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Climate change, urban vulnerability and development in Saint-Louis and Bobo-Dioulasso: Learning from across two West African cities

Abstract:

Climate change processes pose significant challenges to development in cities across West Africa. These processes shape and mediate urban vulnerability across urban areas and hinder wider development efforts across these cities. This paper reviews these emerging perspectives within the context of UN-Habitat's work in Bobo-Dioulasso, Burkina Faso and Saint-Louis, Senegal. It argues that policy makers and researchers need to engage with issues of climate change and development at an urban scale and across 'ordinary cities' through exploring the range of vulnerabilities inherent in each city. Specifically, the paper illustrates the diversities and similarities of climate change processes that exist across these two medium sized, or ordinary West African cities, the intersections with existing economic profiles and potential impacts and the emerging urban governance responses to these issues. It demonstrates the need to move beyond constructions of an archetypal 'West African' city, and illustrates the emerging work by UN-Habitat and local partners in developing localised knowledges about urban vulnerabilities and the multiple and divergent ways in which these issues are beginning to be addressed.

Key Words: climate change, urban, vulnerability, West African cities, adaptation.

Main Text

1. Introduction

The rapid urbanisation of cities in West Africa mediates a range of complex and often contradictory processes that expose urban populations to social, economic and environmental hazards. The convergence of these ongoing hazards with emerging climate change impacts threatens to increase the vulnerability of these populations, particularly the urban poor, to the changing conditions of these cities and illustrates the increasing importance of examining climate change processes and responses at an urban scale (Bulkeley and Newell, 2010, Hodson and Marvin, 2010). These processes pose significant risks and challenges across a range of urban issues, especially in relation to development in the growing and dynamic cities of the region. As multiple climate change emergencies become increasingly frequent, and a range of secondary impacts challenge the capacity of cities in the West African region to cope, the need to pay increasing attention to understanding the relationship between climate change, urban vulnerability and development is pressing.

Across the West African region, municipalities and their partners are engaged in a range of responses to climate change. These build on traditions of often innovative governance with minimal resources, seeking to develop information around climate change impacts and measures that seek to reduce risk and vulnerabilities to these emerging processes, and countering notions of the helpless, failed and undeveloped African city (Pieterse, 2008). Extensive engagement around climate change issues by UN-Habitat, through its pivotal role in the 'Cities and Climate Change Initiative' (CCCI), is being carried out with selected cities in the region to map out their climate risks, vulnerability to climate change, adaptation pathways and resources, and potential urban futures. This work, in some cases, complements a similar focus across a plethora of international agencies, donors and research institutions that together engage with multiple perspectives on how West African cities respond to climate change. In other cases the CCCI work forms the beginning of new policy formulation that seeks to position local responses to climate change at the centre of urban governance responses. These climate change governance responses are thus characterized as multi-scalar in nature. They interact with

existing institutional configurations (Hodson and Marvin, 2010, Bulkeley and Newell, 2010) and include a range of urban intermediaries beyond the state (Biermann and Pattberg, 2008), together with the everyday strategies mobilised by urban dwellers to navigate multiple and changing environmental conditions of city life (Simone, 2010).

This paper is part of a project initiated by UN-Habitat to fulfil this objective of linking research and policy-making to develop knowledge sharing and dissemination partnerships between UN-Habitat and those working across the science/policy-making interface. The aim is to generate dialogue and co-production of urban climate change knowledge and policy between researchers, city officials, local communities and other urban intermediaries (Joshi and Moore, 2004, Parnell et al, 2009), and to more effectively disseminate UN-Habitat's wealth of empirical evidence concerning climate change and cities across the West African region. This paper focuses on two divergent examples to provide an overview of the climate change vulnerabilities facing two contrasting West African cities. It examines the challenges these vulnerabilities pose, specifically concerning impacts upon existing economic activities and the dynamics these processes may produce around development. We examine comparatively how the different contexts (institutional, climate, resources, actors, risks) of each city shape how they respond to these emerging processes in relation to vulnerability and development. We use case studies of the coastal city of Saint-Louis, Senegal and the semi-arid Sahel city of Bobo-Dioulasso, Burkina Faso to compare the similarities and differences that constitute the relationships between and across climate change, vulnerability and development. Drawing on this work, we highlight the danger of generalizing about 'the African' or 'West African city' during research and policy processes, connecting to wider debates and critiques about urban theory, research foci and intellectual traditions concerning urban studies beyond the North (Myers, 2011, Robinson, 2002, 2011, Roy, 2009). Furthermore, the paper asserts the need to develop detailed research concerning what Robinson (2002: 531) terms 'ordinary cities' as a response to the "large number of cities around the world which do not register on intellectual maps that chart

the rise and fall of global and world cities". This is particularly important as climate change issues become increasingly urbanized across the region. Whilst there is much scholarship on climate change governance across global North cities and increasing work in high profile African cities such as Cape Town (Cartwright et al, 2012, Mukheibir and Ziervogel, 2007, Bulkeley et al, in review) and Mombasa (Awour et al, 2010, Kebede, 2012, Kithiia and Dowling, 2010), the paper illustrates the importance of engaging with 'ordinary cities' (Robinson, 2002, 2006) and the empirical, conceptual and policy perspectives that such work can generate.

We draw on primary data generated from UN-Habitat projects in both cities, reflections on the research and policy development processes, and the limited number of academic studies that have engaged with these cities. The methodologies involved in collecting the data informing this paper reflect both UN-Habitat's general approach and the different contexts in which the CCCI has engaged. In general terms, both initiatives have been conceptualised as moving from an assessment phase, where information and data is collected and evaluated in order to identify critical issues of vulnerability, to defining policy and actions over the long and short term, to the mobilisation of specific actions and/or advocacy for action by different actors, either public or private. The approach is close to action research and planning, where UN-Habitat promotes the gathering of existing information, the identification of gaps and the required further data collection, with a view to maximising use of existing knowledge and research, and stimulating its socialisation and collective analysis in view of action. The most important characteristic of this approach is that data and research are fed directly into the process, which defines and supports the development of policies and actions, which in turn provides further evidence to researchers. The intention is to promote innovative partnerships between universities, local governments and communities and to provide useable scientific knowledge for decision-makers.

In Bobo-Dioulasso, the research began in 2009 and incorporates: a series of workshops with various urban actors; a survey of 120 members of the wider public focused particularly on women; interviews with urban intermediaries; and public forums across three districts of the city, bringing together over 100 opinion leaders to explore how climate change may affect everyday lives of urban dwellers. This research culminated in a workshop in October 2011 and a commitment by Deputy Mayor Sanou to draft a strategic development plan, to create a climate change unit within the municipality and to launch a climate change charter for the city (UN-Habitat, 2011c). The research demonstrates how engaging with multiple stakeholders and developing data resources can provide the basis for emerging governance responses at the city level.

In the case of Saint-Louis, the city linked to the CCCI program in 2010. However, researchers and policymakers were able to draw on a longer history of climate change research and action in the city. This focuses on flood risks in the city (Diagne, 2007) and includes the 2010 ARCADIS research program, using community knowledges, remote sensing and GIS to develop models that can be used by the municipality in climate change planning (Seck, 2010). Work on the CLUVA (Climate Change and Vulnerability in Africa) project to develop a city profile of climate change, prioritization of risks, identification of urban hotspots, brings together historical data and various urban intermediaries to take forward climate change responses. Whilst data collection has been problematic, the experiences of locally-based researchers and policymakers have helped to navigate some of these problems. Both cities, like many 'ordinary cities' in the region, can be characterized by an absence of spatial data; the CCCI has helped not only to bring together existing information, but also to generate new perspectives and data sets relevant to climate change processes in these cities.

The paper draws on these methods and approaches to highlight the possibilities for creating context-specific knowledge that takes account of geography, governance, economic and cultural

issues, which in turn shape development vulnerabilities and responses to them. It also illustrates some of the tools and approaches, including the use of different urban actors and working across projects and initiatives of different nature, which enable the gathering of such information, its discussion with the involved urban communities, and its use in orienting policy making. Some of these processes are extremely local, rarely documented and, therefore, difficult to discuss, evaluate and disseminate. Consequently, this paper aims to make such practices more visible and part of the debate, pointing to avenues through which policy makers and practitioners, particularly at the global level, can access or build on them. We argue that is important for policy-makers and practitioners not to attempt to generalise about 'the West African city', but to compile geographically and place-specific evidence across the region so that understandings of vulnerabilities match actual existing conditions in these urban spaces, which is essential in the development of climate change responses. Therefore, the paper outlines the different vulnerabilities facing Saint-Louis and Bobo-Dioulasso, the different impacts of these vulnerabilities on development, and the ways in which the cities are embedded in different national and local governance contexts that structure responses to these issues.

2. The impact of climate change on development

Focusing on how climate change produces and reshapes urban vulnerabilities that mediate development can form an important contribution to understanding how climate change will affect these two West African cities. Work to map urban vulnerabilities remains relatively recent in contrast to the ongoing national climate change assessments, strategies and plans focused on environmental and agriculture concerns (Moser et al, 2010). Where this work has been undertaken, it has tended to ignore the links between climate change, development and the economic dimensions of vulnerability across research, policy and debates (Hunt and Watkiss, 2011). Yet climate change impacts on economies are critically important in regions that may be

prone to what O'Brien and Leichenko (2000) term "double exposure' intersecting and mediating with ongoing development agendas. African cities are often thought of as vulnerable to climate change and to the inequalities in global economic and trade systems. However, the picture is dynamic and varied, with some regions or sectors having the potential to benefit from climate change (for example, agricultural yields may be improved by increased precipitation). In order to fulfil this potential, the capacity to adapt and change, which may be elusive in some contexts, is of critical importance. It is thus important to consider the differential impact of climate change on different social groups within cities. As Adger et al. (2003: 179) argue, "vulnerability to the risks associated with climate change may exacerbate ongoing social and economic challenges, particularly for those parts of societies dependent on resources that are sensitive to changes in climate". In West Africa, risks are most apparent in agriculture, fisheries and other components that constitute the livelihoods of rural and urban populations. Of significance is the fact that observed climate change, present-day climate variability and future expectations of change are changing the course of development strategies, with governments attempting to promote adaptive capacity in the context of competing sustainability objectives.

West Africa is increasingly urbanizing, with much of this growth concentrated in the coastal cities of the Gulf of Guinea, where over 40 percent of the region's population now reside (Toumlin, 2009). The Gulf of Guinea is considered a Low Elevation Coastal Zone (LECZ). Coastal cities, such as Saint-Louis, are exposed to sea level rises prompted by climate change and accompanied by increased frequency and intensity of sea storm surges, floods, gale force winds and tropical cyclones (Desanker 2009). These trends were evident during 1998 and 2000, when almost all of the districts of Saint-Louis flooded (Diagne, 2007). West African cities beyond the coastal zone, like Bobo-Dioulasso, are often located in the dry and arid Sahel belt, a transitional zone between the Sahara and the tropical coast that relies on fluctuating seasonal rainfall for its agriculture. This area is likely to experience some of the worst impacts of climate change, including increasing drought and desertification (Kandji, 2006, Thornton et al 2008),

which in turn are likely to have a significant influence on achieving the Millennium Development Goals (Kandji, 2006). The development implications of these climate change processes for cities in West Africa, located on the coast or in the Sahel, are as varied as they are stark. In a region already considered one of the poorest and struggling to formulate responses to diverse development issues such as poverty, food security and conflict, the impact of climate change threatens to further hinder development.

Urban vulnerability can be considered across a range of different contexts within these cities, from the physical landscape to social and economic contexts. As Satterthwaite et al. (2007: 9) suggest, "vulnerability to climate change is understood to mean the potential of people to be killed, injured or otherwise harmed by the direct or indirect impacts of climate change". As such it is apparent that climate change is likely to increase economic inequalities in cities such as Saint-Louis. Infrastructures and services are likely to be disrupted or fail, and a lack of investment and rights provides little in the way of a safety net, adding another, potentially catastrophic, layer to the wider development challenge for the region. As Davidson et al. (2003: 98) argue, "it is becoming increasingly clear that realization of the development goals can be seriously hampered by climate change", with the urban poor particularly affected (Hardoy and Pandiella 2009, Adger et al. 2003).

3. Bobo-Dioulasso and Saint-Louis: a comparison of climate change vulnerabilities and responses

Saint-Louis and Bobo-Dioulasso represent two West African cities that illustrate the diversity of climate change impacts and associated vulnerabilities, how these affect urban economies and development, and the different ways in which responses are being formulated. Although both cities are located in the West Africa region, they face quite different challenges with regard to

the impacts of climate change. In what follows, we discuss the climate change vulnerabilities, economic profiles, projected potential impacts, and emerging governance responses that are being formulated from these projections.

Both cities are important to their regional, national and international hinterlands, which means that climate change is a significant issue not just in the cities themselves, but also in their broader regions, whilst impacts in the broader region may also reverberate in these cities in a diversity of ways. Saint-Louis was the capital of French West Africa until 1902 and its population has grown threefold in the last 30 years to about 190,000 inhabitants, with projected estimated growth to 300,000 people in 2030 (Commune de St Louis, 2011). Bobo-Dioulasso is the second largest city of Burkina Faso, after the capital Ouagadougou, and its population has also increased dramatically from around 225,000 in 1985, to nearly 400,000 in 2006 (CCCI, 2010). This is projected to grow toward 800,000 by 2020 (ECOLOC, 2002).

3.1 Climate change vulnerabilities in Bobo-Dioulasso and Saint-Louis

The differences in climate change vulnerabilities facing the economies of the two cities are primarily a consequence of geographical location. Saint-Louis is located in the delta of the Senegal River, on several islands and on a narrow strip of sand separating the ocean from the river. Numerous islands fragment the city and encompass diverse human settlement patterns, from the very high density of Nguet Ndar, to the sparsely occupied area of Bango, where agricultural activities are prevalent. The city is built on alluvial land at a maximum of only 3.5 metres above sea level (UN-Habitat, 2011a). Any changes to river or sea levels leave the city more vulnerable to flooding, with resilience to floods and heavy rains reduced by the high water table (Diagne, 2007, Seck, 2010). Projected sea level rises may have a serious impact on the equilibrium between the river and the sea, causing infiltration of saltwater in the water table and

reducing the outflow of water from the delta into the ocean during floods, thus exacerbating seasonal floods (Seck, 2010). Along the coast, the dune strip (*Langue de Barbarie*) is exposed to the combined effects of currents and tides, erosion, and other morphological dynamics (UN-Habitat, 2011a), as well as increases in the intensity and frequency of storms and strong winds. Reduced natural vegetation, with increased human presence and badly designed human protection measures, has exacerbated dune erosion. Particularly disastrous was the creation of a channel in the dune strip south of Saint-Louis in 2003 (UN-Habitat 2011a). This breach was intended to facilitate water flow and save the city from an exceptional flood. It was successful in reducing the flood risk within the city, but the initial four metre opening has eroded to become a 2000 metre-wide opening, which has increased the movements of water between the ocean and the river, (UN-Habitat 2011a). Dune erosion increases the vulnerability of adjacent areas of the city, such as the low income fishing settlement of Nguet Ndar. These coastal areas are also affected by increases in sea temperature, with associated detrimental impacts on marine ecosystems and the livelihoods that depend upon these.

In contrast, Bobo-Dioulasso is located in the mountainous area of Hauts-Bassins. The climate is characterised by average annual rainfall between 900 and 1200 mm. The climate has two main seasons: a dry season from October to May and a wet season from June to September (UN-HABITAT, 2011c). Bobo-Dioulasso, like Burkina Faso as a whole, is experiencing a range of climate change-related phenomena that are becoming increasingly prevalent across the fragile Sahel region in which the city is situated. These processes include rising temperatures, reduced rainfall, drought, land degradation and loss of pasture (Zeng 2003). These transformations could become catastrophic for a country, already one of the world's poorest, whose economy is based primarily on climate sensitive agriculture (crop production, animal husbandry and forestry). Bobo-Dioulasso also faces a number of specific climate change challenges relating to its morphology and urban form, which, according to the results of the municipal unit CCCI, include flooding, heat waves, strong winds, rainfall variations and drought (UN-Habitat 2011c).

As in most of West Africa's coastal cities, climate change is bringing sea-level rises, heavier rainfall and higher temperatures to Saint-Louis. This represents perhaps the key focus of work concerning climate change vulnerability in West Africa and beyond (McGranahan et al. 2007). In contrast, the impact of climate change in Bobo-Dioulasso is characterised particularly by increased length and occurrence of drought during the dry season. However, despite this, much less attention has been paid to non-coastal West African cities and the potential impact of drought on agriculture and urban economies.

3.2 Urban economies

Fishing is the major economic activity in Saint-Louis, with a regional trading hinterland stretching as far as Bamako, Mali. A community of around 22,000 fishermen is located mostly in Nguet Ndar, a high density settlement with poor living conditions (UN-Habitat 2011a). Nguet Ndar is poorly serviced and overcrowded. It is one of the densest urban areas in West Africa, with over 50,000 people occupying less than one square kilometre and living in vulnerable conditions (Commune de St Louis, 2011). A key asset of Saint-Louis is its historic, cultural and environmental capital. Its historic centre was registered as a World Heritage Site by UNESCO in 2000. Tourism generated 97 billion CFA (USD.188 million) of gross revenue in 2000, becoming the second biggest economic sector after fishing (Commune de St Louis, 2011). Despite this, the tourism infrastructure in Saint-Louis – hotels, restaurants and some commercial activities – is limited to the central island, the south of *Langue de Barbarie,* and the reserves and national parks, all of which are vulnerable to sea level rises. Tourism influx is not high at present, but the city authorities are working on a range of strategies to support this important economic sector and the need to consider potential climate change impacts. Agriculture is also a major sector of the urban economy. Due to the presence of fresh water in the delta, the region of Saint-Louis produces over 48% of the national output of horticultural products (Commune de St Louis, 2011).

The overall state of development in the city is characterised by a number of limitations to economic growth. The environmental quality of urban settlement is poor, with serious problems in waste management and sanitation and other networked infrastructures. Thus economic growth is limited by lack of urban infrastructure (Commune de St Louis, 2011). The city is neither producing sufficient jobs, nor the revenue needed for service provision and management and has failed to attract significant new investment. The fragmented urban space across islands and neighbourhoods, with diverse cultures and economies, also constrains local economic development, such that the potential of the city as a regional transit and a commercial centre remains underdeveloped. Despite this, Saint-Louis remains a centre for rural-to-urban migration, but poor planning for urban growth has resulted in burgeoning informal settlements (particularly in Pikine) and encroachment into fragile and vulnerable flood-prone areas. With over 110,000 new residents expected in the next 20 years (Commune de St Louis, 2011), the city faces a number of development challenges to incorporate a growing urban population within the economy and to improve the livelihoods of its citizens.

The key economic drivers in Bobo-Dioulasso are somewhat different to Saint-Louis. The city has traditionally been a centre of industry and logistics through its excellent transport infrastructure, but it suffered relative economic decline in the early days of independence. Bobo Dioulasso's role as the economic capital of western Burkina Faso and the centre of the most agriculturally productive area in the country is important when considering climate change. The climate of the Hauts-Bassins region has long supported agriculture. The presence of water makes the soil easy to work and the wet season allows plentiful vegetation, which supports animal farming. The region is a major producer of cotton and corn, and is self-sufficient in sorghum, millet and maize production. Surplus production is exported to other parts of the country and to other countries in the sub-region. Horticulture, vegetable production and livestock are also important. Industry is dominated by agro-forestry-pastoral processing, with manufacturing and chemical industries also of significance. Agricultural and related sectors face

precarious futures, with increasing temperatures and periods of drought generating desertification across the Sahelian agricultural landscape (PANA, 2006). Previous droughts have brought a range of economic consequences to the city, including increased rural migration, a slowing economy and increasing periods of political tension.

Both Saint-Louis and Bobo-Dioulasso share a number of similar economic drivers, particularly growing populations and a reliance on natural resources and agriculture, alongside widespread conditions of poverty. They have also been pilot studies in the ECOLOC programme. This was launched in 1997 by the Club du Sahel Secretariat and the Municipal Development Programme (MDP) to stimulate local economic development, particularly through growth in agriculture and fishing. Considerable economic challenges remain for both cities, including large scale and entrenched poverty and a lack of well resourced urban governance that restricts economic development and reinforces urban vulnerabilities.

3.3 Development vulnerabilities to climate change

In both cities, development is at stake as populations increase, unemployment remains at high levels, and the main economic activities are threatened by the range of biophysical processes associated with climate change. Bobo-Dioulasso and Saint-Louis are vulnerable to the impacts of climate change in multiple ways. As we have seen, in both cities, this urban vulnerability is related to the wider environmental contexts in which the municipalities are located and how these intersect with ongoing economic activities. The nature of urban economies also creates different vulnerabilities to the impacts of climate change. In the case of Saint-Louis, vulnerability is related to the limited capacity of the local economic system and urban infrastructures to withstand the effects of sea level rises and coastal flooding (Seck, 2010). In the case of Bobo-Dioulasso, vulnerability relates to the wider agricultural production systems

(and associated industries) in the context of changing seasonal climate patterns, soil erosion, failing harvests and drought (ECOLOC, 2002). The key urban economic sectors are particularly vulnerable to climate change phenomena precisely because they are situated in fragile climate zones. Both cities exemplify the ways in which entrenched underdevelopment and structural problems reinforce the urban vulnerabilities of cities exposed to the changing patterns of climate.

A series of considerations around the manifestations of vulnerability in relation to development in both cities reveals the shared yet diverse urban economic futures they face in relation to climate change processes. Firstly, both cities are experiencing a series of interruptions and crises across traditional economic activities that depend heavily on environmental conditions, and are acutely affected by climate variation and extreme weather phenomena. The affects of climate change will not be distributed evenly, as some areas may gain from the changes and others are likely to lose significantly. However, agriculture in the urban hinterlands is likely to be negatively affected by changing rain patterns. Although predicted rainfall variation may be manageable with better technical capacities, traditional agriculture in the Sahel remains fragile, despite longstanding adaptations to the climate. Predictions from crop-climate models show that in tropical countries even moderate warming (1^{o}C for wheat and maize and 2^{o}C for rice) can reduce yields significantly because many crops are already at the limit of their heat tolerance (WDR 2008), and any reduction in productivity in the Sahel may have disastrous effects on the livelihoods of farmers. In the case of Bobo-Dioulasso, increased frequency of droughts could have severe consequences for agri-industries in the city (ECOLOC, 2003). Secondly, in the case of Saint-Louis, changes in ocean temperatures and acidity are likely to have significant economic effects on fishing productivity, which in turn will deplete the livelihoods of the thousands of fisherman and their households, particularly Nguet Ndar. Fishermen already describe a need to travel longer distances and stay out at sea longer in order to catch fish (Commune de St Louis, 2011). This comes with increased risk and reduced incomes within the

context of increasing extreme weather events. Thirdly, the increase in flood events, whether through coastal, flash or groundwater flooding, is having a major economic impact in Saint-Louis, particularly in areas that have expanded into flood prone zones, and in Bobo-Dioulasso where 20 percent of survey respondents identified this as the main vulnerability of the city (UN-Habitat, 2011c). In both cases, the economic infrastructures, assets and networks that sustain multiple economic activities are often interrupted, damaged or destroyed during these flood events. Damage to buildings and properties can have serious implications for vulnerable households already exposed to socio-environmental hazards. Urban flooding also creates a range of health dynamics that reflect and reinforce economic vulnerability, including increased disease vectors and epidemics, which can have devastating consequences for the livelihoods of households. Across flood damaged cities, businesses and other economic stakeholders often face damage and disruption, loss of produce, and disturbances within markets and transport infrastructures, which reveal the multiple economic vulnerabilities across a range sectors. In addition, climate change dynamics affect decisions on investments as they increase uncertainty in already uncertain investment conditions. Flooding constitutes a larger issue for Saint-Louis and its vulnerable coast line, but is also a threat to Bobo-Dioulasso, specifically in relation to crop damage and soil erosion. Fourthly, the economic vulnerabilities of significant numbers of the urban poor are evident in both cities. In the diverse urban poor communities that characterise both cities, damage and loss to infrastructure, services and shared assets can undo development and poverty alleviation strategies, and wider programmes of investment. In households that already operate under precarious conditions and often have few resources to sustain livelihoods, the economic repercussions associated with climate change dynamics provide an additional layer of vulnerability. Finally, in both cities urban growth is also likely to increase because of the reduced viability of agricultural economies in the hinterland, prompting a wave of climate change migrants responding to the increased disruptions to their livelihoods. This migration will exert pressure on already stretched urban infrastructures, networked systems

and the wider social, political and economic environments of Bobo-Dioulasso and Saint-Louis, leading to potential conflict and new vulnerabilities.

3.4 Emerging urban climate change governance

Both cities are actively engaged in planning and policy work around climate change issues that aim to respond to the range of impacts emerging from these processes. New forms of urban climate change governance are thus emerging from both cities. The CCCI programme in both cities aims at promoting political, technical, and social dialogue between the community, and local and national governance levels. These processes of urban climate change governance are characterised by a range of activities that seek to raise awareness of the challenges posed by climate change, identify the most vulnerable economic sectors and social groups, improve resilience to the vulnerabilities of the cities, and form a series of initiatives, programs and measures that illustrate both the similarities and differences of climate change responses in Bobo-Dioulasso and Saint-Louis. A range of work emerging from local, national and international intermediaries has been undertaken to support the urban governance of both cities in responding to climate change and economic vulnerability.

Firstly, there has been a long term effort to *build capacity and vision* across both municipalities supported by a range of local, national and international partners, revealing the multi-scalar nature of climate change governance (Bulkeley, 2010). For example, in Saint-Louis these activities, supported by UN-Habitat, include the Local Agenda 21 developed in 2008. In recent years, the Mayor has worked across various economic sectors to promote the importance of local intervention for adaptation and mitigation of climate change and in 2010, the city subscribed to the CCCI and to the 'Making Cities Resilient' Campaign of UNSDR. In Bobo-

Dioulasso, similar initiatives have characterised emerging climate change governance, revealing the multi-scalar nature of these responses, the need to increase municipal capacity, and the links being made between and across a range of urban policies and climate change programs. The second type of urban governance activity relating to climate change and economic vulnerability in both cities concerns *adaptation*. In Saint-Louis there have been a number of research and action-oriented studies to develop long-term adaptation responses predicated on generating and collating data on sea level rise and flooding (for example, the ARCADIS project). In 2011, the city developed a strategy document identifying five areas of action concerning coastal erosion, river dynamics and rainwater. This is a concrete effort to identify and define key interventions, such as increasing coastal defenses to improve urban living conditions, environmental management and economic development in the context of changing climate and the impacts associated with these changes. In Bobo-Dioulasso work is ongoing to identify key vulnerabilities, and to develop appropriate adaptation responses over the short and long term that will emerge from new institutional arrangements. The latter include the Climate Change Charter, the establishment of a dedicated unit within the municipality to deal with climate change, and the city's involvement in the Cities Alliance programme.

The third urban governance response to climate change, development and vulnerability in both cities relates to *public participation*. The cities have initiated consultation with residents, communication and consideration of cultural appropriateness in developing urban adaptation and mitigation measures. In Saint-Louis, the local knowledge of residents, particularly that related to important economic activities, such as fishing and agriculture, has informed climate change responses aimed at reducing economic vulnerabilities. Residents have been consulted in order to better understand the dynamics and changing patterns associated with climate change and to identify response options. In Bobo-Dioulasso there is a strong emphasis on strengthening education activities, building awareness, and promoting changes in attitudes and behaviour of

citizens around climate change impacts that were explored at the series of district workshops. In particular, the significance of the impact of urban deforestation in exacerbating some of the effects of climate change has been highlighted by urban dwellers, with over 60 percent of survey respondents wanting increased tree planting over the coming years (UN-Habitat, 2011b). To this end, greater community involvement and dialogue between urban actors is viewed by the municipal government to be a central component in approaching economic vulnerability and climate change. The objective of such dialogue is to gather information about the concerns of various actors related to the experience and impacts of climate change on livelihoods and urban life. It also aims at sensitization and clarification regarding climate change and its potential impact on residents. Of course, as in many cities across the region, questions still remain about the ability of the urban poor to fully participate in these processes and the politics of community involvement, but there are at least ongoing attempts to include their knowledge and experiences in current data gathering and policy formulation processes.

Fourthly, as part of the UN CCCI process, the *knowledge base and governance strategies* around climate change processes, urban vulnerability and responses are being developed to strengthen and develop capacity in responses to climate change vulnerabilities by focusing on local dimensions and taking into account factors such as gender. This activity seeks to access information and scientific research from academics and other experts on vulnerability and environmental dynamics. In Saint-Louis, Vision 2030 is an important outcome of these measures to improve the knowledge base and governance strategies of the city. The policy has a strong emphasis on securing development and is focused on a number of key areas including: environmental preservation; urban environmental management and sanitation; promotion of local economy and inter-municipal collaboration; dynamism of transport networks; and participatory democracy and citizenship (Commune de St Louis, 2011). In Bobo-Dioulasso the building of local understanding of climate change impacts and relating residents' experience to

policy development has improved knowledge relating to vulnerability. In particular, this has highlighted the significance of the impact of urban deforestation in exacerbating some of the effects of climate change. It has also revealed that residents in informal settlements are most vulnerable to flooding within the city, and most badly affected by a longer hot/dry season, high winds and heat surges. In both cities, an enhanced knowledge base has also revealed the significance of a range of measures to improve economic resilience to climate change processes. These include, for example, creating adequate infrastructure through better designed neighbourhoods, strengthening the network of storm water drainage, improved waste and garbage management, improved sewage and site sanitation..

Fifthly, in Saint-Louis, the *development of multi-scalar governance partnerships* across a variety of different actors is of particular significance, drawing in resources from beyond the city and illustrating the importance of climate change governance that involves multiple stakeholders. As an important centre for learning based around the city's university, and as a focus of international attention precipitated by both its history and exceptional environmental context, Saint-Louis has gathered support from a variety of actors besides UN-Habitat. These include the CLUVA project bringing together local and international academics, GIS mappers, communities and others, several city to city partnerships, as well as the involvement of international organizations such as UNESCO and UNSDR, generating a complex mosaic of various actors involved in research and governance. Bobo-Dioulasso, with its less developed international network, is much less able to attract international interest and attention. In this sense it shares the relatively more obscure destiny of the many intermediate 'ordinary cities' (Robinson, 2002, 2006) across the West African region. The significance of these partnerships is quite considerable for Saint-Louis, which has received advice, expertise and resources from a plethora of partners, enriching the range of options being considered and the depth of analysis. For Bobo-Dioulasso, access to the international arena provided by UN-Habitat has been a key

element of capacity development. It has also linked the city into national-level climate change governance such as the National Action Adaptation and Climate Change (2007) and ongoing municipal level developmental agendas.

In both cities local knowledge development and the processes described above have led in the past few years to the development of policy responses that attempt to address some of the key climate change challenges. In Saint-Louis, where changes related to sea level rise are particularly worrying for communities residing along the coast, processes of relocation have been agreed and are being implemented, particularly for the most exposed residents in Nguet Ndar. Although limited in scale while research continues, they nonetheless represent a success in terms of increased awareness and mobilization of resources. Similarly, horticultural activities are being reassessed and there are plans to develop new areas, more protected from salinization and erosion (Commune de St Louis 2011). Difficult choices lie ahead as the city reconsiders its expansion plans and how to make use of the very valuable yet fragile environments for tourist development. The need to also reconsider modalities of protection against floods has sparked an interesting debate on housing typologies and building techniques, where the possibility of building in a more resilient way vis-a-vis floods, and creating urban structures more permeable to water, is being considered. In particular, the introduction of drainage channels and the construction of higher buildings is a possible solution. In Bobo-Dioulasso, workshops with local stakeholders (conducted by the municipality and UN-Habitat) has clarified the roles diverse stakeholders in the city, organizing them in order to provide solutions to climate change vulnerabilities through concrete measures such as drafting a new municipal charter (UN-Habitat, 2011c). For example, in future years, the local meteorological service will be expanded to enhance the city's technical capacity to update data on hazards and vulnerabilities, and to provide the population with better information on temperature changes and potential pluvial floods. In addition, the municipality has also decided on steps for effective land use planning

and investment in risk reducing infrastructure, and for protection of the eco-system. For now, the main obstacle for Bobo Dioulasso's climate change governance, common to many 'ordinary cities' of the region, remains insufficient financial and human resources.

4. Conclusion

The Saint-Louis and Bobo-Dioulasso case studies suggest that making sense of the intersections between climate change, vulnerability, development and emerging urban governance responses requires a strong understanding of local economic and social contexts, so that initiatives target the most effective measures and important sectors. Local development in a context of climate change requires faster capacity to adapt and change, and a responsive institutional environment in which to undertake these changes. In contexts where primary activities (such as fishing and agriculture) are predominant, impacts are bound to be higher. There is also a need to integrate responses that are innovative and preserve the environment while simultaneously including the multiple forms of 'traditional agriculture' and local knowledges, which have responded to the fragile environmental histories of the Sahel (Mortimore, 2010). Examples include proposals to develop urban agriculture (Saint-Louis) and urban re-forestation (Bobo-Dioulasso). While these are still proposals rather than detailed policies, they require a new look at urban planning standards and approaches, alongside the development of new building techniques and typologies that are more adapted to water prone environments.

The case studies also suggest that there is a need to analyze broader issues that hinder adequate climate change responses in relation to development, suggesting that urban climate change governance cannot just stop at the city boundaries. In the case of the Senegal River, and Saint-Louis specifically where there has been longer-term planning for climate change impacts, the overall management mechanism could be questioned to better understand why the impact of

water control mechanisms (principally dams) has not improved. Such questioning might also better understand the ways in which available water could be more effectively used for economic development in a region that has huge water deficit for some periods of the year. In the case of Bobo-Dioulasso, better planning mechanisms need to be in place at the municipal level to deal with climate change. The municipality acknowledged the importance of climate change in 2001, when it started to adapt its urban policies through the Strategic Water Sanitation Plan. In 2002, it developed a waste management plan and began cooperation with UN-Habitat in 2004 on a range of urban infrastructure issues that can be considered directly related to improving development. Indications for future management are good. In 2011, the city started to garner support for the development of a City Development Strategy, which could work on integrating the various economic dimensions of sectoral development and of climate change responses into a strategy to bring together and prioritise interventions. The establishment of a dedicated unit within the municipality to deal with climate change is also envisaged and the issue of climate change could be a key consideration in the City Development Strategy formulation now that sufficient awareness has been raised about the need to consider climate change impacts on development. In both cities, it is now also acknowledged that climate change planning has implications for sectoral policies, such as economic development, basic service provision and for waste management.

Through these two case studies, this paper has highlighted three specific issues. Firstly, development has tended to be relatively neglected in discussions of climate change in West African cities that have focused on physical vulnerabilities (Hunt and Watkiss, 2011), yet climate change, urban vulnerabilities and development are interrelated. Through direct impacts, such as the damage and destruction of infrastructures and property caused by climate change-related events, the development of both Bobo-Dioulasso and Saint-Louis can be considered vulnerable, threatening productivity, economic opportunity and the livelihoods of citizens. This highlights the need for increased policy and academic attention that can analyze and address

these dynamics. Secondary impacts, such as migration from drought affected hinterlands, also create and reinforce the vulnerabilities of these cities to climate change processes, hindering the economic aspirations of Bobo-Dioulasso and Saint-Louis as they seek to develop their urban economies. Further work is needed by both policy makers and researchers to explore at the urban scale the multiple processes that are mediating and being produced by and through climate change in the context of development. Whilst this work has begun there is significantly less focus on the climate change vulnerability at the wider urban and regional scale and across different economic sectors within cities. The importance of this work is to understand how these impacts on the wider urban economy will reinforce, reflect and create vulnerabilities across the city and the need to develop adaptation responses to these issues.

Secondly, the case studies illustrate that it is counter-productive to generalise about 'the West African city' or rely on existing literatures of global North and 'high profile' African cities when assessing and responding to the challenges posed by climate change to economic development. Saint-Louis and Bobo-Dioulasso face different climate change issues, which will have differential impacts on development; the cities are also embedded in different national and local governance contexts that structure responses to these issues. Therefore, there is a need for context-specific knowledge, which takes account of geography, different climate change challenges, urban governance, and economic and cultural issues that in turn shape the economic development vulnerabilities and responses across 'ordinary cities' (Robinson, 2002, 2006). Such work can illuminate not only the localised relations between climate change and cities, but may also offer a platform to 'speak back' to wider policy and conceptual debates concerning these issues that are normally predicated on the 'usual suspects' of high profile cities (Robinson, 2002). The compilation of geographically and place-specific evidence, such as that being generated by UN-Habitat, is vital so that knowledge and good practice might be disseminated in appropriate ways. The diversity of urban West Africa presents serious challenges to understanding and acting upon the relationship between climate change and development.

However, this complexity should not militate against the effective sharing of knowledge and good practice, and instead might provide a better indication of where certain types of adaptation might work more effectively to support economic development in this region.

Thirdly, and following on from this, the Saint-Louis and Bobo-Dioulasso case studies reveal the value of localised knowledge and the ways in which this might effectively inform best practice and knowledge sharing through urban governance strategies. The case studies point to the significance of combining analysis of climate and environmental phenomena from a scientific point of view with detailed information from the communities that live and experience environmental processes as part of their daily livelihoods (Kithiia, 2011). They also suggest that this combined approach is a key element in developing appropriate responses. Of critical importance is the need to disentangle the knowledge of the community from perceptions of possible policy responses. In fact, in situations often inflected by a lack of trust between the population and public powers (or elites, including researchers), the people may tend to orient policy responses on the basis of 'interests' that may not be well articulated. While it still may be difficult to properly include marginalised communities in the knowledge-sharing and planning processes around climate change adaptation, efforts to do so in both these cities are likely to produce more appropriate adaptations than previous planning responses have managed. Such work must draw on the everyday strategies of incrementalism and improvisation (Simone, 2010) that characterize these urban spaces and show "the ways in which spontaneous adaptation occurs and can be supported" (Moser et al, 2010:55), whilst remaining focused on the ongoing conditions of poverty that hinder current development agendas (Kithiia, 2011).

Finally, the paper illustrates the growing importance of climate change governance at an urban scale (Bulkeley, 2010, Bulkeley and Newell 2010) and the need to conduct detailed research around new and emerging institutional arrangements, processes of co-production and forms of governance in order to consider how 'ordinary cities' are responding to climate change

imperatives, and the range of ways in which these dynamics will influence ongoing development work and socio-environmental relationships. In responding to Robinson's (2002) call to study 'ordinary cities', both in relation to vulnerability and emerging climate change governance, such work can reverse the flow of knowledges and actions from the global North, providing pathways for ordinary cities in the North and South to conceptualize, approach, study and respond to climate change at a municipal level.

As Kithiia (2011) argues, implementation of effective climate change policies needs strong institutional frameworks and integration across multiple agencies at the municipal level. This paper reveals some of the ways in which the apparatus to address these issues is being assembled in two ordinary West African cities. This is particularly important, both in addressing the vulnerabilities of urban dwellers and also in relation to future flows of adaptation and mitigation capital, which are estimated to rise up to $275 billion per annum (World Bank, 2010). This will prompt the need for municipalities to create partnerships with academic institutions, NGOs, development agencies, and to use national and international technical assistance (Beltran, 2012), in order to create the knowledge base and resources to access these flows of investment. Cities such as Saint-Louis and Bobo Dioulasso, with the support of UN-Habitat's CCCI are making tentative steps toward these institutional arrangements.

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