACKGROUND

i. Revitalisation of Planning Education

This online resource on 'Climate change and African cities' is one step in a much longer process of curriculum design and implementation as part of the 'Revitalisation of Planning Education' project. The project, operated by the African Association of Planning Schools (AAPS), attempts to rethink African planning education with an emphasis on empirical realities and ideological formations rooted in the Global South. The other themes considered by AAPS to be underrepresented in the training of planners in Africa are:

- a. Informality;
- b. Actor collaboration;
- c. Spatial planning and its relationship to infrastructure; and
- d. Access to land (AAPS, 2010 p. 2).

The aim of this resource is not only to aid planning educators in revising and developing curricula for a particular educational theme, but also to provide planning students, professionals or laypeople with an informative base to expand their theoretical knowledge and practical skills. The resource has specifically been designed to be open-ended, flexible and adaptable (AAPS, 2010 pp. 3-4).

ii. Rationale for climate change and African cities

Sudden shocks such as terrorist attacks or natural catastrophes may have a huge impact on society, but the biggest risk may be from creeping risks, such as climate change that develop over decades (World Economic Forum, 2010 p. 6). 'The more highly interlinked the risk, the more its impact and severity is amplified' (World Economic Forum, 2010 p. 8). Climate change is indeed highly interconnected with among others the environment, economy, politics, poverty, food security, access to water, and the built environment. Due to historic spatial planning practices entrenched by present planning practices (or lack of) and market forces; poor households in Africa are increasingly vulnerable to the potential effects of climate change. This combination of vulnerabilities and hazards continues to threaten the resilience of urban communities on our continent.

Planners are in an ideal position to contribute to the fight against climate change, but have been slow to get involved. Few strategies, plans or frameworks analyse and monitor hazard and vulnerability factors or contain risk assessments of the present and future effects of climate change on urban areas. This can be explained by the many other short-term developmental challenges demanding immediate action, but planning cannot ignore the warning signals of climate change projections, and needs to mainstream disaster risk reduction measures into sustainable development planning policies, strategies and interventions (Faling, 2010).

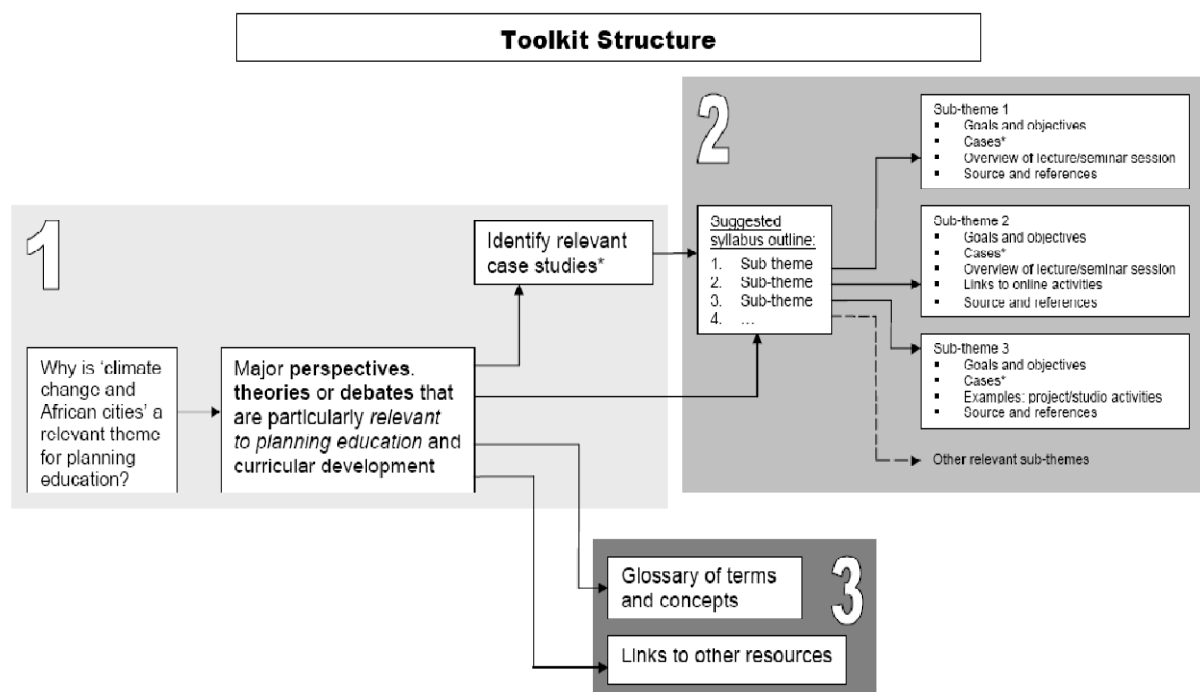
iii. Structure of the Online Resource

A series of 'online toolkits' that include definitions, descriptions, case studies (including best practices), course/lesson/project outlines and references have been developed for this theme. The first section introduces the theme by explaining the importance for planners in Africa to understand climate change, and therefore to be included in the planning curriculum. Secondly, it describes a number of perspectives, theories and debates pertaining to climate change and planning education. Lastly, this section investigates a number of case studies appropriate for teaching and learning purposes, and related to the sub-themes to be introduced in the next section.

The second section makes suggestions for the structuring of a syllabus with the major sub-themes of the climate change and African cities theme. It also explains how each sub-theme could be incorporated into an education programme, including proposed activities designed to aid the teaching and learning of a particular sub-theme.

The third section contains a glossary of terms and concepts that are central to the theme on climate change and planning, and links to various websites with information, tools, case studies and other resources relevant to climate change and African cities and useful for learning more about the topic.

Diagram 1 – The toolkit structure (AAPS, 2010 p. 5)



iv. Some limitations

A few disclaimers are necessary:

1. Much more can and should be said about climate change and its implications for urban planning than what is included here. BUT climate change is a relatively new field in urban planning, and very little has been written from an African perspective.

2. This framework is limited to the *urban*, for 'Africa is the world's most rapidly urbanising continent' (Pelling, et al., 2009a pp. 3,6) and thus African cities are becoming more vulnerable to disasters than rural areas. Rural planning is therefore not addressed.

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SECTION 1 – INTRODUCTION, THEORIES AND CASE STUDIES

1. INTRODUCTION

1.1 African cities are vulnerable to the impact of climate change

Cities in developing countries at present face many complex, multidimensional hazards outside their experience and outside their ability to control, causing major setbacks in hard-won economic and social development. It is expected that the impacts of climate change will contribute to lower the threshold for disasters to occur, and increasingly frustrate efforts at sustainable development. 'The more highly interlinked the risk, the more its impact and severity is amplified' (World Economic Forum, 2010 p. 8). Consequently, for some cities the impacts of climate change may be insignificant, while for others the consequences for human settlements, infrastructure, ecosystems, health, energy, housing, water and food security, migration, agriculture, tourism and biodiversity may be catastrophic (ALNAP & ProVention, 2009 p. 4; Puppim de Oliveira, 2009 p. 253).

Climate change, being highly interconnected with the environment, economy, politics, poverty, food security, access to water, the built environment, etc., thus necessitate a systemic and integrated approach when planning for adaptation and mitigation (Bulkeley, et al., 2005; Halsnæs, et al., 2007). Perhaps at its core a role for urban planning?

1.2 Where are the planners?

Studies and literature focussing on the impact of climate change and its consequences for planning is very sparse (Blanco, et al., 2009 p. 163). The majority of climate change studies in Africa have been driven by the atmospheric sciences community with the result that they are disconnected from development-related issues (Scholes, et al., 2008 p. 4). Though urban planning is regarded by politicians, organisations and practitioners as the 'switchboard' for implementing global warming mitigation and climate change adaptation (Biesbroek, et al., 2009 p. 231), planners have only recently joined the climate change debate, and consequently the planning community (and planning education) has played a limited role in developing and implementing responses to climate change (Sanchez-Rodriguez, 2009 p. 203). Even though 'sustainability' is a prefix/suffix to every development plan (Hjerpe, et al., 2009 p. 242), few plans analyse and monitor hazard and vulnerability factors, contain risk assessments, or purposefully build disaster resilient cities.

Planners' limited role in the debate could mainly be explained by two reasons. Firstly, planners are confronted with so many other short-term developmental challenges such as access to housing and services, food and water security, poverty eradication, natural resource management, and transportation needs – demanding urgent attention; that long-term climate change is not a priority. Yet climate change is expected to exacerbate these developmental stresses (Halsnæs, et al., 2007 pp. 666, 672; Parnell, et al., 2007 p. 358). If it is true that 'all aspects of human life will at least to some degree be affected by the expected climate change', (then) future research (and education) cannot overlook climate change and its effects as an irrelevant topic' (Nordlund, 2008 p. 873).

The second reason is the uncertainty surrounding the climate change science. Many sceptics argue that the science is still too uncertain to be included in planning research, education and practice. Dessai, et al., (2007 p.1) reckons this is not reason enough to exclude climate change from the planning agenda. Though it is true that the climate change debate is enveloped in uncertainty, it is

not unique to climate change, for often planning decisions with a long-term impact are based on the best current estimates of risk and uncertainty (Lowe, 2004 p. 76), and uncertainty is omnipresent in all other global phenomena – the economy, geopolitics and health.

1.3 Planning ought to play a more prominent role in the climate change debate

Local governments are the closest to where the consequences of climate change will pan out, and thus best positioned to build resilient cities (Pelling, et al., 2009b p. 43; Puppim de Oliveira, 2009, p. 253; UNISDR, 2010, p. viii). Planning is essential to local government capacity to respond effectively to climate change and other sustainable development challenges (Davoudi, et al., 2009 pp. 13-16; Crawford, et al., 2008 p. 4575). Many authors are convinced that planners ought to play a more prominent role in implementing climate change mitigation and adaptation measures in this environment. This is because 1) planning is considered to create order, reduce conflicts among activities, and seek to benefit all of society; 2) no new institutions need to be created as many cities have urban planning departments; and 3) planners already play a significant role in defining the form, structure, and function of cities, (Sanchez-Rodriguez, 2009 p. 203; Roy, 2009; Parnell, et al., 2007; Laukkonen, et al., 2009).

‘Adapting to climate change is at its core a call for planning’ according to Blanco, et al. (2009 p. 158), and furthermore adaptation is the ‘type of planning that fits naturally the agenda of urban and regional planning’.

1.4 This has implications for planning education

As a profession dedicated to the public interest, curricula in planning schools lag behind in promoting the fundamental transition of cities necessary to mitigate and adapt to climate change. It is therefore essential to revise the curriculum of planning degrees to address this knowledge void (Pizarro, 2009 pp. 255-254) and to provide normative guidance to planners in dealing with climate change issues. However, research on the most effective way of addressing these gaps – whether to include climate change in the existing curriculum, or as a separate subject – is almost non-existent (Hurlimann, 2009 pp. 644, 656). In Green CITYnomics Pizarro (2009, pp. 255-279) makes suggestions for the development of a curriculum that addresses climate change - some of which were taken up the development of this resource.

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2. PERSPECTIVES, THEORIES AND DEBATES

2.1 Introduction

This section briefly introduces the main themes and sub-themes pertaining to climate change and urban planning. They form the basis of the suggested course outline that ought to be considered when undertaking course development or curricular revision.

2.2 Climate change science and scenarios

2.2.1 *Climate change science*

The climate is diverse, and determined by complex interactions between the land, oceans and the local, regional and global atmosphere. The disturbances (such as anthropogenic forcing) in atmospheric constituents that lead to global changes, affect certain aspects of these multifaceted interactions, causing changes in the climate to vary from region to region (Christensen, et al., 2007 p. 865).

Climate forecasts are still either unavailable or unreliable due to considerable uncertainty in portraying different emission development paths. Furthermore, the climate system has complex feedback mechanisms and impacts that also play a role in climate variability. Climate change scenarios are therefore widely used to project climatic changes. A scenario is a hybrid of results from coupled atmosphere-ocean global climate models, historic climate data and often statistical methods (Dessai, et al., 2005 p. 88) (Boko, et al., 2007 p. 436) (Adger, et al., 2005 p. 77).

There are thus still many uncertainties in future climate change scenarios (Hulme, et al., 2005 p. 29). Nonetheless, even if the climate does not change as expected, planning for climate change holds many benefits to society e.g. correcting economic and spatial inefficiencies (Ruth, et al., 2006 p. 19; Rousseau, 2004 p. 58).

2.2.2 *Projected climatic changes for Africa*

Africa is hotter and drier with less dependable rainfall than most other regions of the world. In its Fourth Assessment Report the IPCC expects that Africa will experience between three and four degrees Celsius higher annual mean air temperature for the period 2088-2099. There are a number of restrictions to making precise precipitation estimations, but greater climate variability and more severe weather events can be expected in future, e.g. large regions on the continent are projected to become drier, for droughts are expected to occur slightly more often and for a longer duration. The IPCC also projects sea-level rise, flooding, tropical cyclones, and heat waves for the African continent (Christensen, et al., 2007 p. 865) (Boko, et al., 2007 pp. 443-444).

2.3 Climate change impacts

Climatic changes will have consequences for human settlements, infrastructure, ecosystems, health, energy, housing, water and food security, migration, agriculture, tourism and biodiversity among others. Because so many households depend heavily on the climate for their day-to-day livelihoods, and the climate exerts a significant impact on the economic development of many African countries, Africa is among the most vulnerable continents to climatic changes (Christensen, et al., 2007 p. 865). The situation is aggravated by the interaction of multiple developmental stresses at various levels such as complex governance and institutional dimensions; endemic poverty; limited access to capital, including markets, infrastructure and technology; ecosystem degradation; and complex

disasters and conflicts – eroding the adaptive capacity of institutions in Africa to respond to the challenges of climate change (Scholes, et al., 2008 p. 4; Boko, et al., 2007 p. 435).

2.3.1 Urban risk

‘The built environment (is) the stage on which our most important interactions with climatic conditions are played out’ (Smith, 2009). Floods, landslides and mudslides are becoming more frequent events in African cities as more low-income households settle on steep slopes, floodplains or in ravines (Wisner, et al., 2009 p. 28). Some impacts already prevalent from sea-level rise include the increased erosion of the shoreline, loss of wetlands, inundation of low-lying property, expansion of flood zones, increased cost of maintaining infrastructure, and salinisation of surface- and groundwater (Purvis, et al., 2008 p. 1063; Ruth, et al., 2006 p. 22).

Future climate change is likely to increase these negative impacts on cities, as well as negatively affect food and water supply and water quality, e.g. areas already experiencing water stress, such as southern Africa, are very likely to expect more severe water shortages in future (Ruth, et al., 2006 p. 24; Boko, et al., 2007 p. 441). In the case of severe weather, centralised critical infrastructure may become dysfunctional, with consequences for the whole urban system. The longevity of protective infrastructure, roads and railway lines too close to the sea is reduced, due to the combined effects of sea-level rise and increased storms (Theron, et al., 2008 p. 4). Stormwater systems, already strained by the increasing severity of events, will have to handle more runoff as development increase. Climate refugees will place additional demands on housing and infrastructure (Boko, et al., 2007 p. 450) while large parts of the existing population are still not connected to a public sewage disposal system. This, combined with poor supplies of drinking water, may lead to deaths from diarrhoeal diseases (Munich Re Group, 2004 p. 30).

2.3.2 Urban vulnerability and resilience

If resilient, a community is ‘able to sustain itself through its systems by dealing with issues and events that threaten, damage, or try to destroy it’ (World Bank, 2008 p. 32). If not, then it is vulnerable to some degree. The root causes of vulnerability are embedded in demographic pressure, social, economic and ideological systems, and specific sets of unsafe conditions (Oliver-Smith, 2002 pp. 28,36; Anderson, et al., 1998 p. 10).

The poorest are usually amongst the most vulnerable, for they lack skills and resources, have limited access to safety nets such as welfare or health care systems, and many have informal or illegal residential status (Parnell, et al., 2007 p. 361). The poor in developing countries are priced out of safe areas and are concentrated in increasingly vulnerable and unsafe urban and peri-urban spaces such as areas that are low-lying or steeply-sloping, flood-prone, close to pollution sources, often at highest risk of fire, with inadequate or non-existent services, and lack protection from extreme climatic events. All the various forms of hazards interact with each other to produce compound hybrid hazards. As hazardousness grows, it undermines the coping capacities of communities. Consequently, their ability to cope with hazards such as the adverse effects of climate change is inadequate (Annan, 1999; Parnell, et al., 2007 pp. 357,361; Freeman, et al., 2002 p. 5; ALNAP & ProVention, 2009 p. 4; World Bank, 2008 p. 5; Roy, 2009 p. 276-277; Laukkonen, et al., 2009 p. 287).

But not only are African cities prone to major catastrophic events, urban households have to also deal with everyday risks as a function of their daily existence. The two are linked in many ways and share root causes. Everyday risks lower people's threshold of resilience, and thus pave the way for catastrophic events. At the same time, everyday risks lower people's willingness to prepare for catastrophic events, as risk becomes an accepted part of life (Pelling, 2003 p. 15). Though these everyday risks do not often produce mass casualties, poor households have very few resources to fall back upon (Wisner, et al., 2009 p. 33). This leads to the ratchet effect of vulnerability where each succeeding event reduces the resources of a household to resist and recover from the next shock (Pelling, 2003 p. 16; Oelofse, 2002 p. 43).

2.4 Perspectives on planning for climate change

Extremely little has been written on the role of planning in climate change adaptation and mitigation or urban disaster risk reduction in Africa. Research on urban disaster risk has so far focussed on mega-cities and is dominated by North American and Western orientation (Pelling, et al., 2009a p. 10; Pelling, 2003 p. 19).

2.4.1 Adaptation and mitigation

Resilience indicates 'the capacity to successfully adapt to the impact of climate change and is the overarching goal achieved through mitigation and adaptation' (Hamin, et al., 2009 pp. 238-239). Both mitigation and adaptation are necessary to avoid the impacts from climate change (Martens, et al., 2009 p. 16). Mitigation refers to the reduction of greenhouse gas emissions to counter global warming (UNISDR, 2009 p. 19), and is driven by international and national initiatives over a long term. Adaptation to climate change 'entails taking the right measures to reduce the negative effects of climate change (or exploit the positive ones) by making the appropriate adjustments and changes' within the local context (UNFCCC, 2007 p. 10).

In developing countries the issue of climate change is overshadowed by immediate development priorities, i.e. housing, poverty eradication, energy access, water and food security, health, transportation needs, natural resource management, and air and water pollution. However the effectiveness of development strategies may be reduced and vulnerability enhanced if climate change mitigation and adaptation are not integrated with development planning (Halsnæs, et al., 2007 p. 666).

2.4.2 Disaster risk reduction

Disaster risk reduction (DRR) is well established within the international development community (Mercer, 2010 p. 247). It is defined as 'the systematic development and application of policies, strategies and practices to minimise vulnerabilities, hazards and the unfolding of disaster impacts throughout a society, in the broad context of sustainable development' (UNISDR, 2009). DRR policies and strategies are well established at grassroots level and focus is on the underlying root causes of community vulnerability. DRR strategies highlight a community's ability to reduce their own risk. Successful strategies build resilient communities, whilst ensuring vulnerabilities are not increased through development efforts (Mercer, 2010 pp. 247-249).

A number of authorities have compared DRR and emerging climate change adaptation and mitigation measures. Some like Parnell, et. al (2007) and Blanco, et al. (2009) argue for climate

change mitigation and adaptation to be directly integrated with existing urban development efforts, i.e. the developmental local state and livelihoods analysis. Others advocate for increased convergence or even imbedding adaptation and mitigation into wider DRR strategies, which should in turn be mainstreamed into wider development planning (Mercer, 2010 p. 250). This is because it is very hard to disentangle social, environmental and technological hazards from each other, and disaster risk reduction offers an 'integrated approach towards intervening in human vulnerability and resilience, instead of focussing on mitigating a single threat' (Pelling, 2003 p. 5).

2.4.3 Sustainable development planning

Rumsey, et al. (2009 p. 1049) warn that the impacts of climate change may unravel the efforts undertaken by a variety of stakeholders to achieve sustainability. Climate events are already a major stress to development, but threaten to undermine sustainable urban development in developing countries through additional burdens it lays on poverty eradication and other development goals (Halsnaes, 2009 p. 83). To achieve the objectives of sustainability, a drastic shift from a business-as-usual approach is required.

Climate change, disaster risk reduction and sustainable urban development have largely been addressed separately in both science and policy. But they need to be integrated to counter the likely negative effects of climate change on urban development. Synergies between these three involve several policy areas such as spatial planning, energy, urban design, public transportation and water and sanitation (Hjerpe, et al., 2009 p. 234, 242; Biesbroek, et al., 2009 p. 231).

2.5 What does this mean for planning: challenges and opportunities

If spatial planning were to fulfil the 'switchboard role' for implementing climate change mitigation and adaptation measures at the local level, then planners are required to contribute knowledge, expertise and capacity building in addressing climate change issues and will have to make stark choices in choosing the preferred spatial configuration of urban areas (Davoudi, et al., 2009 pp. 13-16; Crawford, et al., 2008 p. 4575), for the spatial form of cities and the way in which land is developed and used have significant implications for reducing emissions and for adapting to the adverse effects of climate change.

According to some, land-use planning – with its influence on the location and density of development, is the most fundamental tool for integrating disaster risk reduction (including climate change mitigation and adaptation) with urban planning. It is suggested that densities be increased, developments be planned for multiple use, energy sufficiency be improved, and the need to travel be reduced by creating more public transport infrastructure and integrating land-use and transport planning (Bulkeley, et al., 2005 pp. 177-179; Pelling, et al., 2009b p. 50; Pizarro, 2009 pp. 33-34).

Communities in high-risk areas are often largely excluded from formal governance processes and services whilst community-led planning is essential to identify and monitor hazards, reduce risk and prepare for disasters. Planners need to raise awareness of the increase in extreme events and everyday risks associated with climate change, and improve access to information and advice. To mitigate against future disasters, it is vital to design and enforce appropriate built environment and public health standards, and institutionalise a range of social safety nets, including food security programmes. Massive relocations may however be an unavoidable feature, but this should be a last

resort (Pelling, et al., 2009b p. 49; ALNAP & ProVention, 2009 pp. 23, 27; Parnell, et al., 2007 pp. 358-360).

As a profession dedicated to the public interest, planning cannot ignore the warning signals of climate change projections, and should embed disaster risk reduction measures in sustainable development planning policies, strategies and interventions.

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2.7 List of major readings/references to learn more about the issues/themes mentioned

The list below includes books, journal articles and open source documents on the themes and sub-themes mentioned above, which are also prescribed in the syllabus in the next section. The literature on planning for climate change is growing exponentially, therefore regularly consult the websites of the following organisations for more open source documents: The World Bank, UNISDR, IPCC, UNEP, UN-Habitat, UNFCCC, ProVention.

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3. RELEVANT CASES

3.1 Case study 1: Lagos, Nigeria

3.1.1 Background

Lagos is a group of islands surrounded by creeks and lagoons, and bordered by the ocean. Storm surges on the coast are likely to increase in future, accompanied by greater extreme wave heights along the coasts, and heat waves are likely to increase in number.

Lagos' population is estimated at 18 million people (2010). It is the hub of economic activity in West Africa but sensitive to climate change due to its flat topography, low elevation, high population, poverty, coastal erosion and weak institutional structures. It has dense informal settlements on flood-prone land – many of them floating slums, with virtually no physical or social infrastructure. These residents will be severely affected by sea level rise and storm surges because of their low resilience to external hazard stressors. Heat waves will likely severely strain the urban system by inflicting environmental health hazards on the most vulnerable, imposing extraordinary consumption of energy air conditioning, causing physical damage to infrastructure, and disrupting urban activities.

Third Mainland Bridge, Lagos



(Source: Wikipedia)

Informal settlement in Lagos



(Source: <http://www.nairaland.com/>)

Lagos traffic



(Source: How we drive)

Lagos is a member of the C40 Large Cities Climate Leadership network, and it has hosted a second Lagos Climate Change Summit in 2010, but still does not have a comprehensive analysis of the possible climate risks it is facing, and seems to lack concern or awareness of the likely inundation of the city due to sea level rise. Although climate change is not specifically addressed, there are a few activities in taking care of developmental and infrastructural lapses that built resilience such as a sea wall along Bar Beach to counter coastal erosion (though this is not adequate for the full impact of climate change on the city), addressing the backlog in the physical infrastructure, a buss rapid transport system, tree planting and city greening projects, improvement of the solid waste dump sites, drainage channels construction and improvement, cleaning open drains and gutters, and slum upgrade projects.

3.1.2 Rationale

This case study was specifically chosen for being an African mega-city that has to deal with many developmental problems in the extreme. It was also chosen for its seemingly apathy in addressing climate change impacts, though disaster risk reduction is being addressed to some extent – offering some hope for the future. There is an urgent need to empower local governments in Lagos intellectually, technically and financially to identify, formulate and manage the climate-related emergencies and disasters, as well as longer-term risks more proactively.

3.1.3 Background reading and preparation material

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3.2 Case study 2: Delhi, India

3.2.1 Background

Delhi has a population of 16 million inhabitants of which most live below the national poverty line in hyper-dense slums in close proximity to environmentally degraded land and flood-prone areas with no access to services. Simultaneously rising per capita incomes are increasing energy consumption, and over-stretching its infrastructure. Delhi's physical infrastructure, social services, slum populations and associated environmental risks make the city highly vulnerable to climate-related challenges. Moreover, there is increasing competition for scarce resources and basic services as demand far exceeds supply, and this will only worsen with severe weather events.

River in New Delhi



(Source: China Smack)

Bazaar street in Delhi



(Source: <http://www.tropicalisland.de/index.html>)

Temperature, precipitation and sea-level are likely to rise in future. Delhi will be faced with variability in weather patterns and the potential for exacerbated extreme events due to climate change. The government of Delhi has made many efforts towards climate change mitigation, but it remains project-orientated and there is scant emphasis on adaptation. Mitigation efforts were first introduced in the government departments before gradually being rolled-out. Delhi had a very

successful overhaul in providing cleaner public transportation, is recovering methane from landfill sites, gives subsidies, low-interest loans and matching grants to promote the use of less energy-intensive technologies, and the city's greening program is considered to be one of the largest in the world. The Delhi government has established a program to raise awareness about carbon credits and clean development mechanisms among various departments.

Delhi's green busses



(Source: Travel Dudes)

Because its efforts are primarily project-oriented, Delhi's response to climate change is piecemeal and not very effective. Gradually the city is developing a programmatic approach, but there is a need for better coordination between departments and among levels of government. While the neglect of adaptation remains a concern, the awareness and administrative capacity being built as a result of mitigation projects may help adaptation projects and policy measures to be introduced.

3.2.2 Rationale

This case study was chosen because it reflects a mega-city in a developing country on another continent, dealing with many similar challenges as African cities. Delhi knows poverty, slums and complex, multi-hazardousness in the extreme. Yet it has already made some headway in climate change mitigation efforts from which African cities can learn. African cities can furthermore learn from Delhi's lack in adaptation efforts, by including adaptation measures from the start when planning for climate change.

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3.3 Case study 3: Dhaka, Bangladesh

3.3.1 Background

Dhaka, the capital city of Bangladesh, is one of the biggest mega cities in the world with an estimated population of 13 million. Still, it is one of the fastest growing cities in the world expected to grow to 16 million by 2015. The city is highly unplanned and has one of the highest population densities in the world. Expansion of the city is limited by physical constraints – much of the periphery, where future expansion is set to happen, is a low-lying floodplain. More than half the Dhaka population live under the national poverty line, 2.5 million are slum dwellers, and many areas are under-serviced.

The city is wedged between four flood-prone rivers, as well as between the Himalayan mountain range and a body of water that generates violent cyclones. Flooding is thus a common environmental problem for Dhaka, and the severity is increasing year on year. This is ascribed to the rise in the mean sea level, and the increasing severity and frequency of tropical cyclones and extreme storm surges. Other causes are the high rainfall and the deforestation in upstream catchment areas, and the drainage congestion and inadequate pumping facilities that lengthen the flooding period.

Flooding in Bangladesh



(Source: BBC)

Dhaka has an elevation between 2-13 meters above sea level. Scientists believe that due to climatic changes, flooding in Dhaka will increase as a result of the melting of glaciers in the Himalayas, sea level rise and increasing rainfall. E.g. a one-meter rise in sea level as the result of the melting of the Himalayan glaciers and Greenland ice sheet could flood one-third of the country and displace as many as 40 million people. Dhaka is also likely to experience higher temperatures – even a heat island effect – from rising emissions, increased industrial activity and use of air conditioners. The city will thus be impacted by climate change in three major ways: flooding, drainage congestion, and heat stress.

The environmental changes that are occurring directly affect all aspects of society. Human health, food security, industry and energy security, infrastructure, and economic development are all threatened by climate change. The sheer number of people living in the city means that the negative consequences of climate change are likely to be felt by a large number of people, especially the urban poor who live in flood-prone and water-logged areas. Those who are forced to leave their homes to escape from climate change will become environmental refugees

3.3.2 Rationale

Bangladesh will be among one of the worst affected regions in the world by climate change because it is both low-lying and densely populated. It is seriously at risk for all of the five main climate threats: drought, floods, storms, sea-level rise, and agricultural crop loss. This case study was chosen to illustrate the dire impacts climate change are already having on cities in developing countries. The consequences of climatic changes will worsen conditions in Dhaka and Bangladesh.

3.3.3 Background reading and preparation material

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3.4 Case study 4: Cape Town, South Africa

3.4.1 Background

Cape Town is home to approximately 3.27 million people and has seen high urban growth rates during the last 15 years, leading to the growth in the number and density of informal settlements in the city. Like most cities in South Africa, the city is one of sharp contrasts between the wealthy – living close to the city bowl, and the poor – living on the inhospitable, spatially removed and topographically disadvantaged Cape Flats.

Informal settlements are characterised by acute poverty and are overcrowded and under-serviced. It is estimated that more than 38% of households in Cape Town live below the minimum subsistence level, and approximately 40% are unemployed. Residents are furthermore exposed to a range of chronic everyday risks such as high levels of crime and violence, inadequate access to safe drinking water, sanitation and waster removal as well as disastrous hazards such as severe weather and flooding, and shack fires. Informal settlement fires are an almost weekly phenomenon in Cape Town – destroying dwellings, leading to considerable hardship, undermining households’ fragile livelihoods and exacerbating their extreme vulnerability. Households living in under-serviced settlements often operate at the limits of their capacity as they attempt to juggle multiple stressors such as food insecurity, disease, crime and violence and unreliable incomes. Fires and floods erode whatever attempts they have made to accumulate savings and resources, increasing their vulnerability to hazards over time to the point where a minor hazard can have severe consequences. The immediate physical cost of a single incident can exceed a household’s financial resources, but the indirect losses due to health consequences, or work or school days lost might be even higher. Loss of identity documents can result in people not being able to claim social grants. This may impact on other households who take in friends and family who have lost all.

The poorest and most marginalised are impacted most. The MANDISA project launched by the University of Cape Town to analyse fires in informal settlements, indicates the importance of socio-economic factors in driving risk (in this case fire risk). The project concludes on the importance of mainstreaming disaster risk reduction into the planning of human settlements so as to build the resilience of the poor and marginalised.

Aftermath of a fire in Kayalitsha informal settlement, Cape Town



(Source: S.A. Weather and Disaster Information Service)

Aftermath of a fire in Joe Slovo informal settlement, Cape Town



(Source: HEDON)

3.4.2 Rationale

This study was thus not chosen for its direct applicability to climate change adaptation and mitigation, but rather for its focus on the everyday risks in informal settlements that threaten households' livelihoods. It is expected that these everyday risks will be exacerbated over time by the impacts of climate change, contributing to the hazardousness of informal settlements, and the vulnerability of its residents.

3.4.3 Background reading and preparation material

- ▶ City of Cape Town, online available at <http://www.capetown.gov.za/en/Pages/default.aspx>.
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3.5 Case study 5: Sorsogon City, Philippines

3.5.1 Background

Sorsogon City is flanked by the ocean on two sides and vulnerable to tropical cyclones, heavy rainfall and storm surges. It is also affected by increased temperature, increased precipitation and sea level rise, which are likely to increase in frequency and intensity in future. Monsoon rains are also expected to be prolonged in the future. It has a population of about 200 000 of which the highest concentration of people (mostly in informal settlements), the hub of economic activity, and critical infrastructure are found closest to the coast.

Aerial view of Sorsogon City, Philippines



(Source: Wikipedia)

The popular perception was that local government could do little to counter climate change, but in 2008 the mayor launched a climate change initiative to enhance the basic understanding of climate change and the important role local government could play. Consequently decision-makers committed to develop a climate change profile for the city to identify critical areas and practical local adaptation actions. The local vulnerability was analysed and impacts were assessed in cooperation with various stakeholders. Local residents profiled and visualised climate change impacts exposure through risk mapping and descriptions, while the technical teams quantified the current and future socio-economic costs assuming no adaptation. This promoted ownership of the assessment process.

Beach area in Sorsogon City



(Source: UN-Habitat)

Knowing the climate change vulnerabilities, the local government identified four priority ‘quick-win’ responses to increase people’s resilience to climate change: (1) improving settlements and basic infrastructure; (2) enhancing livelihoods; (3) developing climate and disaster risk management systems; and (4) improving environmental and climate change mitigation actions. As a result the city’s Comprehensive Land Use Plan and the Local Development Plan will be enhanced with the integration of environmental sustainability and climate change parameters.

3.5.2 Rationale

This case study was chosen for its educational value for a number of reasons, being: it is a city in a developing country dealing with similar developmental challenges as most cities in Africa; it is a coastal city already experiencing the impacts of severe climate events; it forms part of the UN-Habitat Cities in Climate Change Initiative (CCCI) with a strong focus to support the development of pro-poor and innovative approaches for the implementation of climate change policies and strategies; and they seem to have successfully fostered awareness and capacity-building among the local population by involving them in the risk and vulnerability assessment.

3.5.3 Background reading and preparation material

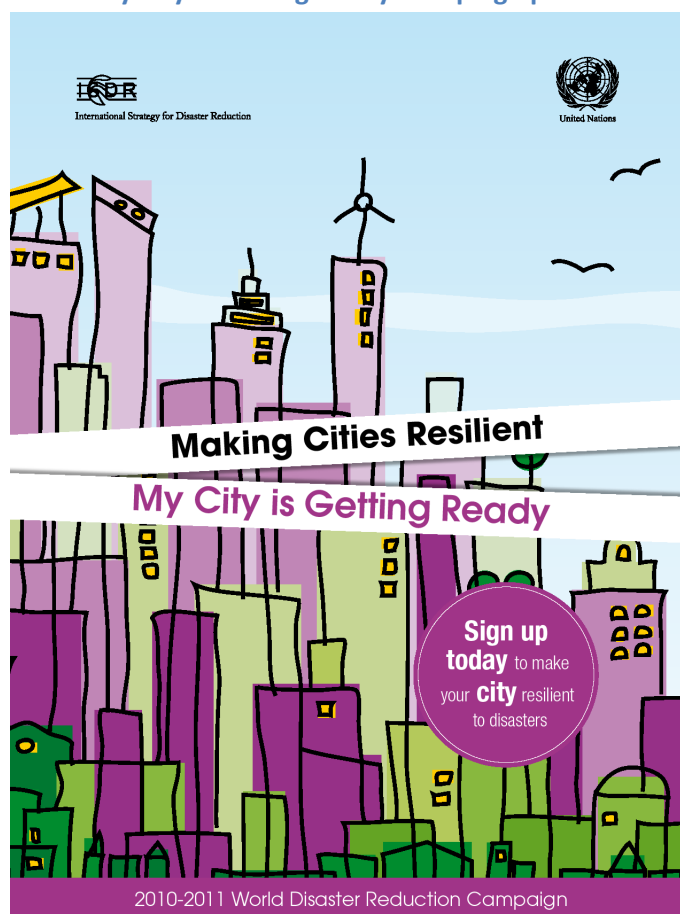
- ▶ Sorsogon City. (2000). *Climate Change Challenges and the Need for Action*. Online available at <http://www.rockefellerfoundation.org/uploads/files/9f54b750-5d73-4885-abf3-eb040404fb1a-philippines.pdf> , accessed 25 November 2010.
- ▶ UN-Habitat. (2010). *Cities and Climate Change: Initial Lessons from UN-Habitat*. Sustainable Urban Development Network (SUD-Net). Nairobi: United Nations Human Settlement Programme (UN-Habitat).
- ▶ UN-Habitat. (2010). *Planning Sustainable Cities: UN-Habitat Practices and Perspectives*. Nairobi: United Nations Human Settlement Programme (UN-Habitat).
- ▶ Wikipedia. (2010). *Sorsogon City*. Online available at http://en.wikipedia.org/wiki/Sorsogon_City accessed 25 November 2010.

3.6 Case study : The UNISDR 'My city is getting ready' Campaign

3.6.1 Background

The UNISDR World Disaster Reduction Campaign for 2010-2011 is about making cities resilient. They have launched a 'My City is Getting Ready' campaign in which mayors from cities around the world sign up to get ready, reduce the risks and become resilient to disasters. 'Making Cities Resilient' addresses issues of local governance and urban risk while drawing upon previous ISDR Campaigns.

'My City is Getting Ready' campaign poster



(Source: UNISDR)

This campaign aims to get as many cities of different sizes, characteristics, risk profiles and locations as ready as possible. 'The campaign is focusing on raising political commitment to disaster risk reduction and climate change adaptation among local governments and mayors; including through high profile media and public awareness activities, and will develop specific technical tools that cater for capacity development opportunities.'

For this purpose the UNISDR has developed a worldwide campaign using posters and videos, organising events in cities all over the world, developing a ten-point checklist for making cities resilient, setting up a mailing list, etc.

By the end of November 2010, 151 cities worldwide have already signed up – though only seven on the African continent.

3.6.2 Rationale

This case study is different from the others, as it does not refer to a specific city, but a campaign. This example of a campaign was chosen because it raises the awareness not only of climate change, but more specifically disaster risk reduction in general. Though the campaign is targeted at local governments, it encourages local authorities to involve other stakeholders in 'getting the city ready'. This campaign is also a good example of using diverse methods to raise awareness.

3.6.3 Background reading and preparation material

- ▶ UNISDR. (2010). 2010-2011 World Disaster Reduction Campaign: Making Cities Resilient, 'My City is Getting Ready.' <http://www.unisdr.org/english/campaigns/campaign2010-2011/documents/campaign-kit.pdf>, accessed 25 November 2010.
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