

South African coastal cities' response to climate change adaptation: moving from projects to process

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Introduction

Rising rates of urbanization accompanied by increasing consumption puts the spotlight on how cities can mitigate and adapt to climate change (Wilbanks et al. 2007; Satterthwaite et al. 2007). Globally, cities are starting to develop policies and plans to adapt to the impacts of climate change (Birkmann et al, 2010; Corburn, 2009; Horton et al. 2010). This is in part driven by the international scientific community that is encouraging adaptation as an important and urgent way to complement on-going mitigation efforts, that have formerly tended to dominate policies and finance (Pielke et al. 2007, Romero-Lankao 2008). It is also driven by a bottom up response that reflects an awareness of the need to better plan for climate variability in order to increase the resilience of cities and protect its inhabitants.

Although the focus on urban adaptation has emerged more recently than earlier adaptation research that tended to focus on sectors such as agriculture, coasts or biodiversity, cities are catching up and developing adaptation responses (GLA 2010, Storch et al. 2009, Bloomberg et al. 2010). Despite urban adaptation plans being developed fairly rapidly, many are slow to be translated into action, with the peer-reviewed literature mirroring limited evidence of adaptation actions (Granberg and Elander 2007, Heinrichs et al 2009, Birkmann et al. 2010). Developing policy is an important step but translating policy into practice is often where the barriers to adapting start to emerge more clearly. Using a governance lens is helpful in highlight the different nature of barriers that can include issues related to information, knowledge, perceptions, policy, finance, capacity and cooperation. This is particularly important in urban areas, where different actors often have different goals and social, economic and ecological responses need to be integrated within urban policy priorities. Municipalities are an important actor in the sense that they manage cities at the meso scale and play a key role in multi-level governance because of their link to the local and national scale (Corfee-Morlot et al. 2009). Exploring municipalities' adaptation to climate change through a governance lens is therefore of paramount importance in order to overcome barriers where possible.

Many cities in the global South have been slower to develop adaptation responses than some cities in the global North. However, two cities in South Africa, eThekweni and the City of Cape Town, have been leaders in establishing adaptation policies and plans (Roberts 2008, Cartwright et al. 2008, Satterthwaite et al. 2007, Mukheibir and Ziervogel 2007). These policies and plans are slowly being translated into action. This paper explores how eThekweni and the City of Cape Town have engaged in climate

change adaptation, what the barriers and opportunities have been and where future efforts need to focus. A framework for assessing the barrier and opportunities is developed from the literature to help position support for adaptation to climate change to address specific needs such as knowledge gaps, action gaps or institutional gaps. This is important in developing lessons for other global South cities, where there are large numbers of people exposed to climate hazards and adaptation policies and plans might not have been well developed. Because climate impacts are one of numerous other challenges, it is necessary to carefully position adaptation within a complex political and institutional landscape (Ziervogel et al. 2010).

Moving from projects to process

Much of the early adaptation research focused on sectors, particularly agriculture, water, coasts and later health. Within southern Africa and in other areas there was a focus on the rural context with agriculture being a primary focus in terms of the climate change impacts and potential responses (Downing et al. 1997; Easterling et al. 2001; Adger et al. 2003). Research explored crop varieties and how they might be changed, agricultural management techniques, the use of seasonal climate forecasts to prepare for annual climate variability (Dixon et al. 2003, Patt et al. 2007, Ziervogel et al. 2006) as well as the recognition that non-agricultural livelihoods may need more support in future (Mortimore and Adams, 2001, Eriksen et al. 2005, Reid and Vogel, 2006, Ziervogel and Taylor, 2008).

Although human settlements were included in the 2001 Intergovernmental Panel on Climate Change (IPCC) report (Scott et al. 2001), a more nuanced research focus on urban adaptation issues has taken longer to emerge than some of the other sector foci. In southern Africa, this has been the case but it is rapidly changing (Parnell et al 2007, Roberts 2008, Roberts 2010, Ziervogel et al. 2010). Reasons for the growing focus on urban areas and climate change are clear; cities consume energy and produce waste, have high vulnerability because of their concentration of people and services but also have resources and experience in managing complex problems (Betsill and Bulkeley, 2006; de Sherbinin et al. 2007, Satterthwaite et al. 2007, Winsvold et al. 2009). In addition, cities have experience in engaging stakeholder participation and linking to national government (Betsill and Bulkeley, 2006).

Much of the early adaptation research and practice started by focusing on the information needed to adapt and technical solutions (Ziervogel et al. 2006; Smit et al. 1999). For example, early adaptation responses to coastal vulnerability included suggestions of shoreline stabilization and to manage future water stress, responses included improving storage or increasing interbasin transfers (Dixon et al. 2006). This research soon evolved to recognize that understanding the institutional context of adaptation projects is key and that the process of adaptation and learning is as important as the technical solutions and information available (Armitage et al. 2008, Inderberg and Eikeland, 2009; Lonsdale et al. 2008, O'Brien et al. 2009, Pahl-Wostl et al. 2007, Tschakert and Dietrich 2010). A richness of social science expertise was more systematically included in the field of adaptation with a focus on the people, associated institutions and explorations of how science needs to be made policy relevant (Adger et al. 2005, Pelling and Dill 2009, Pelling et al. 2007, Vogel et al. 2007, Parnell et al. 2007).

Within the field of adaptation to climate change, a more recent focus on governance has

started to emerge (Adger et al 2005, Adger et al. 2009, Granberg and Elander 2007, Jordan 2008, Urwin and Jordan 2008). The International Human Dimensions Programme on Global Environmental Change has started an Earth System Governance programme that suggests a focus on the architecture of earth system governance, of agency beyond the state, of the adaptiveness of governance mechanisms and of their accountability and legitimacy, and of the modes of allocation in earth system governance (Biermann et al. 2009, Biermann 2007). Support for adaptive governance recognizes the institutional constraints but focuses on the interaction between actors and the environment recognizing the need for reflexive processes that incorporate learning (Folke et al. 2005, Kemp and Martens 2007).

A focus on governance supports a focus on process; a process through which goals are defined and pursued collectively with government being one of the actors in this process (van Zeijl-Rozema et al 2008, Betsill and Bulkeley, 2006). The shift in focus from government to governance encourages the exploration of how government relates to a wider range of actors and institutional contexts (Betsill and Bulkeley, 2006, Nelson et al 1998). Relating this back to adaptation, as many scholars are doing, is important because effective governance systems are necessary to realize adaptive capacity (Moser, 2009) particularly in the context of climate change as a complex problem (Duit et al. 2010).

The advantage of urban adaptation issues being a more recent exploration is that instead of starting with a focus on technical responses, it has been quick to include a focus on governance as an important lens through which to understand adaptation (Betsill and Bulkeley, 2006). This is particularly important when seeking to understand who adaptation responses benefit, bringing in issues of power as well an understanding the regulatory and institutional barriers and opportunities for successful adaptation responses (Biesbroek et al. 2009; Moser, 2009).

The exploration of barriers to and enablers of adaptation is a growing focus in the literature (Biesbroek et al. 2009; Inderberg and Eikeland, 2009). It is clear that innovation is required because of the complexity of the challenge, including the number of actors involved, the temporal and spatial scale and the need to engage in multi-level governance. Unfortunately the complexity of the policy field can hamper innovation (Winsvold et al 2009), which is why a focus on coordination is important. However, coordination alone is not enough. Understanding the perception of the need, the regulatory constraints and the political pressures are important in unpacking the ability to innovate further. Although these issues of policy, process and institutions are critical, it is clear than understanding current projects and action and the knowledge on which they are based is still critical. For this reason, an integrated framework is needed to assess urban adaptation processes that includes an understanding of the technical, scientific and institutional challenges that are underpinned by an understanding of the governance context.

In order to have a framework for assessing barriers to adaptation, we focus on two areas that Winsvold et al. (2009) suggest undermine effective urban adaptation; that of knowledge and that of action. They suggest that the knowledge problem can be addressed by enabling knowledge transfer and collective learning, and that the action problem can be addressed by motivating a wide range of actors and including them in a

coordinated process, recognizing that innovation can be hampered by the complexity of the policy field. In addition to this, it is evident that it is often institutional constraints that limit adaptation (Inderberg and Eikeland, 2009). This supports the move in focus, as observed in the literature, from projects to process, as stressed by Inderberg and Eikeland (2009) who suggest that resources and technology are little use if institutional factors hinder their implementation and undermine proper adaptive measures. They suggest that organizational ability to implement feasible actions is critical which is learnt through interacting and doing.

We propose that in order to explore the barriers and opportunities for urban adaptation, governance should be the lens through which the data is explored. Through the governance lens, Winsvold et al.'s (2009) focus on knowledge and action can be combined with an assessment of institutions including formal regulations, to provide a frame to assess current adaptation processes.

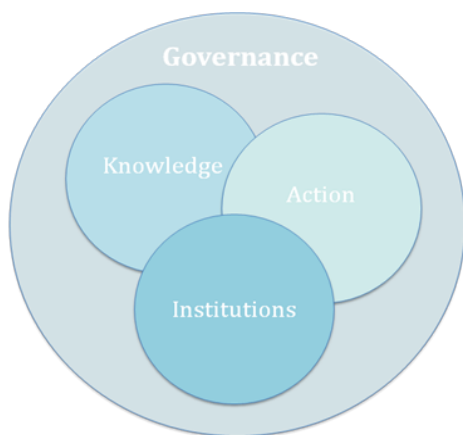


Figure 1: Framework for assessing adaptation barriers and opportunities

Included in the knowledge problem is the state of information about climate impacts and risks as well as the perceived need to respond to climate change. The action problem includes inter-governmental cooperation and leadership as well as capacity to act. Importantly this includes action that is project specific as well as action around processes. Lastly, the institutional problem focuses on existing policies, mandates and finance that support or undermine desired adaptation responses. The governance lens is then used to pull these three problems together and identify any overarching governance challenges that need to be addressed to enable a holistic urban adaptation response.

Case studies: City of Cape Town and eThekweni

This paper focuses on the two largest coastal cities in South Africa – the City of Cape Town, in the south west of the country and eThekweni municipality, formerly known as Durban, on the east coast. The analysis in this paper is based on interviews in each of these metros undertaken in early 2010 with 6 government actors all involved in adaptation in their different capacities. The interviews were analysed using Nvivo content analysis software. The interviews were undertaken as part of a study to understand current adaptation responses and challenges in 5 coastal cities in South Africa, with the view to strengthening the coastal cities network and identifying issues to take up with national government in terms of further support for adaptation at the local level.

The aim of the research is to explore how these two cities have institutionalized adaptation within their functions and the challenges they are facing in innovating around adaptation within city policies, plans and practice. First, an overview of the emergence of adaptation is presented before exploring the barriers and opportunities faced. Most of the barriers focus on the institutional and governance issues, highlighting the importance of framing this type of research within a governance context that includes space for the challenges of technicalities but recognized the development context, the relationship between actors and the unspecified mandates that many actors are challenged with.

Context

eThekweni and the City of Cape Town are two of the five biggest cities in South Africa, with these five cities providing 44% of national employment in 2001 (SACN 2006), highlighting the importance of large cities in South Africa's economy. These cities have diverse economies including private sector services and retail, providing important spaces for black economic empowerment and economic advancement, although many of the residents do not benefit from urban services, despite the intention of the Metropolitan cities to consolidate their fragmented municipal history (SACN 2006). Both cities have high urbanization rates matched by high levels of poverty, echoing the historic segregated apartheid city.

In South Africa, there is no legal or policy framework dealing specifically with cities. Rather, there is a national framework for local government within which policy and legislation of relevance to municipalities is situated (SACN 2006). Within this context urban agendas are developed, with city government aspiring to urban innovation led by a developmental state, with a focus on environmental sustainability, shared economic growth, social inclusion in the context of 'good urban governance' (Boraine et al. 2006).

Both eThekweni and the City of Cape Town are coastal cities, with their ports being key hubs for economic activities. eThekweni municipality encompasses the city of Durban, whose port is the busiest on the African continent and the biggest in terms of container capacity (<http://www.transnetnationalportsauthority.net>). Cape Town's port is smaller but also important for economic activity. eThekweni has 35km of coastline that has experienced severe storm surge in the past and expect more in the future and the City of Cape Town also has coastline that is vulnerable to storm surge and sea level rise. Both municipalities are tourist destinations with rich biodiversity.

Although eThekweni and the City of Cape Town share a number of characteristics, there are also a number of differences. eThekweni, in KwaZulu-Natal, sits on the east coast of the country with annual summer rainfall of around 1000mm, whereas the City of Cape Town, in the Western Cape province in the south west of South Africa, experiences a Mediterranean climate with the average annual rainfall being 550mm and falling mainly in winter.

eThekweni has 3.5 million people, an unemployment rate of 43 per cent, excluding those employed in the informal sector and high levels of HIV and AIDS (Roberts 2008). There is a significant proportion of tribal land within its borders which creates

challenges for planning, when the formal policies cannot always be followed because of the differences in tribal governance.

Climatic change is expected to decrease runoff by 158 million m³ per annum by 2100 in the Mgeni catchment because of increases in temperature and changes to rainfall variability, significantly impacting water resources that are currently stressed in terms of both quality and quantity (Roberts 2008). Direct impacts on health are expected due to heat waves and extreme weather events and impacts on biodiversity and infrastructure, agriculture and biodiversity are a concern (outlined in more detail in Roberts 2008).

The City of Cape Town (CoCT) has an urban and peri-urban population of near 3 million, with high levels of informality and in-migration. Water security is a concern, partly because of the geographic location on the drier western side of the country and partly because of growing domestic and agricultural demands. High numbers of informal dwellers have poor access to water and sanitation as well as experiencing annual flooding, alongside wealthy areas with access to cheap reliable water supplies (Smith and Hanson, 2003). In addition, the exposed coastline makes the city's residents, infrastructure and ecosystems vulnerable to storm surge and sea level rise (Cartwright et al. 2008). Overlay the expected climatic changes of increases in temperature and rainfall variability on top of attempts to redress inequitable access to water, housing and services and it becomes clear that adapting to climate change is critical.

Past adaptation processes

In eThekweni, the process of developing a municipal response to climate change started in 2004 when the Environmental Planning and Climate Protection Department started an impact analysis to inform a climate change response strategy that developed into their Municipal Climate Protection Programme (MCPP). When they started they did not use the term adaptation but rather started with an impact analysis that they thought would be the basis for formulating policy and strategy that would work its way through the usual local government cycle. However, council simply wanted to know how they were going to stop all of these climate impacts they had identifying and how these impacts would effect the strategic vision for the city. It was clear that an immediate work program was needed to explore the impacts in more detail and match local government responses to those.

One of the triggers for getting support for their work was a big sea event along the coast in 2007, rain storms that damaged properties in 2008 and two tornados that wrecked two informal settlements. These events assisted in getting politicians and senior officials to understand that there may be a problem. Although, they have found that recently there have not been these big events and it has become harder to access funding. Another benefit from the exposure of the big disasters is that an act was promulgated rapidly afterwards. When the politicians saw the extent of the storm damage, they recognized that an Integrated Coastal Management Act was needed urgently and it got pushed through the system.

The Environmental Planning and Climate Protection Department see themselves as an implementing agent but are faced with a resource and skills poor environment, which

determines what is politically prioritised. They feel that because of the pressure to ensure development-linked co-benefits adaptation responses have received more support than mitigation (Roberts 2010). There is more political support for them protecting the houses they have just built from an increased flood return level, than working with industry to reduce a gas that cannot be seen in the atmosphere.

In the City of Cape Town, climate change work started in 2001, driven by the Environmental Resource Management Department, where there was broad thinking around climate change, rather than a focus on adaptation or mitigation specifically. Momentum was gained partly because of the rolling blackout of the city which provided a key leverage point from an energy perspective. In the early stages there was external finance linked mainly to mitigation projects including the first Clean Development Mechanism (CDM) project in South Africa, Kuyasa, that implemented low-cost urban housing energy upgrades (Sutter and Parreño, 2007). In 2005 there were some local government positions linked to climate change funded, and through this an adaptation framework was developed by external consultants in 2006. After this the budget was cut along with the positions.

Although an adaptation framework existed it took a while for adaptation work to be developed. Some work was undertaken that focused on the coast (Cartwright et al. 2008, Fairhurst et al. 2008), where sea level rise modelling generated political interest in protecting the coastline. The coastal work has not been driven as an adaptation issue but rather it has been supported under coastal zone protection, with resilience to more frequent and extreme storm surge events linked to sea level rise being used as a key leverage point to build arguments of climate change adaptation.

Throughout this period there have been links to external academics, consultants and NGOs that have culminated in the recent City of Cape Town Climate Change Think Tank that brings together different groups to explore projects, policies and processes related to climate change in the city. One of the strengths of this is that the think tank is a starting point in terms of a collective responsibility around these issues that do not just stay with city officials but spreads between key people in society with the recognition that “we are all in this problem together” and need to find solutions collectively. Although there have been several political champions from the different ruling parties in the province, action has taken a lot of time and effort to get going.

The city currently operates in a crisis manner. Although flooding in informal settlements is a major challenge, many officials say that they expect it to flood every winter and they will respond to the crisis of people having to be relocated and given shelter and provisions. They say that a proactive response is challenging because if people are moved out of the flood prone areas, others will just move out in and there is limited land to move them too anyway. So flood preparedness is seen as an unmanageable thing and it is easier to deal with the crisis. It is clear from this example, and there are others, that socio-economic issues drive action in the City of Cape Town. Adaptation is something that “comes behind trying to shift changes” at present. There is the insight from those concerned with adaptation, that addressing both short and long term climate impacts is key to the city’s socio-economic and environmental sustainability.

Urban adaptation barriers

Knowledge and understanding constraints

One of the key issues identified in both eThekweni and the City of Cape Town is the perception within government and civil society that climate change adaptation is an environmental issue. As one of the officials stated, she sees it as “an economical issue, social issue, political issue and a sustainability issue, its all of those things”. Another official said that “climate change is a big threat and challenge to the social and economic fabric of society”, highlighting his desire to not see it positioned as an environmental responsibility. The concern is that if it stays in environment it will suffer, as it is so much broader and cross-cutting than that.

Another concern is the widespread belief that the impacts of climate can be dealt with as a crisis. When a crisis happens or things change beyond a certain point then an engineering solution will be found. As an official from the City of Cape Town articulated, adaptation requires a new kind of thinking:

“I think what adaptation really asks is for the first time for us to collectively, as communities, as a city, as administrators, as officials, to try and do something that is not very well done at the local level, which is forward planning - to think ahead and say if we do this now we will benefit later.”

But he recognized that this requires a huge shift in mindset, as by human nature we are bad at planning for the future.

Action constraints

One of the challenges identified in the City of Cape Town was an ambiguity as to who is responsible for adaptation, as was the case in earlier research on adaptation in the Cape Town water sector (Ziervogel et al. 2010). This ambiguity spreads across local government departments and spheres, inhibiting action on the ground. Part of the challenge is that there is not enough engagement and interaction between the three spheres of government (national, provincial and local) around the various roles. In order to be effective, roles need to be communicated effectively and well aligned in terms of both responsibility and coordination. This is particularly important for avoiding exposure to and recovering from adverse climate change impacts that often requires a holistic response rather than responses by one actor or group undermining that of another. Unfortunately there are examples of provincial and local government working at cross-purposes in ways that undermine robust adaptation.

Although in the City of Cape Town, politicians have understood some of the issues, getting action in place has been slower, although it has happened and is picking up speed. Everyone is doing their business as usual and adding another task to that adds additional burdens, so there is the recognition that institutional structure, including resources for personnel and finances for projects, will help to support action in future if matched with capacity development.

Institutional constraints

“The factor that determines success or progress in the sectors is not about technical skills or money, it’s about institutional hurdles” City of Cape Town official

In eThekweni, the climate function at the local level is not structurally based and not acknowledged. It is present because people have shown leadership on the issue because of their personal convictions rather than their mandate. Because of this, if those people disappear then the current climate change work is likely to disappear with them. In eThekweni they are running at fifty percent staffing capacity with tight budgets and urgent development pressures.

Politicians' limited long-term strategic thinking linked to election cycles is a key institutional constraint. They work in five year cycles and are concerned with whether they are able to engage in activities that will get them re-elected. Political short termism has been recognized internationally as limiting the ability to plan for long term risks, such as in coastal management in the U.K (Few et al. 2007).

Another key institutional constraint is finance. Currently actors are drawing on funding from their mandated activities and adding a climate component to the work they do in creative ways, but few are receiving government finance to explicitly work on climate change. Much of the funding is coming from international donors. A City of Cape Town official suggested that,

“until the city puts their own money into climate change investments they will remain vulnerable to international trends, to funding models, to donors coming in and out. A sensible city government approach requires the proper investment mechanisms to generate its own funding, or to have its own resources built up to deal with these issues. The ability to do this is very limited in South Africa given the current regulations.”

The current financial regulations hinder adaptation. Further exploration is needed into the options for changing financing in the near future. This will require engaging with municipal financial policy as well as focusing on departments having a climate change adaptation mandate so that they can access funds directly.

Linking back to the point discussed earlier, that adaptation is seen as an environmental issue, is the reality that it is therefore not held at a very high strategic level in the cities or provinces. In order to have a holistic approach it needs to be positioned at a higher level. This is also necessary to institute change across the organization, which is currently undermined because of the silo approach that the current government structure supports. To address this, relationships need to be built and champions found that can work within the current line functions and collaborate across departments and spheres.

Discussion

It is clear from the two South African cities explored here that although municipalities might be focused on getting adaptation policy and projects running, government officials are intimately aware of the governance challenges they face around knowledge, action and institutions in building up their adaptation work. We suggest that projects are an important step in bringing actors together and building momentum around issues, but it is clear that there are many processes that have contributed to building adaptive capacity. For this reason, a governance lens helps to look at

processes related to knowledge, action and institutions that can be addressed to better facilitate urban adaptive response.

Although governance barriers were not articulated as part of the adaptation process by the interviewees in many cases, we suggest that it is the process of adaptation and learning and the actions and institutions associated with adaptation that is key to assessing whether adaptation is happening successfully or not. In order to move forward, we suggest that the framework for addressing barriers to adaptation can be used to focus on governance responses.

In terms of the knowledge problem it is critical to broaden the understanding of climate change adaptation so that it is not seen as an environmental issue, but a development issue. This needs to be communicated to politicians, officials and civil society and a discussion needs to happen around how this might be done. Although in the City of Cape Town's the politicians and senior executives recognise and understand the role and importance of adaptation, this has been slow to translate into actionable support.

Another aspect of the knowledge problem is to improve the understanding of the role that local government can play in adapting to climate impacts. All local government actors were able to identify the importance of their contribution, however they felt there was not recognition of this from the national level. Local government felt that national government depends on them to implement policy and action and so they would value this recognition. Understanding the nature of the adaptation challenge is also important so that anticipatory adaptation can be supported rather than the crisis mode that tends to be the norm.

One of the key components of the action problem, as highlighted in the literature, is the necessity for adaptation to be addressed as a process where learning is supported. This support for learning requires recognition of this and the accompanying leadership to provide the space for learning. Within the City of Cape Town this has been recognized by those currently engaged in adaptation, with an official highlighting his recognition of the need for this,

“I think that the unique thing about adaptation is that everyone is learning as they go. There is going to be a lot of fumbling and a lot of mistakes made. So leadership is going to be critical in taking something forward that allows for errors to be made and for the process to unfold and to learn as we go. For adaptation to be successful it will require strong leadership that will stand in the face of interrogation.”

In addition to this is the recognition that it is hard to plan for impacts that may only happen in thirty years' time or may actually never happen. This means that success is measured over decades as opposed to over a short term time frame. Although there is recognition of the challenges around learning it is clear that more needs to be done to create a collective learning environment.

Another step towards addressing the action problem is to ensure the correct institutions are in place to support action and emerging leadership around climate change adaptation. Given that there is currently no mandate this makes it hard.

Institutional change is required to change mandates that will enable access to staff, budget, operational activities and for the issues to be mainstreamed in a way that does not depend on the initiating department self-funding all activities. As a eThekweni official said,

“If you get a mandate coming down from national, it gives us the capacity to build the skills, to put the people in place, to answer those questions, and that’s the point, we’re never going to be able to answer those questions, until we have actually got people working full time.”

One way of strengthening the mandate of cities is to put environmental issues into the constitution at local government level specifically, because that has been missed. Metropolitan municipalities need to be given the same powers and mandates as provincial government where currently the three-tiered governance system complicates the mandate at a local level.

In eThekweni, the Environmental Planning and Climate Protection Department recognized that despite there not being a mandate or political pressure, there was an opportunity. They facilitated the integration of adaptation work into the mainstream by working with different departments to assess their current work, resource limitations and business plans and how they might consider climate impacts. eThekweni also had a mayor that took on a stronger leadership role around climate change born out of his experience of the disasters beginning 2007 and particularly those in 2008/9 which hit local communities and resulted in losses of houses and deaths. Seizing these opportunities has been key to profiling adaptation in the early stages.

Addressing financial regulations is a significant barrier that has no clear resolution at present. There is no obvious way to change current regulations to build up financial resources beyond the current budget cycle, which requires a shift to longer-term thinking. From the interviews it is clear that when municipalities put their own money into action, there is greater ownership but because of the lack of mandate, money has to be used creatively to support adaptation work. Flexible international funding has enabled activities to get kick-started. Although future international funding is seen as a potentially important contribution, there was a strong sense from both eThekweni and the City of Cape Town that municipal budget needs to be ear-marked for adaptation activities to get city support.

Conclusion

The governance of adaptation within cities is complex, hampered by unclear mandates, institutional hurdles accessing finance and staff, and political ambiguity about its relevance within cities of the global South. We have argued that using Winsvold et al.’s (2009) framework of action and knowledge is a helpful start but that it is necessary to include an understanding of institutional barriers including key regulatory mechanisms that currently inhibit adaptation responses. The barriers to knowledge, action and institutions benefit from being explored through a governance lens to ensure that the holistic context of adaptation response is adequately captured and acknowledgement of process is prioritized above projects.

Innovative responses have emerged within eThekweni and the City of Cape Town, primarily because of individual leadership, responding to current climate risks that are threatening development and flexible funding. Although a small number of leaders started work in these two cities, recognition of the adaptation challenge is growing, although in fits and starts. However, the perception that it is an environmental problem is inhibiting the mainstreaming of adaptation across departments. Although both cities have a handful of adaptation projects, it is clear that addressing the challenges that have arisen from developing and implement these projects is as important as developing new projects. The reality is that it is easier to find funding for projects than for supporting processes such as changing cities' mandate. This suggests that both internal and external funding needs to be more responsive to supporting process, rather than the current preference for projects. Although the support for collective learning and adaptive management is supported in the literature, evidence for how it has been supported in cities of the global South is limited, suggesting this as an important area for future research.

This paper suggests that despite the barriers experienced, action and learning is happening in two coastal cities in South Africa, driven by local needs as well as international funding opportunities. However, support from the national level is lacking and the ability to change institutions is limited in many cases, although there are innovative examples of where shifts are happening. Understanding the complexes of knowledge, action and institutions through a governance lens can help to focus support for reducing the barriers to adaptation in cities of the global South.

References

- Adger, W. N., Huq, S., Brown, K., Conway, D. and Hulme, M. (2003) Adaptation to climate change in the developing world, *Progress in Development Studies* 3(3), 179-195.
- Adger, W. N., Arnell, N. W. and Tompkins, E. (2005) Successful adaptation to climate change across scales. *Global Environmental Change* 15(2), 77-86.
- Adger, W. N., Lorenzoni, I., and O'Brien, K. (Eds.). (2009). *Adapting to Climate Change: Thresholds, Values and Governance*. Cambridge: Cambridge University Press.
- Armitage, D., Marschke, M. & Plummer, R. 2008. Adaptive co-management and the paradox of learning. *Global Environmental Change*. 18: 86-98.
- Betsill, M. and Bulkeley, H. 2006, Cities and the Multilevel Governance of Global Climate Change. *Global Governance* 12 (2):141-159.
- Biermann, F., 2007. 'Earth system governance' as a crosscutting theme of global change research. *Global Environmental Change: Human and Policy Dimensions*. 17(3/4): 326-337.
- Biermann, F., et al. 2009. *Earth System Governance: People, Places, and the Planet*. Science and Implementation Plan of the Earth System Governance Project. Earth System Governance Report 1, IHDP Report 20. Bonn, IHDP.
- Biesbroek, G.R.; Termeer, C.J.A.M.; Kabat, P.; Klostermann, J.E.M. (2009). Institutional governance barriers for the development and implementation of climate adaptation strategies. International Human Dimensions Programme (IHDP) conference 'Earth System Governance: People, Places, and the Planet', Amsterdam, The Netherlands, December 2-4, 2009.

- Birkmann, J., Garschagen, MA, Kraas, F., Quang, N. (2010) Adaptive Urban Governance - New Challenges for the Second Generation of Urban Adaptation Strategies to Climate Change. *Sustainability Science*. 5. 2. 185-206.
- Bloomberg, M. R., Sachs, J., Small, G. (2010). Climate Change Adaptation in New York City: Building a Risk Management Response. *Annals of the New York Academy of Sciences*, 1196, 1, 1-3.
- Boraine, A., O. Cranshaw, C. Engelbrecht, G. Gotz, S. Mbanga, M. Narsoo and S. Parnell (2006) The state of South African cities a decade after democracy. *Urban Studies* 43.2, 259–84.
- Cartwright, A., Brundrit, G. and Fairhurst, L. (2008) Sea-Level Rise Adaptation and risk mitigation measures for the City of Cape Town. Report prepared for the City of Cape Town. Cape Town.
- Corburn, J. (2009). Cities, Climate Change and Urban Heat Island Mitigation: Localising Global Environmental Science. *Urban Studies* 46 (2):413-427.
- Corfee-Morlot, Jan, Lamia Kamal-Chaoui, Michael G. Donovan, Ian Cochran, Alexis Robert and Pierre-Jonathan Teasdale (2009), "Cities, Climate Change and Multilevel Governance", *OECD Environmental Working Papers N° 14*, 2009, OECD publishing.
- de Sherbinin, A., Schiller, A. and Pulsipher, A. (2007), "The vulnerability of global cities to climate hazards", *Environment and Urbanization*, 19, No. 1, pages 39-64.
- Dixon, R., J. Smith and S. Guill (2003) Life on the edge: vulnerability and adaptation of African ecosystems to global climate change, *Mitigation and Adaptation Strategies for Global Change*. 8. 2. 93–113.
- Downing, T.E., Ringius, L., Hulme, M. and Waughray, D. (1997). Adapting to climate change in Africa. *Mitigation and Adaptation Strategies for Global Change*. 2. 1. 19-44.
- Duit, A., Galaz, V., Eckerberg, K., and Ebbesson, J. (2010), Introduction: Governance, Complexity, and resilience. *Global Environmental Change*. 20. 363–368.
- Easterling, W. E., L. O. Mearns, C. J. Hays, and D. Marx (2001). Comparison of agricultural impacts of climate change calculated from high and low resolution climate change scenarios: part II. Accounting for adaptation and CO2 direct effects, *Climatic Change*, 51:173-197.
- Eriksen, S., Brown, K. and Kelly, P.M. (2005) The dynamics of vulnerability: locating coping strategies in Kenya and Tanzania. *The Geographical Journal*. 171. 4, 287–305.
- Fairhurst, L. (2008) Sea-Level Rise Risk Assessment: Risk and impact identification. Report prepared for the City of Cape Town. Cape Town.
- Few R, Brown K, Tompkins EL. (2007) Climate change and coastal management decisions: Insights from Christchurch Bay, UK. *Coastal Management*. 35(2-3): 255-70.
- Folke, C., Hahn, T., Olsson, P. & Nordberg, J. 2005. Adaptive Governance of social-ecological systems. *Annu. Rev. Enviro Reosur*, 30: 441-73.
- Granberg, M. and Elander, I. (2007) Local Governance and Climate Change: Reflections on the Swedish Experience. *Local Environment: The International Journal of Justice and Sustainability*. 12 (5). 537-548.
- Greater London Authority. (2010). The draft climate change adaptation strategy for London: Public Consultation Draft. <http://www.london.gov.uk/climatechange/strategy>

- Heinrichs, D. et al. (2009). Adapting cities to climate change: opportunities and constraints (findings from eight cities). Fifth Urban Research Symposium, Marseilles, France. <http://go.worldbank.org/P74DFSRCDO>
- Horton R, Rosenzweig C, Gornitz V, Bader D, O'Grady M. (2010). Climate risk information: climate change scenarios and implications for NYC infrastructure. New York City Panel on Climate Change. *Ann N Y Acad Sci.* 1196(1):147-228.
- Inderberg, T. H. and Eikeland, P.O. (2009). Limits to adaptation: analysing institutional constraints. In Adger, W. N., Lorenzoni, I., and O'Brien, K. (Eds.). *Adapting to Climate Change: Thresholds, Values and Governance*. Cambridge: Cambridge University Press. 433-447.
- Jordan A, 2008, "The governance of sustainable development: taking stock and looking forwards" *Environment and Planning C: Government and Policy* 26(1) 17 – 33
- Kemp R, Martens P. 2007. Sustainable development: how to manage something that is subjective and can never be achieved? *Sustainability: Science, Practice and Policy* 3: 1–10.
- Lonsdale K.G., Downing T, Nicholls R., Parker D., Uyarra M C, Dawson R., Hall J, (2008) Plausible responses to the threat of rapid sea-level rise for the Thames Estuary, *Climatic Change*, 91(1-2) (2008): 145-169.
- Mortimore, M. J. and Adams, W. M. (2001) Farmer adaptation, change and 'crisis' in the Sahel. *Global Environmental Change* 11, 49-57.
- Moser, S. C. (2009). Whether our levers are long enough and the fulcrum strong? Exploring the soft underbelly of adaptation decisions and actions. In N. W. Adger, I. Lorenzoni & K. L. O'Brien (Eds.), *Adapting to Climate Change: Thresholds, Values, Governance* (pp. 313-334). Cambridge: Cambridge University Press.
- Mukheibir, P. and Ziervogel, G. (2007). Developing a Municipal Adaptation Plan (MAP) for climate change: the city of Cape Town. *Environment & Urbanization*. 19(1).
- Nelson, L. Robbins, R. and Simonsen, B. (1998) Introduction to the special issue on governance. *The Social Science Journal*. 35. 4. 477-491.
- O'Brien, G., Devisscher, T., Downing, T.E. and Tellam, I. (2009) Conclusions. In Devisscher, O'Brien, O'Keefe and Tellam (eds) *The Adaptation Continuum: Groundwork for the future*. ETC Foundation.
- Pahl-Wostl, C., J. Sendzimir, P. Jeffrey, J. Aerts, G. Berkamp, & K. Cross. 2007. Managing change toward adaptive water management through social learning. *Ecology and Society* 12(2): 30. [online] URL: <http://www.ecologyandsociety.org/vol12/iss2/art30/>
- Parnell, S., D. Simon and C. Vogel (2007) 'Global Environmental Change: Conceptualising the Growing Challenge for Cities in Poor Countries', *Area* 39.3: 1-13.
- Patt AG, Ogallo L, Hellmuth M (2007) Learning from ten years of climate outlook forums in Africa. *Science*. 318. 49–50.
- Pelling, M and Dill, C (2009) Disaster politics: Tipping points for change in the adaptation of socio-political regimes, *Progress in Human Geography*. doi:10.1177/0309132509105004.
- Pelling, M., High, C., Dearing, J., Smith, D (2007) Social learning and adaptive capacity: surfacing the relational spaces of adaptation to climate change in organisations, *Environment and Planning A* 40 (4), 867-884
- Pielke RA, Prins G, Rayner S, Sarewitz D. Climate change 2007: Lifting the taboo on adaptation. *Nature*. 2007; 445:597-8.

- Reid, P. and Vogel, C. (2006) Living and responding to multiple stressors in South Africa—glimpses from KwaZulu-Natal, *Global Environmental Change* 16 (2) (2006), 195–206.
- Roberts, D. (2008), Thinking globally, acting locally - institutionalizing climate change at the local government level in Durban, South Africa. *Environment and Urbanization*. 20, 2, 521-538.
- Roberts, D. (2010), Prioritizing climate change adaptation and local level resilience in Durban, South Africa. *Environment and Urbanization*. 22, 2, 1-17.
- Romero-Lankao, P. (2008). *Urban Areas and Climate Change: Review of Current Issues and Trends*. Issues Paper for the 2011 Global Report on Human Settlements
- SACN (2006) *State of the Cities Report 2006*. Johannesburg: South African Cities Network (www.sacities.net).
- Satterthwaite, D., S. Huq, M. Pelling, H. Reid, and P. Lankao, 2007: *Adapting to Climate Change in Urban Areas: The Possibilities and Constraints in Low-and Middle-Income Nations*, IIED (International Institute for Environment and Development), London.
- Scott M., S. Gupta, E. Jáuregui, J. Nwafor, D. Satterthwaite, Y. A. D. S. Wanasinghe, T. Wilbanks and M. Yoshino (2001) 'Human settlements, energy and industry'. In J. J. McCarthy, O. F. Canziani, N. A. Leary, D. J. Dokken and K. S. White (eds) *Climate Change 2001; Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change*.
- Smit, B., I. Burton, R. Klein and R. Street. 1999. The science of adaptation: A framework for assessment. *Mitigation and Adaptation Strategies for Global Change*, Volume 4, Issue 3-4, pp. 199-213.
- Smith, L. and Hanson, S. (2003). Access to water for the urban poor in Cape Town: Where equity meets cost recovery. *Urban Studies*, 40(8). 1517 – 1548.
- Storch, H., Downes, N., Moon, K. (2009). *Climate Change and the Resilience of Megacities in South-East-Asia: Creating Risk-Based Climate Change Information for Ho Chi Minh City's Settlements*, Proceedings REAL CORP-2009, Tagungsband.
- Sutter, C. and Parreño, J. C. (2007) Does the current Clean Development Mechanism (CDM) deliver its sustainable development claim? An analysis of officially registered CDM projects. *Climatic Change*. 84 (1), 75-90.
- Tschakert, P. and Dietrich, K. (2010). Anticipatory Learning for Climate Change Adaptation and Resilience. *Ecology and society*. 15 (2).
<http://www.ecologyandsociety.org/articles/3335.html>
- Urwin, K. and Jordan, A. (2008) Does public policy support or undermine climate change adaptation? Exploring policy interplay across different scales of governance. *Global Environmental Change*. 18, 1, 180-191.
- van Zeijl-Rozema, A., Cörvers, R., Kemp, R., & Martens, P. (2008). Governance for sustainable development: a framework. *Sustainable Development* 16(6):410–421.
- Vogel, C, Moser, S, Kasperson, R and Dabellk, G (2007). 'Linking vulnerability, adaptation and resilience science to practice: Pathways, players and partnerships', *Global Environmental Change*. 17, 349–364.
- Wilbanks, T., Romero-Lankao, P., Bao, M. Berkhout, F., Cairncross, S., Ceron, J., Kapshe, M., Muir-Wood, R. and Zapata-Marti, R. (2007) "Chapter 7: Industry, Settlement and Society", in Parry, M., Canziani, O., Palutikof, J., van der Linden, P. and Hanson, C. (editors) *Climate Change 2007: Impacts, Adaptation and*

- Vulnerability, Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge and New York, pages 357-390.
- Winsvold, M., K.B. Stokke, J.E. Klausen, and I. Saglie, 2009: Adapting to climate change: Thresholds, values and governance. In: *Organizational learning and governance in adaptation in urban development* [Adger, W.N., I. Lorenzoni, and K. O'Brien(eds.)]. Cambridge University Press, Cambridge, pp. 476-490.
- Ziervogel, G., Bharwani, S. and Downing, T.E. (2006). Adapting to climate variability: Pumpkins, people and pumps. *Natural Resource Forum*. 30. 294-305.
- Ziervogel, G, Shale, M. and Du, M (2010). Climate change adaptation in a developing country context: The case of urban water supply in Cape Town. *Climate and Development*. 2. 94-110.
- Ziervogel, G. and Taylor, A. (2008). Feeling Stressed: Integrating Climate Adaptation with Other Priorities in South Africa. *Environment*. 50, 2. 32-41.