Community adaptation and innovative water and climate change policies in Durban (South Africa): an encounter in relational space

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Abstract

The eThekwini Municipality has received international recognition for its progressive water and sanitation policy. The Municipality is also known to be a ‘climate change champion’, having developed adaptation policies with a pro poor focus. Both sets of policies exemplify the ‘experimentalist’ governance of eThekwini Municipality. Experimentalist governance deliberately establishes provisional frameworks for action that leave room for maneuver. Under this approach policies are elaborated and revised in light of a recursive review of efforts to implement them. This paper explores how abstract progressive policies, and the practices and interventions of state actors, are experienced and transformed in the lived experience of the urban poor. Based on ecological and financial sustainability criteria Durban has developed a discourse of spatially differentiated service provision, based on the Urban Development Line (UDL), that guarantees free basic water supply and ensures access to basic sanitation through alternative technologies such as dry toilets for the poorest segments of the population, who are located predominantly in the rural periphery. The UDL aims to protect an important ecological buffer zone, the rural periphery, which provides environmental services to the city. This paper focuses on how residents from three low income communities in Durban experience local state policy and water and climate vulnerabilities and how they adapt and transform the differentiated water and sanitation services they are provided with to meet their needs. Actual coping and adaptation practices of households and communities are contrasted with policy discourses and the perceptions about water and sanitation service provision of the main actors in the water governance arena. The paper focuses on the relations between the lived experience of low income communities and the abstract spaces of municipal water functionaries, to analyse how, through these interactions, incremental learning leads to progressive policies that have set a precedent for South African national water and climate policy.

1. Introduction

The city of Durban, which is administered and managed by the eThekwini Municipality, has received international recognition for its progressive water and sanitation policy. The Municipality is also known as a ‘climate change leader’ in the developing world context, as it has developed adaptation policies with a pro-poor focus (Taylor et al., 2013). Both the eThekwini Water and Sanitation Unit (EWS), which is responsible for water and sanitation service provision and the Environmental Planning and Climate Protection Department (EPCPD), which is responsible for climate change adaptation, adopt an approach of 'experimentalist' governance. Experimentalist governance deliberately establishes provisional frameworks for action that can be changed in response to incremental learning and a recursive review of practices and efforts to implement them. This paper explores how these abstract progressive policies, which are constructed by actors of the state, are experienced and transformed through the everyday lived experiences of the urban poor. In turn these local transformations inform policy and practice through engagements between the state and its citizens, resulting in experimentalist governance.

The paper first presents the abstract spaces and practices that have been developed by the local state to address service provision and climate change. Secondly it explores how residents from three low income communities in Durban experience water, sanitation and related climate vulnerabilities and how they adapt and transform the water and sanitation services they are provided with to meet their needs. Based on financial and ecological sustainability criteria, Durban has developed a spatially differentiated service provision model, where residents living in the rural periphery or in informal settlements receive different levels of services to those in the urban core. The practices and technical interventions developed to address water and sanitation challenges and ecological sustainability in the city in relation to the Urban Development Line (UDL), which divides the rural and urban zones of the city, reveals the relationship between abstract or normative policy and the everyday lived worlds of ordinary people.

2. The spatial turn and the multiple constructions of space

The spatial turn in human geography, which began in Paris with the influential work of Lefebvre and Foucault in the late 1960s, has highlighted the importance of socio-spatial relations in constructing environmental issues and their solutions in the contemporary world (Warf and Arias, 2009; Sutherland, 2013). According to Lefebvre (1974, cited in Warf and Arias, 2009, p 3) "space must be understood not simply as a concrete material object but also as an ideological, lived and subjective one." Abstract constructions of space, such as the policy and maps produced by planners, engineers, architects and scientists need to be considered in relation to the everyday lived worlds of ordinary people, who construct their spatial practices in relation to the policies and plans developed to service them, as they adapt to their everyday realities.

Post-positivist geography has made a significant contribution to the understanding of society-space relations by revealing the multiple ways in which social life is colonized through the social production of abstract 'spaces' (Soja, 1989), which are then challenged by the everyday practices of ordinary people. Understanding the co-constitutive nature of society and space as a set of social and spatial relations that produce and re-produce each other is useful in exploring the progressive water and sanitation policies and climate change programmes in Durban. This paper is therefore reflective of the spatial turn as it explores the spatial relations embodied in the making of space in water and climate change governance by a wide range of actors through spatial practice, representations of space and everyday lived experience (Lefebvre, 1974; Soja, 1989; Massey, 2005).

Spatial practice is defined as perceived space which emphasizes material conditions and mappable spatial forms (Soja, 2009). It is the space of experience, events, daily routines and networks and hence it holds the actions of politicians, officials and ordinary people. Representative space, or abstract space, is the representation of the world in an ordered and structured way, for example spatial policies or the planning and development maps of a city. It is the space of policy and spatial rules that are constructed by planners, architects and engineers as they seek implement government ideals. Representational space, on the other hand, is both symbolized and everyday lived space. It is about vibrant and surprising spaces created by a multitude of complex inter-relations and connections (Soja, 2009). Representational space often resists the dominant ordering of space and society by creating 'spatial alterity', which allows for alternatives that challenge economic and bureaucratic abstraction, enabling symbolic and lived spaces to emerge (Dierwechter, 2001). Representational space therefore actively re-shapes urban spatialities that have been colonised and dominated by abstract space and the technical spatial practice of the state.

Massey (2005) reflects on social space through three main propositions. She states that space is a product of interrelations, as constituted by interactions at all scales; that space is about multiplicity and the interaction of multiple trajectories; and that space is always under construction. It is always "in the process of being made. It is never finished, it is never closed" (Massey, 2005, p 9). She too, like Lefebvre, acknowledges physical, mental and lived space and explores these concepts through her idea of the 'stories-so-far of space' that are made up of multiple interactions and relations of the material, abstract and everyday world. Both Massey (2005) and Lefebvre's (1974) constructions of space provide a useful framework for exploring the relations between the abstract spaces and spatial practices of the state and the everyday lived worlds and spatial practices of citizens.

3. The abstract 'spaces' of water governance and climate change in Durban

Water and climate change governance in eThekwini Municipality is shaped by the South African Constitution (1996), national policy and legislation, and the macro-level discourses that frame development and transformation in South Africa. The Constitution of South Africa (1996) mandates that everyone has the right to sufficient water within available resources. The Constitution states that water and sanitation services are a local government responsibility. Human dignity (Section 10) and the promotion of equality (Section 9) are also core values of the Constitution (Section 10) and these values underpin water and sanitation service provision. Water, and by association sanitation, is therefore considered to be a social good and a critical element in the transformation and development of the country (Tissington et al., 2008). The right to a healthy environment and to have the environment protected is also enshrined in the Constitution (Section 24) and this provides the moral base for climate change mitigation and adaptation. The policy framework of developmental local government which emerged post 1994, and which draws on the Constitution, strongly supports notions of sustainability and equity (Parnell et al., 2002; Von Donk et al., 2008; Taylor et al., 2013). Similarly, global conventions to which South Africa is a signatory, such as the Millenium Development Goals, which influence policy making at the national and local government level in South Africa, are underpinned by sustainability goals and principles.

The neo-liberal, pro-growth agenda with its discourses of cost efficiency and cost recovery and the more transformative pro-poor agenda, with its discourses of transformation and re-distribution, play a critical role in shaping the policy and practice of local government in South Africa and in Durban. The juxtaposition of these two macro-discourses and the tension this raises at the local government level is evident in both water and climate change governance. According to Bond (2012) and McDonald et al. (2002), the neo-liberal cost recovery approach to water delivery in South Africa, which is supported by the World Bank, undermines the rights to water that are supported by the Constitution. The commodification of water means that not everyone will be able to afford to pay for the right to have sufficient access to water, given that the free water allowance, which is implemented through the Free Basic Water Policy (2000), is considered to be insufficient for larger households (Bond, 2012). This raises concerns as to whether the focus of service delivery is on cost-recovery or on social and environmental justice. Likewise the pressure on environmental resources for economic, pro-growth development undermines the ability of EPCPD in eThekwini Municipality to protect these resources, particularly for the poor, as valuable ecosystem services in climate change adaptation.

These abstract constructions (or spaces), which include international frameworks and national legislation, policy, discourses and plans create the epistemic frame within which local government operates. These broader level policy frames are then taken up in the ’spaces’ of local government, which are mandated to improve the quality of life, housing, service provision and income generating opportunities of their citizens. Policies and programmes that have set out to improve the condition of life for citizens in a focused and deliberate way have shaped society and space over many decades (Murray Li, 2007). Many of the challenges and sites of struggle found in local authorities today are a result of the intended and un-intended outcomes of these interventions (including abstract policy and technical programmes and projects), which influence society and the environment and focus resources on particular types of problems at particular times.

Technologies are carefully chosen to strategically devise and implement interventions to govern the relevant processes. Challenges are ‘rendered technical’ by defining the knowledge, limits, actors and tools that need to be mobilised to address the problem, thereby defining the field to be governed (Murray Li, 2007). Through the process of ‘rendering technical’, boundaries are drawn between experts and those who are subject to expert direction in that particular governance field. These boundaries are often contested and this is where the site of struggle over governance emerges, most particularly as the boundaries reflect the relations between abstract policies and their associated interventions and the everyday lived worlds of ordinary people. This paper explores the tensions and learning that occurs along these porous boundaries as the policies and practice of water and climate change governance in eThekwini Municipality attempt to take hold, and as communities respond by transforming these interventions through their everyday practices.

The Municipal Systems Act (2000) of South Africa legally defines a municipality as including councilors (politicians), administrators (officials) and the local community (Piper and Nadvi, 2009). This is symbolically significant as it not only creates the space for participatory governance, but it also recognizes the value of ordinary people and their practices in the foundational praxes of local government. However, in reality in South Africa is has been argued that the 'spaces' within local government tend to be more bounded, with politicians and officials producing the policy and practices of the municipality with limited input from local communities (Piper and Nadvi, 2009; Sutherland et al., 2013a; Sutherland et al., 2013b). However, these boundaries can be porous with local government responding to the knowledge and experiences of local communities, particularly when an approach of experimental governance is adopted. This paper focuses on two such progressive 'spaces' within the local state namely EWS and EPCPD. Table 1 outlines the broad approach, policies, practices and interventions of these two departments within eThekwini Municipality.

Table 1: Governance approaches of EWS and EPCPD (Source: Carmin et al., 2012; Sutherland et al., 2013b; Sutherland et al., 2013c; Taylor et al., 2013)

	EWS	**EPCPD**
Governance approach	Experimental. Transitional adaptation[1].	Experimental. Transitional adaptation.
Policy frames	Informed by principle that water and sanitation are a social and economic good. Clear vision and goals reflected in EWS Customer Services Charter. No overarching 'stable'policy framework. Policy aligned with reality which is dynamic and changes quickly. Regular shifts in policy based on incremental learning and public participation: e.g Free Basic Water Policy. Policy aligned with concept of Urban Development Line. Influenced by global policy and research networks.	Informed by the need to support and protect people and the environment in the face of climate change. Developed a macro-framework for adaptation based on years of experimentation. Range of policies and targets for climate change adaptation that integrate with and relate to the major imperatives of the Municipality including addressing poverty, inequality, economic development, service provision and infrastructure. Focus on adaptation, but include mitigation through collaboration with the city's Energy Office Policy. Policy aligned with concept of Urban Development Line. Influenced by global policy and research networks.

[1] This refers to Pelling's (2010) different modes of responding to threats or disturbances: resilience, transition and transformation.

Practice	Strong leadership (champion). Highly committed and motivated EWS team. Strong technical capacity. Strong partnerships which are open and engaging with a wide range of actors: research institutions, civil society organisations and consultants. Strong international connections. Incremental learning. Innovative as a result of a culture free from the 'fear of failure'.	Strong leadership (champion). Highly committed and motivated EPCPD team. Strong technical capacity. Research partnerships with research institutions and consultants carefully controlled and managed by EPCPD. Strong international connections. Incremental learning: understanding around climate change arose out of trial and error exploration. Integrate climate change adaptation through a phased process into spaces within the Municipality which are sympathetic to the climate change agenda: use science based sectoral climate change champions.
Interventions[2]	Free basic water , flow limiters, the use of plastic bodied water meters, polypropylene water piping, ground tanks and semi-pressure water service levels, UD toilets, anaerobic baffle reactors, the use of grey water for urban agriculture, customer services agents, condominial sewerage and a customer water debt repayment policy. Implemented a differentiated model of service delivery. Spatial knowledge management through the use of GIS also informs decision making, with EWS being home to the leading ITC-GIS group in the city.	ICLEI Cities for Climate Protection Campaign (2002-2006). Municipal Climate Protection Programme: assesses impacts and proposes responses to climate change. Focus is on adaptation which is supported through the development of Municipal Adaptation Plans. Resilience-focused interventions which offer development-linked co-benefits. Currently developing a mitigation and adaptation strategy in partnership with the Energy Office to address tensions between mitigation and adaptation responses e.g. more open space for adaptation versus higher density urban spaces for mitigation. Linking climate adaptation to the politically relevant and pressing issues of developing African cities: service and infrastructure delivery, job creation and economic development.
Participation	Public responsiveness is a cornerstone of EWS's Water and Sanitation Services Charter. Education and training programmes with councillors and communities. Establishment of Focus Groups, which	Limited scale participation: EPCPD focusing efforts on integrating climate change concerns into Municipal structures. Development of Durban Climate Change Partnership to include multiple actors in a

[2] This is not a comprehensive list of interventions. Rather the interventions pertinent to this paper are presented here. For a more detailed account see Sutherland et al, 2013b, Sutherland et al, 2013c and Taylor et al, 2013.

	comprise of ordinary members of the public who engage with EWS around issues related to water and sanitation service provision. Establishment of User Platforms for the 17 planning zones across the city, comprised of elected representatives who meet three times a year. Sizekala 'one-stop' centres that are located across the city where citizens can register service related complaints. Citizens can interact with these centres by visiting them, calling them on a telephone hotline and toll free number, sending sms's or emailing.	structured partnership to address climate change. Civil society champions for climate change need to emerge: most civil society action is focused around more immediate needs such as housing, services and employment.
Politics	Strong leadership, high technical capacity and the national and international profile of EWS and its officials has enabled the Unit to inform and shape water and sanitation provision in the city based on scientific and technical knowledge, within a powerful political arena, that may at times have a different agenda. Innovative technical methods of service delivery are required in the city to ensure sustainability for environmental, financial and water scarcity reasons.	Climate change has low priority in the city. Implementing climate change adaptation policies, programmes, plans, and projects in the city is a political process which requires a good understanding of the broad range of goals and interests that city officials, political representatives and communities seek to advance. The political organisation, formal rules and informal codes of behaviour of institutions, and the rationalities of government both enable and constrain the introduction and implementation of new approaches, such as those required for climate change adaptation.

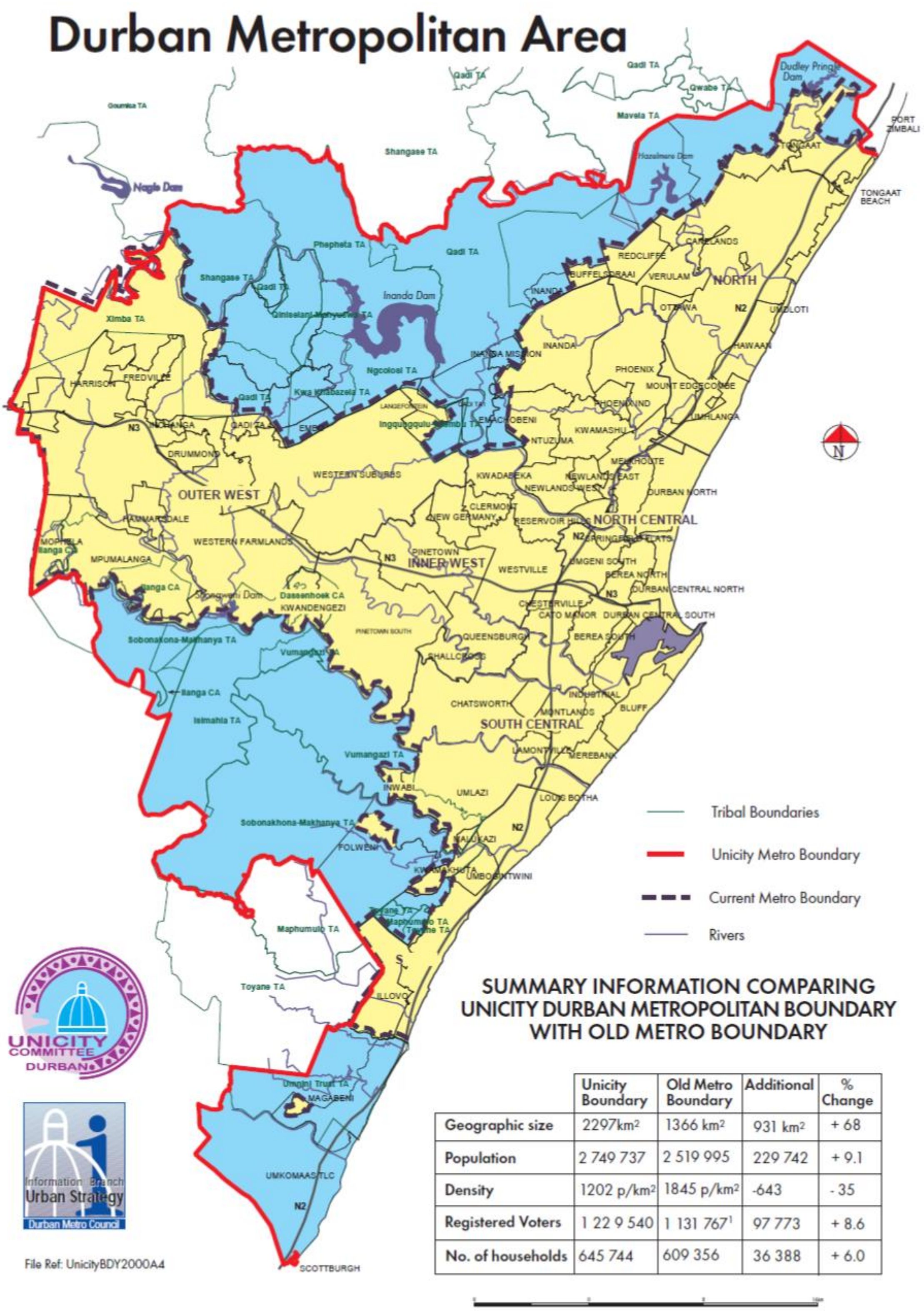
As Table 1 reveals, EWS and EPCPD are governance 'spaces' that have developed policies (which are abstract and normative), practices and interventions that enable them to deliver water and sanitation services and climate protection programmes in the city. The UDL concept, which is embedded in the city's Spatial Development Framework (2013/2014), plays a significant role in water and climate change governance in Durban and it is used a lens through which to explore the relations between abstract space and everyday lived worlds in the city.

3.1 eThekwini Municipality's Urban Development Line Concept

The municipal landscape has changed dramatically in post-apartheid South Africa. The Municipal Demarcation Act (No. 27 of 1998) redrew the boundaries of the local state in South Africa, creating administrative units combining previously well off areas with poorer townships, informal and rural areas to pool resources which could be used for redistribution purposes (Sutherland et al., 2013c). As a result of the Municipal Demarcation Process the boundaries of the city of Durban were significantly altered. During the apartheid era the homeland of KwaZulu was located adjacent to the Durban Metropolitan Area (DMA), creating a dense area of rural households on communal land under Traditional Authority[3]. In 2000, as part of the municipal restructuring process the land area of the city was increased by 68% as large portions of rural hinterland on the boundary of the DMA were incorporated into the administrative boundary of the eThekwini Municipality (see Figure 1).

This raised significant challenges for the city, many of which relate to what it means to be ‘urban’, in a city that contains urban, peri-urban and rural ways of life and two systems of government: municipal government and the Traditional Authority (Sutherland et al., 2013c). The expansion of the city boundary added 75 000 rural households to the Municipality, 60 000 of which did not have access to basic services (Gounden et al., 2006)[4]. This placed considerable pressure on EWS who were now responsible for providing services to peripheral areas in the city that were remote, under-developed, extremely poor, and that were located on steep topography beyond the existing service edge.

[3] Large areas of the rural periphery of eThekwini Municipality are governed by the Traditional Authority, the Ingonyama Trust. The Trust has the responsibility of managing the land on behalf of people who live in traditional areas.
[4] This figure is now accepted as being higher than the figure originally recorded in 2002, see Figure 3.



	Unicity Boundary	Old Metro Boundary	Additional	% Change
Geographic size	2297km²	1366 km²	931 km²	+ 68
Population	2 749 737	2 519 995	229 742	+ 9.1
Density	1202 p/km²	1845 p/km²	-643	- 35
Registered Voters	1 22 9 540	1 131 767[1]	97 773	+ 8.6
No. of households	645 744	609 356	36 388	+ 6.0

Figure 1: The impacts of the Municipal Demarcation Process on Durban (Source: eThekwini Municipality, 2000).

At the same time city planners were focusing on how to contain urban sprawl. The principles of densification and the compact city were strong influences in the producion of the first Spatial Development Framework (SDF, 2002-2007) for the newly formed eThekwini Municipality. This SDF spatially represented a new and contentious concept, the urban edge. The urban edge did not in fact define the edge of urban or suburban development, but was in fact a ‘services edge’ indicating the city’s current ability to provide bulk services infrastructure (particularly waterborne sanitation) (Sutherland et al., 2013c, p 15). The urban edge was used by the city to contain development proposals in the northern and western parts of the city. Although a planning concept, the urban edge was strongly supported by EWS, as it reinforced their efforts to optimise the use of existing wastewater treatment capacity within more centrally located treatment works in the city, before incurring substantial expense in constructing new treatment works on the outskirts of the city (Sutherland et al., 2013c, p 15).

By 2010, the urban edge was replaced by a new concept, the UDL[5], which is shown in Figure 2 and Figure 3.

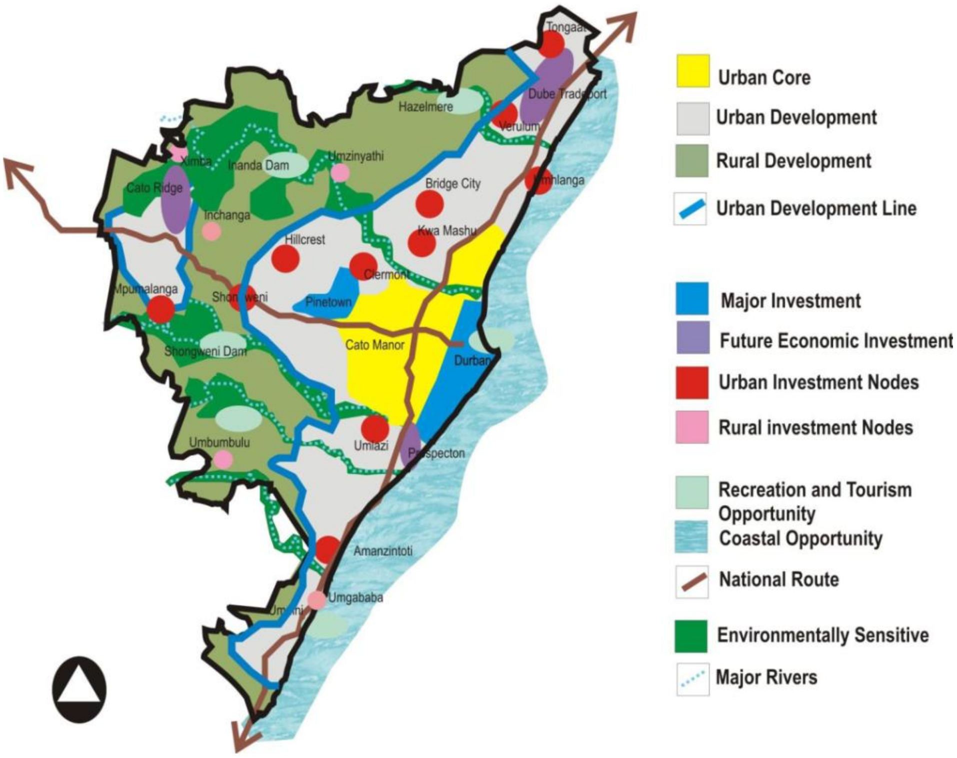


Figure 2: A schematic representation of the Urban Development Line (eThekwini Municipality, 2012)

The UDL is defined by the city in the 2010/11 IDP as:

> “a concept used to not only demarcate the extent to which urban development will be permitted to establish within the metropolitan area in the long term, but more specifically to promote a more convenient, efficient, equitable and sustainable

[5] For more detail on the evolution of the UDL see Sutherland et al, 2013c.

settlement form … the line indicates the outer limit to which urban development will be restricted … The UDL implies that there is a rural periphery …that is different in character and which has different servicing needs and servicing constraints, and which supports different lifestyles. … .Within the UDL, the development phasing line demarcates the interim spatial limit to which development will be allowed in accordance with infrastructure availability and capacity"(eThekwini Municipality, 2010a, p 23).

Planning and development in the city is currently informed and shaped by the UDL concept, which demarcates the urban development zone from the rural development zone (see Figure 2 and Figure 3).

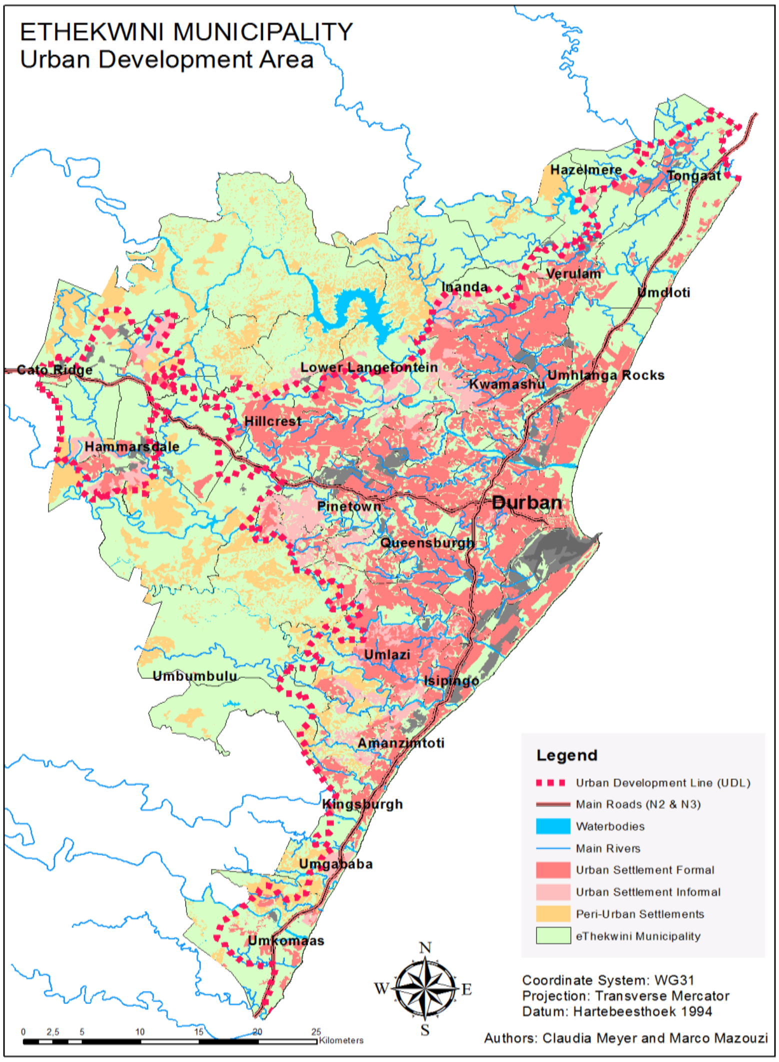


Figure 3: The Urban Development Line and the different forms of settlement within eThekwini Municipality (Source: Meyer, 2013)

Post 1994, and most particularly since 2000, EWS has had to address inequalities in water and sanitation service provision created by the legacy of apartheid and the rural-urban divide (Sutherland et al., 2013b). Under the current funding conditions and with the current backlogs, it will take the city 29-37 years to address water backlogs and 23-28 years to deal with sanitation backlogs (eThekwini Municipality, 2012[6]).The Municipality is also under pressure to reduce its water consumption as it is a water scarce city, which is currently only just meeting its water demands. Within the current context of backlogs and water scarcity, pressure on service delivery is increasing as Durban’s population is growing rapidly as a result of natural increase and in-migration (Macleod, 25/04/2012). Residents of the city aspire to having in-house, full pressure water supply and flushing toilets linked to waterborne sewerage and wastewater treatment (Gounden et al., 2006). EWS argues that the provision of this level of services across the city, including the rural periphery, is not feasible as a result of historical, technological, financial and environmental constraints. According to officials from EWS, peri-urban areas and the rural periphery raise the most significant challenges due to historical under-development, land ownership falling under the Traditional Authority, low housing densities, mobility of the population, the inaccessible and steep terrain and financial costs of providing services to the periphery (Gounden et al., 2006).

As a result EWS has developed a spatially differentiated model of service provision which is sensitive to the city’s available resources and its geographical context (Sutherland and Lewis, 2012; Sutherland, et al., 2013d). In eThekwini Municipality, residents located in the urban development zone, the transition zone along the UDL, and the peri-urban or rural periphery receive different levels of services. Residents located within the urban development zone, unless they live in informal settlements or default on payments, receive full pressure water services and flushing toilets, linked to bulk wastewater treatment or privately administered septic tanks. However residents in the rural periphery receive a range of water services, including a yard tap with 9 000 l/month of free water per household and access to additional water which is then paid for through the municipal billing system, ground tanks (grey tanks) that supply 9 000 l/month of free water per household, and semi-pressure systems with restricted flow meters which are put in place when residents default on water payments. Sanitation in rural areas consists of state provided Ventilated Pit Latrines (VIP toilets), which are de-sludged by the city; Urine Diversion (UD) Toilets, or dry toilets; and community built pit latrines. In informal settlements, many of which are located along the UDL, water is provided through communal taps and sanitation is either absent, where communities use open land within or around the settlement, or it is provided through state and community built Pit Latrines. The Interim Services Programme[7] which has been introduced by the Engineering Services Department in the Municipality (which includes EWS) provides flushing toilets and communal taps and showers in male and female communal container blocks in informal settlements.

[6] This data represents the status quo in June 2012
[7] These interim services are provided to informal settlements which are waiting to be upgraded or relocated to new RDP housing projects.

However, the spatially differentiated model still reflects and may reinforce inequality, as those on the periphery, the majority of whom are poor, receive a different set of services to those within the UDL. According to Bond (03/09/2012) the UDL is a "sanitation belt" or "class line" in eThekwini's water governance, reflecting the previous racial discrimination of the apartheid era. Nevertheless, Bond (2011, p 103) recognizes the pressure the new municipality boundaries have put on the municipal planners and managers in terms of fulfilling their mandate in a timely manner as

> "with the city's expansion in 2001, there were 200 000 families – roughly a third of the population – without basic sanitation. Many lived beyond the sanitation belt, a vast peripheral band of the municipality where it was deemed fiscally unrealistic to lay sewage lines".

The rural periphery of the Municipality is also however, recognised as the ecological buffer for the city. However, it is also where most of the greenfields development is located, which makes it a highly contested space. It contains large areas of open space that provide essential ecosystem services for climate change adaptation (see Figure 2). These ecosystem services include soil formation, erosion control, water supply and regulation, climate regulation, cultural and recreational opportunities, raw materials for craft and building, food production, pollination, nutrient cycling and waste treatment. Sustaining existing 'green infrastructure' (e.g. wetlands, forests, grasslands, productive soils etc.) is as important as improving grey infrastructure (drains, sewers and roads) when it comes to climate change adaptation (Roberts et al., 2012). Community ecosystem-based adaptation, which includes job creation programmes using a green economy approach, forms a cornerstone to Durban's climate change response strategy. The environmental resources, or green infrastructure in the rural periphery, are critical in supporting this approach (Roberts et al., 2012).

The UDL is a unified, albeit contested storyline that is supported by sectors related to spatial planning, service provision, engineering and infrastructure development and environmental management[8]. By rendering the spatial inequalities abstract, scientific and technical, through the use of the UDL, the 'politics' has been taken out of the process of service delivery. However, it will be shown that the abstract spaces and spatially differentiated service provision model produced and supported by the UDL have become entangled with the everyday lived worlds of ordinary people as they respond to and re-shape the water and climate policies and interventions of the city.

4. Water and climate change governance in the lived worlds of ordinary people: a focus on the poor

The abstract policies, practices and technical interventions of the state in terms of water and sanitation provision and climate change protection find their ways in to the lives of ordinary people as they are implemented on the ground. The experiences of communities of these

[8] For more detail see Meyer (2013).

services are then communicated back to politicians and city officials through a wide range of participatory mechanisms, most of which are politically controlled (through councillors and ward committees) or are managerial (through Sizekala Centres, Focus Groups, User Platforms or the Durban Climate Change Partnership). This section of the paper explores how the technical interventions of the state are transformed by ordinary people, which in some cases re-shapes local state policy, learning and action. Water and sanitation provision has been implemented across the city and thus provides the larger focus of citizen's responses. Climate change adaptation measures are still in their infancy and are currently being developed within the city through experimentation.

Both location and housing typology play a critical role in determining access to services and in exposing people to risks associated with climate change. Residents in formal low cost housing projects, known as RDP houses, receive full services; informal settlements receive basic services such as communal tap points and pit latrines or interim services (communal ablution blocks); and peri-urban and rural settlements are serviced according to rural standards (grey tanks and UD toilets). The three case studies presented here reflect water and sanitation provision and climate adaptation in these three different types of settlements[9].

4.1 Settlement profiles

Ocean Drive-In is an informal settlement located on private land in the north of the city adjacent to the new King Shaka Airport (see Plate 1). The settlement has been in existence for over 32 years and consists of 725 households or mjondolos (shacks). The settlement is surrounded by sugar cane and is located on a steep slope. Living conditions in the settlement are challenging as a result of the poor quality of housing, the lack of basic services and facilities and the problems associated with flooding caused by the lack of wastewater and drainage systems and the steep slopes. The settlement is serviced by communal taps, contains dis-functional municipal installed pit latrines which results in the community using the surrounding sugar cane land as toilets, and has no electricity (see Table 2). The Housing Department of eThekwini Municipality began the process of relocating residents of Ocean Drive-In to the formal housing project of Hammonds Farm on 7 November 2012 and by July 2013 half of the households had been moved.

Magaveni is also located in the northern region of eThekwini Municipality. Magwaveni consists of formal RDP houses, informal settlements and a transit camp (see Plate 2). It is situated on a floodplain, and hence many of the houses experience flooding, damp, and poor soil drainage. The original informal settlement was established in 1987 and the RDP houses were built in 2004. Upgrading of the formal settlement is ongoing - with the building of tarred roads, the installation of solar geysers, pre-paid electricity and street lights. Despite this progress, residents of the RDP settlement have still not received their title deeds. Ablution facilities which form part of eThekwini Municipality's Interim Services Programme have been provided in the informal settlement under the administration of EWS. There are 18

[9] For more detailed information on these settlements see Sutherland et al, 2013a and Lewis, 2013.

ablution blocks and 9 communal standpipes currently servicing all the households within the informal settlement. A care-taker has been assigned, by EWS, to maintain each ablution block.

Plate 1: Ocean Drive-In and Plate 2: Magwaveni

Russia is a peri-urban settlement located on communal land in the rural landscape of KwaNgcolosi in the Outer West region of eThekwini Municipality. KwaNgcolosi was part of the homeland of KwaZulu during apartheid and it has retained its rural character and low housing density (see Plate 3). The housing in Russia consists of traditional homesteads, or ‘umuzi’. People live together in extended family groups, with houses built around the main homestead. Houses vary from traditional houses to formal brick houses and many residents are engaged in small scale agriculture. Many of the roads in the area are sand roads, and the topography is steep, so access to the houses is difficult. The pathways to houses are especially difficult to traverse during and after heavy rain. Residents in Russia have access to electricity, telephone lines, water (full water provision and grey tanks) and sanitation services in the form of pit latrines and UD toilets. According to residents, the UD toilets were installed by the Municipality in 2004 and the grey tanks in 2007. Russia is governed by the Traditional Authority and hence falls under a regional inkhosi (chief) and a local induna (headman), as well as an elected councilor.

Plate 3: Russia, KwaNgolosi

Table 2 summarises the services received in the three communities.

Table 2: Service provision in the three case study areas

Case-study settlement	**Housing Typology**	**Type of Water Provision**	**Type of Sanitation Provision**
Ocean Drive In 725 structures, of which 710 are informal houses	Informal Settlement	Communal Tap *(5 taps for approx. 725 households)*	Pit Latrines
Magwaveni (2617 households in total)	Transit Camp (30 households)	Communal Tap *(1 tap for 30 households)* Ablution Block *(2 blocks for 30 households)*	Ablution Block *(2 blocks for 30 households)*
	Informal Settlement (1596 households)	Communal Tap *(9 taps for approx. 1600 households)*	Ablution Block *(18 blocks for approx. 1600 households)* Pit Latrine
	RDP Houses (1012 households)	Metered Yard-Tap In-house metered	Flush toilet
Russia, KwaNgcolosi 3944 households	Rural/Peri-Urban	Grey Tank Metered Yard-Tap In-house metered	Urine Diversion Toilets Pit Latrines

4.2 Water, sanitation and climate change experiences and adaptations

Despite their different realities, residents in the three settlements reported very similar problems related to water and climate. Respondents in all communities were relatively satisfied with the provision of water services but experienced major problems with sanitation and flooding (see Table 3). This implies that the provision of water services, particularly the provision of free basic water, satisfies the basic needs of communities, albeit it that they often obtain water under difficult conditions, such as carrying it in containers to their households or having limited water supply in grey tanks. However, the issue of flooding, which is predicted to increase as a result of climate change, has been identified as a critical issue, along with the provision of adequate sanitation.

Table 3: Water vulnerabilities in the three settlements

Water Vulnerabilities			
	% Respondents[10]		
	Ocean Drive In N=29	**Magwaveni** N=40	**Russia, KwaNgcolosi** N=30
Biophysical			
Damage to house – from rain	40,4	16,2	36,7
Leaking/Flooding house from rain		41,9	24,5
Poor drainage (i.e. muddy pathways)	19,2	27,0	20,4
Disruption to electricity – from rain			2,0
Social			
Collection of dirty/ waste water	30,8	2,7	6,1
Open/leaking tap	5,8		
Poor[11] sanitation	1,9	1,4	
Poor access to water	1,9		4,1
Broken pipes			4,1
Leaking sewerage pipes		4,1	
Broken toilet[12]		2,7	
Bridge needed		2,7	
Vandalism to taps		1,4	
Nothing			2,0

(Source: Surveys undertaken by C2S team members in 2012 in three case study communities)

The impact of heavy rain and flooding

Households in Ocean Drive-In and Russia are most susceptible to flood damage as a result of them being constructed from plastic, tin, mud and traditional materials. Steep slopes in both

10 Residents could list more than one problem in their responses.

11 "Poor" refers to cases where either no water or sanitation has been provided, or respondents are dissatisfied with the services provided.

12 "Broken toilets" refers to cases where a flush toilet has been provided (usually in RDP houses), but these have been of low quality, and as a consequence have become easily damaged.

these settlements increase the impact of flooding on households. In Ocean Drive-In communities have constructed makeshift drainage systems (see Plate 4) that divert water away from their households. However, because this is not an integrated drainage system the diversion of water away from one household often results in this grey water flowing in to another household lower down the slope. This has significant impacts on households as this water is highly polluted containing grey water run-off and sewerage from open defecation in pathways during the night. The low density of households in Russia with their large gardens that are, in many cases, still covered in vegetation, helps to ameliorate the impacts of heavy rain in the area. The environmental services provided by the open spaces in Russia therefore play an important role in dealing with run-off. Where vegetation is removed, significant flood damage is experienced (see Plate 5).


Plate 4: Community produced drainage systems in Ocean Drive-In and Plate 5: Flood damage – leaking and collapsing house in Russia

In Ocean Drive-In a sophisticated system of exchanging house registration numbers has been instituted by the community during the relocation of households to Hammonds Farm. Residents in shacks that are at high risk of being damaged or flooded by heavy rainfall have negotiated with municipal officials to move in to the shacks of residents that have relocated to Hammonds Farm, and that are more durable in heavy rain. The Municipal practice is that shacks are demolished as soon as a household is relocated so as to ensure that new urban residents do not move in to the vacated shacks (see Plate 6). Control over housing numbers is an intensely political process in the city as access to a housing number, which has been attached to a formal house in a housing project by the Housing Department, is the only way of securing the right to move in to formal housing. The fact that residents are prepared to take the risk of exchanging numbers to move in to a stronger and more flood proof house in Ocean Drive-In reveals how concerned they are about the impact of water and floods on their daily lives.

Plate 6: The demolition of shacks on the day a household is relocated to a formal housing project

Despite the fact that the majority of the respondents from Magaveni were from the formal RDP houses, there was a high proportion of residents who reported leaks and flooding from rain. This is attributed to the settlement's location on a floodplain, combined with the low quality of the RDP housing, resulting in flooding of the floors and damp living conditions.

> *"…water is coming from underground and the back of the house, and doesn't drain away. When it rains water also comes through the back wall at the bottom. I can't do anything about this; I need money to cement to the wall…." (Magwaveni female resident, 57 years old)*

The development of Magwaveni on a floodplain highlights the challenges the Municipality faces given the shortages of cheap and accessible land for low cost housing and the risks associated with climate change. However the importance of securing ecosystem services and not building on environmentally challenging sites is a critical consideration in the development of housing for the poor and in addressing climate change adaptation. It is this argument that is used by EPCPD to defend and enhance spaces that contain ecosystem services in the city.

The transformation of the free basic water policy

Residents in all three communities make use of free basic water, adapting their consumption based on how they access water. Residents who have access to grey water tanks will borrow water from their neighbours if they run out on a particular day. They also store water in water containers if they do not use the full quota each day, to ensure that the tank is empty before it is refilled each day. Residents in informal settlements with communal stand-pipes have access to as much free water as they can carry, however they often have to queue for this water especially during the busy times of the day. EWS monitors the use of water in informal settlements to ensure that the free water that is provided is not used at a level which is way above the requirements of the informal community.

Ocean Drive-In residents were concerned that people living outside the community came in to Ocean Drive-In to make use of the free supply of water which wastes water and impacts on the informal settlers living close to the tap points. A resident of Ocean Drive-In stated that

> *"People [from outside the community] coming to wash their cars and run water to our yard" (Ocean Drive-In female resident, 30 years old).*

Evidence of this use of free basic water is shown in Plate 9 and Plate 10.

Plate 9: The driver of the car fills up his bucket at the communal tap point and Plate 10: The driver uses buckets of water to wash his car, partly as an act of cleaning it and partly as an act of spectacle and status

The availability of 'unlimited access' to free basic water in informal settlements produces an adaptation strategy for formal low income residents, where formal low cost housing projects are located adjacent to informal settlements. In one RDP housing project, residents who have access to 9 000 litres of free basic water per month cross the road to an informal settlement to do their washing as they obtain 'unlimited' free water in this location (Buthelezi, 22/10/2012).

Wastage of water is a major problem in areas that have communal standpipes. Plate 7 shows how the tap installed by the community of Ocean Drive-In, is left running while the person using it has gone to do something else.


Plate 7: A communal tap left running in Ocean Drive-In and Plate 8: Collecting water at the communal standpipe with its flow restricting tap

As a result of this problem all communal standpipes installed by the Municipality have a tap that is only open if someone holds the tap mechanism up (see Plate 8). As soon as it is released the water stops flowing. However this has the unintended outcome of potential water contamination from the user's hands coming in contact with the water. Residents have produced their own technologies to deal with this problem. They use the cut off end of a plastic two litre soft drink bottle as a funnel to channel water in to containers. These technologies are shared at some communal tap points, as community members leave them there for others to use. This reveals the 'learning by doing' or experimental governance that occurs as people adapt to interventions designed by the state. Water in Russia is provided primarily via grey (ground) tanks (see Plate 11) and communities have made functional adaptations to this technology to meet their needs (see Plate 12).

Plate 11: Grey water tanks and Plate 12: Grey water tanks modified to support a washing machine

The disposal of wastewater

In all settlements residents dispose of waste water around their houses. The benefits of the larger plots with vegetated open space in Russia are evident as the environment manages and disposes of this wastewater. In Magwaveni and Ocean Drive-In residents were concerned about the management of grey water and the impact it has on their houses and health, whereas in Russia this was not raised as a concern as residents commented that their gardens take care of the waste water and that grey water does not cause problems. The problem of grey water disposal is accentuated during the wet season as water does not drain away. This problem will be exacerbated by the wetter conditions predicted for Durban as a result of climate change. This further supports EPCPD's claim that the protection of basic ecosystem services is essential to the poor who will be impacted more significantly by climate change.

Adaptations to sanitation services

The provision of sanitation services is far more challenging than water provision in the city. Sanitation is a major issue for communities living in informal settlements. It poses significant health risks and it results in a loss of dignity. In Ocean Drive-In the pit latrines installed by the Municipality are not functional (see Plate 13) and residents use the surrounding sugar cane and settlement pathways as toilets. The use of the sugar cane is dangerous for women and children at night and the pathways of the settlement become open sewers after rain. The informal settlement residents in Magwaveni have access to the Interim Services Programme ablution blocks (see Plate 14).

Plate 13: Dis-functional pit latrines in Ocean Drive-In and Plate 14: The Interim Services ablution blocks in Magwaveni

Interim Services ablution blocks are vandalized with residents complaining that they have fallen into disrepair, and that the assigned caretakers are not taking care of them properly. They are often absent and leave the facilities locked. According to a resident of an informal settlement in Magwaveni

> *"the containers [ablution blocks] didn't even last three months! People stole taps, the municipality never came to fix them, and they're still locked and there's no caretaker!...I don't use the other toilet because it's too far and not safe to walk at night. Some people are using plastic and dump their toilet waste near your house, it's a big problem in this area" (Magwaveni female resident, 33 years old)*

The transit camp in Magwaveni has also been provided with an ablution facility, however this was provided through the Department of Housing, who had not hired a caretaker, neither had they installed a standpipe. The community had therefore installed their own standpipe, by hiring a plumber. They complained that it was difficult to report any problems, as neither the tap nor ablution facilities had not been provided by EWS and so they could not call the EWS toll free number. This response shows that communities are aware of the service complaints channels that are available in the city and that they do use them when services have been installed by EWS.

UD toilets were provided by the Municipality in Russia (see Plate 15). In policy terms this is meant to be an ecologically friendly alternative to the flush toilet, as well as an improvement on the pit latrine, in terms of reducing risks to public health arising from poor sanitation[13]. However, nearly 50% of the respondents in Russia stated that they were not using their UD toilets. In some cases residents reserve them for their guests, digging their own pit latrines for day-to-day use. All of the respondents in Russia stated that they were not satisfied with the UD toilets for a number of reasons, most of which related to the difficulty in cleaning/maintaining the toilets. These sentiments are capture in the quote below:

> *"…they said they dig their own pit toilet....she said these toilets they've provided, they call it "gobiqolo"[14].... all of them they're not using because once you're using it's smelling bad and also the rules…. they said if you're using you have to follow this rule. They fail to follow these rules, [so] they decided to dig their own.... look at this one [UD of household where focus group being held], it's clean they never use it.... People were happy at the beginning [about the UD toilets]...also they were getting employment [from the building of the toilets]...They said the Municipality sent someone and that person must go to each house and explain how to use these toilets, and also put the poster in the door of the toilet, on how to use it, and the people they failed to follow all those rules, and they never use it....the time they were building these toilets, they were thinking it's going to be same with the pit latrine [so they never asked!]" (Focus group responses translated from Zulu by Sibongile Buthelezi, 20/11/2012)*

[13] The development of the UD toilets in Durban is based on extensive research and international collaboration.
[14] In some areas residents refer to these UD toilets as "gobiqolo" named after the "folded over" position of those who laboured to construct the toilets.

Plate 15: A UD toilet in Russia that has been reserved for use by 'visitors'

According to a CSO activist the problem of UD toilets is not just one of differentiated services, it is also indicative of the state's tendency to concentrate on finding technical solutions to what are inherently social problems:

> *"...what they're [EWS] trying to do is load more technological fixes on the already technological fix. They couldn't afford to keep emptying toilets, the VIPs weren't working, so they thought okay here's this great technological answer, put it in. People don't get it, they reject it. (CSO activist, 18/01/2013).*

EWS has completed community surveys to determine the acceptance of UD toilets. However, the UD toilet concept was implemented as a technical solution and hence it has not been widely accepted as a solution to sanitation problems in poor communities. Communities in peri-urban and rural areas dig their own pit latrines using the environment to manage their sewerage, thereby navigating around the 'new' technology of the UD toilet. The debate about what type of toilets are sustainable in a fast growing city with limited resources and geographical challenges needs to happen at a more strategic and political level if the uptake of renewable technologies is to be accepted and used more universally in the city.

This section has reflected on some of the adaptations that have taken place around water and climate change policy in Durban. The final section reflects on the relations between the everyday lived experiences and abstract policy and practice and how this shapes urban governance.

5. Engagement with the state: connecting abstract spaces with everyday lived worlds

The eThekwini Municipality has recently undergone significant changes in leadership and styles of management. This change is opening up new spaces and ways of governing that have yet to become stabilized and 'institutionalised'. However, the impact of the previous era of leadership under Mike Sutcliffe (2002-2011), which can be classified as 'managerialism' as a result of the high level of efficiency and centralization, continues to influence governance in the city (Piper and Nadvi, 2009). This high level of control by the local state is reflected in the lack of meaningful participation of ordinary citizens in policy making, and in the control exerted by many ward councilors (politicians) of the communities that they are elected to represent, through political interference in 'quasi' ward committees. In their research on participatory governance in eThekwini Municipality, Piper and Nadvi (2009, p 233) reveal the "way political parties manage to dominate the formal local governance landscape, including the supposedly neutral and inclusive institutions of participatory governance". However this control is not complete and they suggest that there is evidence of civil society action and social mobilisation within the city.

Given the paucity of real engagement of communities with the local state, it is difficult for the everyday lived experiences and knowledge of communities to shape abstract policy and practice. However, within this managerial system, EWS and EPCPD have created opportunities for ordinary people to shape policy and practice. EPCPD is still developing its climate change response strategies and it has shaped this policy and practice through incremental learning and experimentation on the ground. Through engaging in action research, EPCPD has explored the forms of adaptation that are most appropriate in the Durban context and it is still 'learning by doing'. The re-launching of the Durban Climate Change Partnership is also an attempt to engage meaningfully with a range of stakeholders at a more strategic level. However, given that knowledge about climate change adaptation is still being developed both globally and in South Africa, it is critical at these early stages that EPCPD develops strong partnerships with local communities to drive this agenda forward.

EWS has a well-developed and structured approach to participation, which is orchestrated through the 'technical' participation frames developed by EWS officials. EWS engages with communities through Focus Groups, User Platforms, Sizekala Centres, and through a wide range of research projects and civil society organisations (Lewis, 2013). The data collected through these platforms is integrated in to decision making and many of the policy shifts EWS has made, such as changing from 6 000 litres of free water per month to 9 000 litres of free water per month, placing caretakers at communal ablution blocks and the introduction of municipal cleaning of UD toilets, have happened as a result of the engagement between officials and communities (Macleod, 25/04/2012; Malakoana, 23/10/2012; Gounden, 23/10/2012). However, the form of engagement is still controlled by the state and is managed through the technical practices that have been established to allow for participation. Given that the spatially differentiated service model is contested when viewed from beyond the frame of the technical, it is critical that EWS opens up it spaces of participation to include more deliberative processes to deepen the relations between the abstract spaces of water governance and the everyday lived worlds of ordinary people.

6. Conclusion

Water and climate change governance in eThekwini Municipality is progressive and innovative with incremental learning and experimentation forming the main approach to addressing the challenges posed by a fast growing coastal city with high service backlogs facing the impacts of climate change. This paper has reflected on the relationship between the abstract spaces of the state and the everyday lived worlds of ordinary people. The type of engagements between the state and its citizens shapes the way in which the relations between abstract space and lived experience are constructed. Abstract spaces within the local state and the everyday lived worlds of ordinary people therefore produce and re-produce each other, shaping the governance arena in water and sanitation provision and climate change in the city. This paper has explored some of the ‘stories-so-far’ of space which reveal the relations between the material, abstract and everyday lived world in water and climate change governance in eThekwini Municipality. The spaces of water and climate governance in eThekwini are therefore, as Massey (2005) argues, a product of multiple inter-relations, are constituted at different scales from the practices of the local state to the lived worlds of households and individuals, and are always being made. However, as the research reveals participatory governance in Durban needs to be strengthened to deepen these relations and to enhance their ability to co-constitute each other, thereby positively shaping water and climate change governance in the city.

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