

Annexure D – Case study: Planning for climate change adaptation (and mitigation) in the city of Durban, South Africa

Module 2: The Practice of Urban Climate Change Adaptation and Mitigation

A. Project Overview

- 1. Name of Practice:** Climate change adaptation in the City of Durban.
- 2. Location.** Durban, eThekweni Metropolitan Municipality, South Africa.
- 3. Focus.** Climate change adaptation, with the focus on institutional arrangements and processes.
- 4. Partners.** eThekweni Metropolitan Municipality, local communities
- 5. Climatic zone/geo-physical context.**

<input type="checkbox"/> Polar	<input type="checkbox"/> Island
<input type="checkbox"/> Temperate	<input checked="" type="checkbox"/> Coast
<input type="checkbox"/> Arid/semi-arid	<input type="checkbox"/> River basin
<input checked="" type="checkbox"/> Tropical/sub-tropical	<input type="checkbox"/> High plateau
<input type="checkbox"/> Other: ...	<input type="checkbox"/> Mountain
	<input type="checkbox"/> Other: ...
- 6. Weather patterns and resulting vulnerabilities.**

<input checked="" type="checkbox"/> Rainfall patterns	
<input checked="" type="checkbox"/> Wind patterns	
<input checked="" type="checkbox"/> Annual temperature distributions	<input checked="" type="checkbox"/> Floods
	<input checked="" type="checkbox"/> Wind damage

Drought

Health risks attributable to changing climate

Landslides

Other: sea level rise, biodiversity, disasters, water scarcity

7. Stage. What is the current stage of the practice?

Planning and design

Implementation

Partly operational

Fully operational

Other: ...

8. Scale.

Country

Region

City

Town

Sub-district

Community/ neighbourhood

Other: ...

9. Duration. Various strategies between 1999 and 2010.

10. Summary. Durban has been successful in mainstreaming climate change adaptation measures into a number of sectors, and is regarded as one of the earliest adapters to climate change in the world. This case study is about Durban and the lessons that the city learnt from planning for climate change adaptation. This case study was specifically written for the UN-Habitat Cities and Climate Change Academy. The literature used to compile this case study was written by staff that was involved in the climate change adaptation process, and thus were eyewitnesses to the development and implementation of the adaptation strategy.

B. Detailed project information

1. Introduction

A new path of reconstruction and development was cut out for a post-apartheid South Africa in the form of numerous green and white policy papers, acts and regulations. Before 1994 in South Africa, environmental management received limited attention on a local government level. With the emergence of post-apartheid government structures after 1994 the development agenda was revised with a specific focus on environmental management. This however caused tension between the need to introduce environmental issues and concerns into planning, and the need to expedite development to address backlogs in housing and service and the transformation of the post-apartheid space economy. Given the mammoth development priorities, environmental concerns were regarded as less significant, particularly long-term concerns – such as biodiversity – that had no immediate bearing on the development agenda (Roberts, 2008 p. 523). This was also the case for the city of Durban in South Africa when it attempted to implement a climate change strategy.

The city of Durban is a coastal city, and the largest port on the east coast of Africa. The eThekweni Local Municipality is responsible for the planning and management of the city which is 2,300 square kilometres in area, has a population of 3.5 million people, and is the third largest urban economy in South Africa (Carmin, et al., 2012 p. 20; Roberts, 2008 p. 521; SACN, 2012). The city is faced with development challenges typical of post-apartheid metropolitan cities, such as high unemployment rates, structural poverty, backlogs in housing and service delivery and high HIV/AIDS infection rates – that are in many instances escalating. These challenges are very severe and immediate compared to challenges of climate change, which appear to be remote and less pressing in the short term (Roberts, 2008 p. 523). Municipalities in South Africa furthermore face a number of challenges in overcoming the apartheid spatial legacy: lack of funds; lack of technical, managerial, financial and planning skills and capacity to take up the developmental role; institutional transformation issues because of the amalgamation of municipalities; economic woes inherited from apartheid; huge service delivery backlogs; and intergovernmental misalignment and complexity (Van Huyssteen, et al., 2010 p. 27; Oranje, et al., 2011 p. 8).

Nonetheless, Durban has been successful in mainstreaming climate change adaptation measures into a number of sectors, and is regarded as one of the earliest adapters to climate change in the world (Carmin, et al., 2012). This case study is about Durban and the lessons that the city learnt from planning for climate change adaptation. This case study was specifically written for the UN-Habitat Cities and Climate Change Academy. The literature used to compile this case study was written by staff that was involved in the climate change adaptation process, and thus were eyewitnesses to the development and implementation of the adaptation strategy.

2. Long-term climate change impacts, extreme events and disaster risk

Durban regularly experiences flooding, drought, and severe storms – phenomena which are expected to increase as a result of the impact of climate change (Carmin, et al., 2012 p. 20). In 2006 Durban therefore commissioned a study into the long-term climate change impacts. The report called *Climatic Future for Durban*, indicated that by 2100 Durban would experience increased minimum and maximum temperatures; an increasing number of days with temperature exceeding 30°C; sea level rise at 2.7cm per decade; and increased rainfall variability. These changes will cause notable threats to residents through water- and vector-borne diseases, food- and water insecurity, coastal erosion, decline in tourism, infrastructure damage, and damage and loss of property, assets and livelihoods. It is also likely that Durban may experience in-migration as other parts of the country become dryer, placing a greater stress on available resources. The report furthermore indicated that climate change would impact negatively on the economic stability and development gains of the municipality (Roberts, 2008 p. 528; Carmin, et al., 2012 p. 21). Some of these threats and potential interventions are described in more detail below.

Water security

The quality and quantity of water sources and supplies in Durban are already under threat. Variability in the climate will impact negatively on water resources, resulting in shortages at the local level, and changes in distribution will result in infrastructure not being able to catch and store the runoff during severe storms. Adaptation to changes in water availability is therefore one of the most important adaptation measures for Durban. Integrated water resource management needs to be implemented to address both the supply and demand side, e.g. the water absorbing capacity of urban landscapes need to be increased; the urban drainage system needs to be improved; new structures and buildings should be located away from areas of high risk; and storm water retention ponds need to be created (Roberts, 2008 pp. 529-530).

Sea level rise

Durban has a naturally erosive coastline and one of the highest rising sea levels on the South African and Namibian coastlines due to the warming Agulhas current. The coastline with its settlements and infrastructure are furthermore exposed to storm surges, river flooding, shoreline erosion and the influx of biohazards. These challenges may intensify under climate change. A rise in the sea level could affect the well-developed coastline of the city, which would have detrimental consequences for tourism. Projections suggest that the low-lying central business district and the manufacturing centre could be negatively impacted by future sea level rise. The city has already developed setback lines and potential erosion lines to incorporate 1:50 sea storms and a 50-year sea level rise prediction. Proposed interventions include that for all new development excess runoff be contained on site, the height of the natural shoreline need to be increased, and the 1:50 year flood lines that have changed as a result of climate change be

mapped to identify sites and communities at risk (Roberts, 2008 p. 530; Mather, et al., 2011 p. 547).

Human health

Health will be threatened among others by the increase in heat waves and extreme weather events, both through disturbances to ecological processes that could cause an increase in infectious diseases and threaten food- and water quality and security, and through the vulnerability of water and sewage networks in informal settlements to flooding. Interventions should be promoted that ensures an uninterrupted electricity supply, provide more shade, increased water efficiency, and a public early warning system. A community response programme should also be developed (Roberts, 2008 p. 529).

Figure 1 – The erosion of the Durban coastline



(Roberts, 2008 p. 530)

Biodiversity

The impact of climate change on local biodiversity is not clearly understood. The impacts could include increased evaporation from water bodies due to higher temperatures, and a loss of important habitats and changes in the migratory patterns of species. Wetlands, already under pressure from development and groundwater abstraction, could be further threatened by changes in precipitation and its implications on water availability. Better data needs to be developed to understand the likely impacts of climate change on biodiversity (Roberts, 2008 p. 531).

Built environment

In future, the built environment would need to be able to endure greater exposure to severe weather events. Infrastructure is generally designed for climatic conditions of the past, which is no longer appropriate. If the projections are correct, then there will be an increase of at least 30% in mean annual rainfall for Durban by the end of the century, as well as an increase in the number of days with more than 10mm rain, and a change in the flood magnitude that could lead to significant higher runoff and stream flow which in turn could lead to an increase in flooding. New guidelines need to be developed to ensure safety and quality of life, to protect infrastructure and to reduce long-term costs. Road construction standards might need to be revised and routes at high risk of flooding need to be avoided. Furthermore the relocation of people and infrastructure away from high risk areas should be considered (Roberts, 2008 p. 531; Mather, et al., 2011 p. 546).

Disaster reduction

Disaster reduction strategies in Durban mostly concentrate on avoiding flooding and technological disasters, given that Durban is an important port city and industrial and petrochemical centre. The strategies do not engage proactively with planning for extreme weather events. The city needs to be more proactive in minimising the impacts from hazards by reducing risks and vulnerability and by enhancing coping and adaptive capacity (Roberts, 2008 pp. 531-533).

3. Mitigation and adaptation measures

Mitigation vs. adaptation

Cities are places where synergies between adaptation and mitigation are huge possibilities, though they differ in orientation and emphasis. Whereas mitigation focuses on the reduction of greenhouse gases (GHGs), adaptation engages in comprehensive actions to make cities more sustainable and resilient. Mitigation seems to be more popular in cities around the world. Many local governments have prioritised mitigation interventions in their initial engagement with

climate change whereas few cities have made concerted efforts to develop dedicated adaptation plans. Subsequently, there are more mitigation research, policies, programmes and interventions than adaptation. However, the focus on carbon reduction raises issues of equity about who is responsible for causing and addressing the problem. There is therefore often little political interest in mitigation-related issues in Africa. The few mitigation initiatives are driven by international donor funding, or national goals such as the reduction in electricity consumption. In Africa specifically, the role of early mitigation can be seen primarily as an adaptation tool to avoid the worst effects of climate change and to reduce long-term adaptation costs. The possibility exists that adaptation will become the main coping strategy in dealing with climate change (Mather, et al., 2011 p. 544; Carmin, et al., 2012 p. 18; Roberts, et al., 2012 p. 5).

Though Durban initiated a few mitigation projects since 2000, it had a strong and early focus on climate change adaptation. The main reason for the focus on adaptation is the need to improve the local level resilience due to disaster events linked to climate uncertainty. The focus on resilience simultaneously offer potential co-benefits for service delivery in a context of poverty and underdevelopment. In Durban there is the added pressure of ensuring that post-apartheid development gains are not lost or undermined, and that the development challenges are not exacerbated by climate change (Roberts, 2010 pp. 397-399). The remainder of the document describes how the adaptation strategy progressed, and the lessons learned in Durban during the process.

Development of the Durban Headline Climate Change Adaptation Strategy

When Durban sought to implement a climate change adaptation strategy, there was no institutional framework that required South African cities to pursue adaptation planning (Carmin, et al., 2012 p. 21). There were also few international adaptation norms and standards, thus the municipality consulted with various groups in the city, thereby also building support for the adaptation agenda (Carmin, et al., 2012 p. 24). Durban also partnered with the University of KwaZulu-Natal in 2011 to advance knowledge specifically on biodiversity conservation and management given global environmental change (Roberts, et al., 2012 pp. 9-10).

Durban addresses the challenges of climate change through its citywide Municipal Climate Protection Programme (MCP) that was initiated in 2004. As the range and extent of potential climate change impacts on the city became clearer, Durban realised that adaptation rather than mitigation was to be an immediate priority for the city (Roberts, 2008 p. 528). The adaptation work stream within the MCP was introduced in 2006 and was based on a vulnerability assessment of the city that is composed of three separate components: municipal adaptation (i.e. adaptation activities linked to the key line functions of local government), community-based adaptation (i.e. adaptation activities focused on improving the adaptive capacity of local communities), and a series of urban management interventions that address specific climate change challenges (e.g. the urban heat island, increased storm water runoff, water conservation and sea-level rise) (Roberts, et al., 2012 p. 6). Within the municipal component a Headline Climate Change Adaptation Strategy (HCCAS) was developed. The purpose of the strategy was mainly to identify which municipal sectors would be impacted by climate change and what would be appropriate adaptation options. The sectors reviewed included health, water and sanitation,

solid waste, the coastal zone, biodiversity, infrastructure (i.e. electricity and transportation), food security/agriculture, strategic planning, economic development and disaster risk reduction. Some of these sectors (such as water) were already undertaking work that had adaptation benefits, while other sectors showed a limited understanding or prioritisation of climate change issues. Based on this, the HCCAS proposed general adaptation actions that could be taken by the municipality. However, though the strategy assisted in furthering the discussion on climate change in the city, it did not result in action due to its lack of specifying goals and activities for specific departments. It was therefore decided that, rather than having a single adaptation strategy, to embed the adaptation process in the development of sector specific adaptation plans that were aligned with the business plan, development objectives and budget of the municipality. These Municipal Adaptation Plans (MAPs) seemed to be the only way to begin to mainstream climate change adaptation in a context of competing and immediate development needs and political interests (Roberts, 2010 pp. 400-401; Carmin, et al., 2012 p. 21; Mather, et al., 2011 pp. 544-545). 'Essentially, the goal was to build increased resilience one adaptation intervention at a time' (Roberts, 2010 p. 401).

The first MAPs to be produced were for the water and health sectors. They were chosen for their vulnerability to climate variability and change, their importance to the development agenda of the city, and because of their functional relationship and similarities in how they would be affected by climate change (Roberts, 2010 p. 401). During the development of the health and water MAPs, it was realised that regardless of the level of adaptation achieved, emergency situations will still arise, and capacity needs to be created in the disaster management sector. Consequently, a MAP for the disaster management function was also developed (Mather, et al., 2011 p. 546). The next section describes a few examples of adaptation planning in the city.

4. Climate change response and sustainable urban development

Adaptation planning for land use management

Climate change must be considered in all aspects of urban planning and development (Carmin, et al., 2012 p. 21). The municipality has a hierarchy of spatial plans that ranges from a strategic city development strategy, to detailed town planning schemes for managing land uses. Many of the town planning schemes were developed before the 1990s, and have little concern for environmental issues and are even at odds with environmental laws and policies. If these schemes were allowed to be realised, it would harm the biodiversity of the city. Some development plans have therefore been opposed, resulting in conflict between the municipality and the developers. To address these issues, the city's open space system has been included within the schemes as a controlled development layer. This means that no open space within the system may be degraded and all development on sites bordering on open spaces within the system have to be assessed. Conservation zones for privately and state-owned land have been created to ensure the protection of the biodiversity and ecosystem services. Though the municipality is threatened by court action from private developers, it is committed to ensure that

development occurs within the carrying-capacity of local ecosystems. The municipality furthermore undertakes to reduce property tax to zero on environmentally-sensitive land, whereas people are now paying huge taxes on vacant land. A major challenge is to support landowners affected by the changes to the schemes and to provide guidelines and assistance with biodiversity protection, fire, invasive alien species management and ecosystem services (Roberts, et al., 2012 pp. 15-16).

Another intervention is the development of a GIS-platform to demonstrate the impact of projected sea level rise along Durban's coastline. Three different scenarios for 30cm, 60cm and 100cm were developed. This information is already being used in the assessment of coastal development applications and the preparation of shoreline and coastal management plans, for the protection of private property and assets on the shoreline is a contentious issue. According to law, the government is not responsible for protecting private property. Associated with this is the question of service provision to private properties in areas where it may become unviable due to loss of land or erosion. It is not yet clear if the municipality will be under obligation to continue to provide services. In a few instances it was decided not to replace infrastructure in the coastal zone following extreme coastal erosion events (Roberts, 2010 p. 411; Mather, et al., 2011 p. 561).

Adaptation planning for disaster reduction

Durban has come to realise the centrality of the disaster management function to climate change adaptation planning. The adaptation work stream highlights the fact that without a strategically placed disaster management function, local resilience will not be realised. Resilience therefore needs to be built into processes to reduce the probability of infrastructure failure and enhance the chances of a system to bounce back after an extreme event. In some cases people and infrastructure will need to be relocated away from areas that are exposed to risks, new developments need to be planned in less vulnerable areas and capacity on community level needs to be built (Roberts, 2010 p. 401).

The pilot disaster management MAP focussed on emergency situations that may result from rapid onset events linked to climate change and variability. Greater resilience will also have to be achieved to reduce the risk for slow onset disasters that erode people's coping capacities and leave them more vulnerable to disaster losses over time. Local communities will have to take action to adapt to the impacts of climate variability, regardless of local government interventions. A number of projects were initiated within the MCPP to deal with slow onset disasters. One project is a Climate Smart Community pilot project. Community-based adaptation projects were initiated in two poor, high risk, low-income communities. The interventions included:

- Community-based adaptation planning that attempts to develop a detailed understanding of community level risks through risk and vulnerability mapping, creating community awareness about climate change and its impacts, identifying adaptation options, and evaluating their sustainability;

- Suitable replacement crops are sought to ensure food security if the productivity of maize drops due to climate change; and
- Micro-scale agricultural water harvest and management technologies are implemented in impoverished communities to improve food and water security (Roberts, 2010 pp. 408-409).

Ecosystem-based adaptation and mitigation projects

Biodiversity and ecosystems are considered critical elements in a climate change response strategy. The growing awareness has contributed to the emergence of ecosystem-based adaptation (EBA). It addresses climate change adaptation and mitigation, biodiversity loss and the need for improved human well-being. The rationale for promoting EBA work in Durban was that the protection of the biodiversity and associated ecosystem services will increase the adaptive capacity of the whole city. Ecosystem services as an adaptation tool replace the need for expensive infrastructure (e.g. wetlands replace the need for storm water infrastructure), and provide a safety net for poor and vulnerable populations against hazards and economic shocks (e.g. shelter, food security and energy). An added benefit of EBA is biodiversity conservation (Roberts, et al., 2012 pp. 2,7-8).

There are areas of the city where biodiversity and ecosystems assets have been lost. During the 'greening' drive of the FIFA Football World Cup™ event in 2010 the first opportunity emerged for large-scale restoration of biodiversity in the city. This project had both adaptation and mitigation benefits for the city. One project involved the establishment of a reforestation project around a regional landfill site. The projects addressed carbon sequestration, biodiversity loss, and the provision of ecosystem services. The trees for the project are provided by the adjacent rural communities, or 'trepreneurs' who source seeds from local forests which are then propagated at local homesteads. Communities receive credit notes good for food, school fees, building material and other pre-ordered goods on collection of the tree seedlings (Roberts, et al., 2012 p. 17).

Another project that has both adaptation and mitigation benefits was the pilot Green Roof Project for existing municipal buildings. The project measured a reduction in the storm water run-off during rainfall events, reduced surface temperatures of the roof of up to 30°C, and a slow release of water over time. The project also investigated the possibilities of bringing back indigenous biodiversity into the central region of the city. Crop trials suggested that green roofs can contribute to food security in the form of producing tomatoes, green peppers, cowpeas and spinach (Roberts, et al., 2012 p. 19).

Other mitigation projects

A dedicated Energy Office was established in the municipality to specifically address issues of energy efficiency and renewable energy in the light of climate change mitigation. For example it has developed a mass solar heater roll-out programme, which the Department of Housing and Water is to implement in its housing programme in the city. The Office is furthermore working with the National Department of Energy to rollout a traffic and street light retrofitting project across the city. To reduce emissions and to harness renewable energy sources, the municipality

has developed a comprehensive wind map, is in the process of developing energy generation projects such as water reticulation hydro turbines and waste to methane. It is also co-founder of a forum where industry and government meet to discuss ways to develop the energy sector in the province. Specific projects that target greenhouse gas reduction includes a Greenhouse Gas Inventory that assesses the municipality's own emissions, and investigating various forms of transport modes to reduce GHG emissions, and have embarked upon an electrical bicycle pilot project for police officers along the main beachfront of the city (COP 17, 2011).

5. Lessons learnt

Durban has been successful in making the municipal departments and various stakeholders in the city aware of the issues of climate change. In some cases, it has been successful in mainstreaming climate change adaptation into a few sector plans. This section describes the lessons Durban learnt from the process.

Project champions

It is crucial to identify political and technical champions for the projects. In Durban the staff of the 'Environmental Department', responsible for the HCCAS, found that they were more successful in 'converting' existing key staff in other departments into champions for engaging in the climate change adaptation process, than to try to learn the 'language' of each discipline to influence their agenda. Challenges with identifying a political champion is that politicians get elected every five years in South Africa, therefore short-term actions that show immediate results and improve their chances for re-election are pursued while longer-term issues such as climate change adaptation are not (yet) popular (Mather, et al., 2011 pp. 560-561).

Exogenous versus endogenous forces

Since there were no external climate change regulations or the diffusion of best practices originating from external sources at the time Durban conceptualised a climate strategy, Durban's strategy was driven by endogenous goals and objectives. The funding that was available from international donors did not shape the local agenda as often happens, but the funds were used to test internally-driven ideas related to adaptation planning. Three endogenous factors appear to have driven the adaptation process in Durban: 1) the efforts of a technical champion, Dr Debra Roberts, who pushed the climate change agenda in the municipality; 2) the city began to understand its vulnerability to the impact of climate change and interpreted the increasing number of natural hazards in this context; and 3) adaptation was seen as a way to also realise the city's development path, while promoting resilience and sustainability (Carmin, et al., 2012 pp. 23, 28).

Change in emphasis

While it is important to understand the various risks that climate change poses for cities, Durban realised that to gain widespread support it has to shift its emphasis from presenting adaptation as a way to address the threats, to a way of addressing development priorities and equity goals (Carmin, et al., 2012 p. 23). To this effect, on-going projects within various sectors were identified that could already be classified as adaptation measures, and were highlighted as good practice. This helped departments understand that climate change adaptation is not all new and foreign but closely aligned to their on-going work (Mather, et al., 2011 p. 560).

Stand-alone versus mainstreaming of adaptation

Past experience in the city suggests that due to the high-level and generic nature of the climate change strategy, people's excessive existing workloads, pressing development pressures and a shortage of skills and funds, climate change is being regarded as a distant and unlikely threat. It is furthermore often assumed by departments that issues of climate change will be dealt with by the 'environmental people' (Mather, et al., 2011 p. 545). Mainstreaming has therefore proven to be more successful. Durban has found ways to link adaptation to existing policies and plans to demonstrate that climate change is not inconsequential, but already part of citywide priorities and initiatives, as well as integral to the municipality's normal work routine (Carmin, et al., 2012 p. 29).

Coping with uncertainty

There are many uncertainties in planning for climate change. While it is possible to identify a general direction of action, the details of the plan are not always clear. Durban has found local adaptation to be incremental, iterative and non-linear and that the process for developing adaptation plans relied on experimentation, innovation and flexibility. The city realises it has to learn from the past failures and successes to refine its future action, repeating this cycle of learning as their understanding of the problem and solutions increases and deepens (Roberts, et al., 2012 p. 7). Because regional climate change projections are so uncertain, local governments cannot rely only on past experience to guide future planning. Future climate change needs to be investigated through research partnership with tertiary or other research institutions (Roberts, et al., 2012 p. 9).

Challenges delaying adaptation

In the case of Durban, it is not lack of access to new technologies or sophisticated data sets that is delaying the process of implementing climate change adaptation plans, but often very basic institutional and resource challenges (Roberts, 2010 p. 412). For example it is difficult to justify the use of limited resources in responding to climate change that is regarded as quite uncertain, when there are numerous pressing needs to meet. There is also a shortage of technical staff to implement climate change work. Available time and effort to understand climate change science

has been very limited, which means that climate protection work is mostly reactionary (Mather, et al., 2011 pp. 560-561).

Institutional change

Pursuing an adaptation agenda will require shifts in the values and goals that guide the priorities of the city, and adjustments will have to be made to the institutional framework related to actions and decisions. Ways of funding projects also need to be reconsidered, as many of the projects are by nature long-term investments, while Durban's budget cycle extend over three to five years (Roberts, et al., 2012 pp. 18-19). Also, changes to the responsibilities, roles and functions of local government institutions are required to accommodate new activities. In Durban a dedicated Climate Protection Branch was established in 2007 and a dedicated Biodiversity, Climate and Green Project Implementation Branch in 2011, indicating the municipality's dedication to ensuring climate protection (Roberts, et al., 2012 p. 23).

Funding and costs

Climate change adaptation requires some level of capital and operational funding that may prove to be a barrier to poor local municipalities. Such municipalities need to secure a sustained source of adaptation funding (Roberts, et al., 2012 p. 16), for it is not a question of if the municipality can afford to adapt for climate change, but rather, can it afford to lose existing infrastructure and what are the wider costs associated with such failure (Mather, et al., 2011 p. 560).

Winners and losers

Planning for climate change adaptation may require tough and often unpopular decision-making as well as significant political and administrative will. In some cases individual parties, such as developers, will have to 'lose' in order for others, the wider community, to 'win'. This loss needs to be negotiated and will determine the level of long-term success achieved. The desired state is where local authorities and citizens together manage the environment (Roberts, et al., 2012 p. 16).

Exploring innovative opportunities

Links between climate change adaptation and environmental conservation should be promoted through innovative opportunities. For example, during the austral winter, shoals of sardines move up the east coast of South Africa (known as the sardine run), that supports the fishery industry, local economic development and an eco-tourism industry. The warming of the ocean threatens this phenomenon, which offers an opportunity to convey a strategic message about the links between the phenomena, its value and climate change that people will understand and value (Roberts, et al., 2012 p. 24).

These experiences all show that Durban was innovative and entrepreneurial in seeking to promote an emerging policy domain.

6. Conclusion

The number of cities pursuing sustainability has been growing since the mid-1990s as the concern for environmental quality and social equity has grown. These cities have adapted their priorities in order to balance economic growth with environmental quality and social justice (Carmin, et al., 2012 p. 19).

Durban is one of these cities, and has made great strides in addressing climate change adaptation during the past decade. Mather, *et al* (2011 p. 562) attributes its success to three factors: 1) strong political and technical leadership at a number of levels; 2) technical staff from a number of fields were able to deliver credible work, that was pioneering at the time; and 3) continuous communication with and the provision of useable information to officials, politicians and the public has created trust between parties. This illustrates that even with limited resources combined with development pressures, many obstacles can be overcome in the path to climate change adaptation planning.

No city will follow the same path of action in developing a climate change adaptation strategy. The case study of Durban reflects on how a developing city has approached the issue of adaptation, but this will look different for other cities on different development paths. The more the policy field matures, the more options would be available for cities to adopt as their own.

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