# WATER AND CLIMATE CHANGE

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## INTRODUCTION

Despite a constitutional right to water and supportive policy frameworks, many people in South Africa currently do not have access to sufficient affordable clean water. The challenges to address this are immense, and climate change will exacerbate them.

The linkages between water and climate change raise a number of critical questions. What will happen to rainfall patterns and soil moisture? How will we respond politically and as a society? What kind of mechanisms will be used to adjust – will they be friendly or antagonistic to vulnerable parts of our communities? And can we use the inevitable change to improve our relations with each other and with the planet?

This paper aims to reflect on these questions, particularly in relation to water services provision and access. It will present the current state of access to water, provide a rationale for linking climate change and water services, provide examples of responses that could have negative consequences given the state of water provision and vast inequity in South Africa, and explain why an appropriate response is so important. Finally it will propose elements of what an appropriate response might look like, one that puts people's health, dignity and livelihoods at the centre.

## BACKGROUND

*Water!* is the answer many people give when asked what they associate with climate change in South Africa, or to be more precise, *lack* of water – drought, famine, parched earth. While this might be true, it is only part of the story. Changes to the rainfall patterns, increased evaporation and less predictable weather tell the part of the story we have already set in motion, the part that reacts to increased concentrations of greenhouse gases in the atmosphere. The other part of the story is how we respond – what institutions, financing mechanisms and social networks are in place to respond humanely and timeously to climate change. The weak state of water service provision in South Africa combined with the residual challenge of apartheid's legacy and future challenges of migration, urbanisation, population growth, development, financing and climate change make intervention right now all the more important. While we can't stop the primary impacts of climate change in the short term, we can and must make the secondary impacts as benign as possible. We must put in place systems to ensure that each person living in South Africa has access to clean, affordable water, and that these systems are robust enough to last.

South Africa is a water stressed country, bordering on water scarce with 1 100

kilolitres of available water per person per year. By 2010 freshwater resources are predicted to drop below 1 000 kilolitres per person per year. At this threshold, South Africa is prone to extreme water scarcity that will impede development and be harmful to health (WRI 1996, cited in LTMS chapter 6: water and hydrology). Not only this, but rain in South Africa does not fall evenly, nor does a lot of rainfall reach the rivers. It is highly variable in terms of season (winter or summer), year-to-year and location. In general, the north and west is drier than the south and east, with a pocket of winter rainfall in the Western Cape. Only 9% of the rain that falls reaches the rivers; the world average is 31%.

By 2000, 98,6% of South Africa's surface water yield, as well as 41% of the annual usable potential of groundwater was allocated to use (Blignaut *et al.* 2009). Of this allocated use, sixty percent went to irrigation. Urban needs were second with almost a quarter (23%), rural 4%, mining and bulk industry 6%, afforestation 3% and power generation 2% (DWAF 2004). Not all 'urban needs' are domestic – this category also includes light industry and commercial uses. According to the National Water Resources Strategy (NWRS), population and economic growth are "the primary determinants with respect to future water requirements". It also states that in the past climate has been a relatively stable factor and that "in most cases, control can be exercised over the growth in demand for irrigation water". The NWRS provides base and high scenarios for requirements and availability of water in 2025, disaggregated to catchments. At this general level, and with investment in developing new supplies, the requirements and availability of water can be reconciled. But of course an aggregate model, by its nature, hides many details. These numbers are also outdated and climate change predictions have become more alarming rather than less so. The Water Resources of South Africa 2005 study, which has just been released, found 4% less surface water than had been estimated in 1995 (WRC Report No. K5/1491). More recent figures of water allocation and future demand are not easily available – the five-year review of the National Water Resources Strategy, due this year (2009) has not been completed.

The details hidden in the scenarios include problems of a localised nature and *why* demand rises with demographic changes and economic growth; and what can be done about it. It is thus critical that we interrogate these numbers further, not only in the aggregated sense of their total demand, but also at what comprises them; what kind of water supply people are aspiring to and whether this can be met in the long term. It is assumed that economic growth leads to increased water use. This is an historical pattern that results from both increased economic activity and from increased wealth. Every economic sector uses water, from manufacturing to tourism to agriculture – thus a growth in any of these implies a growth in water use. But there is room to disaggregate water use from growth, for efficiency gains, and to question the nature and benefits of economic growth itself. When projecting future demand it is therefore important to look not only at historical use but also at what *could* be done. What would a less water intense economy look like?

In the domestic sector many people aspire to reach the 'top of the water ladder', and politicians fuel these expectations. A wealthy and successful person does not think twice about how much water they are using. Numerous bathrooms with numerous taps are a sign of having 'made it'. Yet already we are seeing that most municipalities struggle to provide water and sanitation beyond 'basic' levels as defined in law; and

in many cases, even basic levels are not being provided (The Water Dialogues 2009). The reasons for this are complex, but important to unpack if we are serious about managing the risk of climate change and serious about providing enough affordable clean water to all.

## STATUS QUO – DOMESTIC PROVISION

The official numbers of who has access to water are contradictory and almost impossible to verify. For example, DWAF[1] estimates that 94% of people have access to infrastructure, but also that 14% either have no access or access that is below RDP standard (DWAF 2007: 58). Remember also that access to infrastructure does not imply ongoing service provision.

Aside from not having infrastructure, people's access to water is constrained by irregularity of supply – the taps are there, but no water flows when they are turned on; affordability – water is too expensive; poor quality; technologies that limit supply such as pre-paid water meters; and technical failures – for example meters that randomly shut down and cut off water. All of these are exacerbated by poor response time by municipalities and fractured relations between people and their local authorities.

Since 1994, government has focused on rolling-out services to get rid of the backlog (i.e. those with no access). While this has laudable intentions, it has not been combined with *sustaining* those services, and what is emerging is a second-order backlog. This second-order backlog is not easily visible in the statistics quoted by government. When a water connection is delivered to someone's house, the backlog is reduced by one. When that water connection fails (e.g. through poor maintenance) no addition is made to the backlog – at least on the books. In reality, the household is no better off than they were before the connection, and might even be worse off as their area is no longer counted in the backlog to be serviced. This second-order backlog is caused by poor maintenance, lack of spare parts for broken infrastructure and the terrible quality of plumbing in new government housing. In Witsand, an area of Atlantis within the City of Cape Town, this is having devastating effects. At a recent hearing on climate change organised by EMG and Oxfam in October 2009, Bulelani Kave described the problem: "The problem of water cut-offs started at the beginning of last year when the city changed the old black water meters and installed new blue meters which they never informed the community about. These metres are supposed to cut off every day after you have used 350 litres. But many of the new houses have bad leaks, so people's water is being cut off every day, before they have even used water because the 350 litres runs through the leaks." This means that although people have houses, they are walking back into the informal settlements to collect water in buckets. There are no nearby communal taps and people are going to the toilet in the bushes. This is not safe and, as Kave says, "this is not some remote rural area, this is the City of Cape Town".

Another way people's access to water is compromised is through pricing. For many households water is just too expensive. This is especially true when waterborne

[1] Although DWAF (Dept of Water Affairs and Forestry) became DWA (Dept. of Water Affairs) in April 2009, we use the historical designation when referring to documents from that period.

sewerage is the only option (and waterborne sewerage is the desired option, the promised option and the aspired for option). Nevertheless, for homes on limited or no income, paying for water to flush the loo is prohibitive, and many people are not paying. This has a number of consequences. At one level refusing to pay for water is an important form of resistance, a way of wielding some power in a situation where people otherwise feel powerless. Yet an inability to pay also leads to high debts – and for many, further feelings of despair. During a community-initiated project on water leaks in 2004, members of the Western Cape Water Caucus collected copies of household water bills in Khayelitsha. At that time, the highest arrears witnessed was forty-three *thousand* Rand. This money was owed by a household in one of the poorest townships in the City – a sum so large that it could obviously *never* be repaid. Yet month after month, the interest on the unpaid bill compounded. Being in such high debt is extremely stressful and makes a whole range of other social interactions harder. For example one woman didn't register her child at the local library because when the library asked to see the woman's water bill she believed that the request for her child would be refused as she was thousands of Rand in arrears. Her daughter was deprived of an important part of her education.

These growing household debts also impact on municipal finances. Every litre of water "lost" through leaks in the reticulation system or through unpaid bills, adds to the "unaccounted for water". Nationally, it is estimated that more than 40% of water is unaccounted for (EMG 2008). Understandably national government and municipalities want to reduce this percentage. But no distinction is made between *physical* losses – critical not only from a revenue perspective, but also from a water conservation perspective – and *financial* losses through unpaid bills. It is hard not to see this conflation as deliberate; and with it comes a *de facto* conflation of financial and resource scarcity, a blurring of the lines between physical limits and limits imposed by the particular economic model used to deliver water to households in South Africa. And this has consequences in the relationship between citizen and state and, as is discussed later, in how we respond to climate change.

For the metros and many other municipalities, tariffs make an important contribution to recovering part of the cost of water provision. They are an important source of revenue. Money for water provision also comes from national government in the form of the equitable share – to be spent on provision of basic services – and the municipal infrastructure grant (MIG) to be spent on capital projects, not maintenance. There are structural and implementation problems with both of these national grants, but it is the contribution of tariffs to cost-recovery that is at the heart of controversies around water services. In South Africa, as elsewhere in the world, water is highly politicised and has become a symbol of class struggle. Thus any response to climate change also needs to respond to inequity and to calls for social, economic and environmental justice.

Let us then look a little more closely at how water is financed and how it is priced. The municipal infrastructure grant is a conditional grant for capital expenditure. This much needed investment in infrastructure has a shadow side – there is no clear mechanism to pay for operation and maintenance. The expectation is that this will come from the equitable share and tariffs, but in most cases, these sources of revenue are wholly insufficient. A case study conducted by The Water Dialogues South Africa in Ugu illustrated the difficulty in generating sufficient funds to roll out and

maintain adequate services for all in a rural and primarily very poor municipality. This is despite Ugu's excellent status in the national benchmarking study as having good management systems and making significant inroads into backlogs. There is simply not sufficient money in Ugu to cross-subsidise between users so that everyone's expectations and right to enough clean affordable water is achieved.

The equitable share is a non-conditional grant from national government that is meant to pay for basic services for poor people, including free basic water. Because it is non-conditional, municipalities have discretion on how it is used and in many cases it has not been solely applied to free basic services. However, this might change as there are initiatives to ring-fence at least part of it for water provision. Tariff setting is also at the discretion of the municipality, with some regulation and guidelines from national government. The requirement is for a rising step tariff, with a first "free" step of 6 kilolitres per household – whether this applies to all households, or is targeted to some households only is for the municipality to decide; and at least two additional steps. The intention is to meet the three objectives of *equitable access* through rising block tariffs; *financial sustainability* through cross-subsidisation; and *environmental sustainability* through demand management. There are some contradictions in meeting these three objectives and in practice tariff setting is extremely diverse. Preliminary research on the six metros by Paul Berkowitz from the Centre for Applied Legal studies showed that there was little convergence in terms of the number of tariff steps, steepness of the curve, targeting of free basic water and so on. The City of Cape Town is closest to the ideal structure and is the most pro-poor; whereas in Nelson Mandela and Ekhuruleni metros, the poor pay relatively more than the rich (Berkowitz 2009). Outside the metros there is even more variability, and the Department of Water Affairs is not fulfilling its role as a regulator. In many instances, water and sanitation are too expensive for most households, and yet very cheap for others.

Because of the huge inequity in South Africa and the differences in household sizes, it is very difficult to design a tariff curve that provides sufficient water for people's needs, yet penalises profligate use. There is insufficient research on demand elasticity (the response of households to water pricing) to design state-of-the-art tariff structures. And in many instances municipalities are just guessing. It is hoped that this will change with research being conducted by the Centre for Applied Legal Studies and Mvula Trust on indicators for appropriate tariffs. The intention of the research is to provide a tool for civil society to engage with their municipalities on tariffs.

A further growing concern in water service delivery, as evidenced by the number of growing protests, is lack of public consultation and participation in decision-making. The intention is there on paper, in the policies and strategies, but it is not taking place on the ground. Two possible explanations exist for this, and perhaps the truth lies between them. The first is that this lack of consultation is deliberate; it is a means of keeping people marginalised and dependent, a way of asserting and maintaining state power. The second rationale is that local government does not know how to consult. The mechanisms for public engagement and participatory democracy are absent not through active choice, but through ignorance. South Africa is a young democracy with infinite challenges and the people appointed to deliver are (at best) technocrats with limited understanding of citizen engagement. Thus complex problems are dealt

with through 'technical fixes' rather than through a process of consultation. The response of many cities to growing household debt is typical – mechanisms are sought to stop people owing money to the city, rather than to understand *why* it is they are not paying and how this can be resolved whilst still ensuring that people can live with dignity and sufficient services. A pre-paid meter or water management device separates the state from its citizens by putting a piece of technology in between, a piece of technology that cannot be talked to or reasoned with, a piece of technology that in effect puts the burden on poor households rather than the state, and punishes people for being poor.

The final piece of the puzzle in understanding why service delivery remains inadequate, and points to a profound future crisis, is that of capacity. In most municipalities there is neither capacity to implement nor to regulate; and this inability to regulate sits at national level as well. Since 1994, there has been a haemorrhaging of municipal engineers. According to South African Institute of Civil Engineering (SAICE) president, Neil Macleod, "out of 284 municipalities, it has been reported that there are 83 operating without a single engineer" (Engineering News 2007, cited in The Water Dialogues South Africa 2007). And the numbers are declining. Even where there *are* engineers, many lack experience. In 2006, SAICE reported that 56% of treatment plants lack sufficient skilled maintenance staff to adequately maintain the installed mechanical and electrical equipment and instrumentation. It stated that "although South Africa's built environment infrastructure is very good, even world-class in parts, the relatively poor overall grade reflects extensive maintenance and refurbishment backlogs caused primarily by funding and skill shortages (cited in The Water Dialogues South Africa 2007). Yet to put it in perspective, since 1994, the number of people who now have access to water who previously did not, is the same as the entire population of Sweden (Eales 2009).

## HOW CLIMATE CHANGE WILL AFFECT WATER CYCLES

The relationship between climate change and water is complex and intimate. The close interconnectedness between the climate and the hydrological cycle means that water resources will be intensely impacted by climate change. As average global temperatures increase, water cycles will change all over the world. One of the greatest challenges in preparing for the impacts of climate change on water is the degree of uncertainty – we can be sure that water cycles are going to change, but it is difficult to predict the scale and location of that change. Furthermore, levels of variability will be higher. This makes it extremely difficult to plan and prepare. Nevertheless, there are many changes that we can anticipate. Here are some of the projections.

### Rainfall and storage less secure

Warm air can hold more water than cold air. Thus, global warming makes the climate more variable. It also leads to more intense floods and droughts, on average. The local manifestation of climate-water changes can be quite different. Globally, predictions for changes in precipitation are variable – it will increase in some river basins and decrease in others; increase in one season and decrease in another. South

Africa reflects this global variation. The IPCC's 4th Assessment Report projects a decrease in runoff of 10-30% in southern Africa. Runoff is that part of rainfall that does not evaporate.

The 'hotspot' in South Africa is the winter rainfall area in the Western Cape. Here 5-30% less rain could fall during autumn and winter with dramatic implications for water provision and farming. Decreases in rainfall are predicted across the country in winter; whereas summer rain could increase, making especially the northern and eastern parts of the country wetter. Mountains add to the difficulty in pin-pointing exactly how much rain will fall where. They play a strong role in the type, amount, intensity and duration of precipitation. For example, often the tops of mountains are wetter than the bottoms, and the leeward side drier than the windward. The transition zone between winter and summer rainfall is another area where it is difficult to make specific predictions but where farmers are already experiencing changes. At the Cape Town climate change hearings in October 2009, Sydney le Fleur, a farmer from the Southern Cape, reported shifts in rainfall patterns. Whereas the most rain used to fall in the winter month of August, about five years ago, it shifted to summer, to November and early December, and fell with much more intensity – the full month's rain in just three or four days. Then, last year, they waited for the rains in November, in December, in January and still nothing. These shifting patterns play havoc with crop yields and make it hard to respond as a farmer. Crop losses of 25 - 30% were observed.

Reduction in groundwater recharge and surface runoff

The IPCC predicts that ground water recharge will decrease in southern Africa. Both the timing and quantity of rainfall affect recharge rates. When less rain falls, both groundwater recharge and surface runoff are reduced *more* than the reduction in rainfall. In a scenario for Bredasdorp, Western Cape, it is estimated that an 8% reduction in precipitation results in a 31% reduction in groundwater recharge, and 30% reduction in surface runoff (Mukheibir 2007; LTMS 2008). According to the Western Cape Climate Change Sstrategy (DEADP 2008 ) in Jonkershoek rainfall has decreased by 14% since 1945 and annual runoff by 20%.

Increased evapotranspiration

On hot days, more water evaporates from rivers, oceans and the soil leaving the ground drier and the air wetter. In South Africa an increase in evapotranspiration of 5 - 15% is projected by 2050. This 'drying out' is a problem for growing food. It also increases the risk of fire.

Decrease in water quality

Water quality is impacted by climate change; pollutants will thrive. Sediments, nutrients, dissolved organic carbon, pathogens and pesticides will increase due to higher water temperatures, more intense rain and longer periods of low flow. When water is warmer, it cannot purify itself effectively. Warm water holds less dissolved

oxygen, which is used for biodegradation. Higher rainfall washes more nutrients, pathogens and toxins into the river. Water-borne disease increases with extreme rain.

Salt water intrusion into coastal groundwater

When sea-level rises, as it will when the world gets warmer, salt water can 'intrude' into estuaries and coastal groundwater tables, which are an important source of bulk water in some areas (e.g. Atlantis). Over-abstraction of groundwater can also lead to salt water intrusion. This is already a threat in the Sandveld region north of Velddrif where farmers are using a lot of groundwater and the levels are dropping rapidly (Western Cape Climate Change Strategy – DEADP 2008).

Greater water demand

South Africa has been an estimated 2% hotter and at least 6% drier over the ten years between 1997 and 2006 compared to the 1970s. Water use has also increased greatly over this time (Blignaut *et al*. 2009). With higher temperatures and drier conditions, more irrigation will be required for agriculture. Higher temperatures also mean that more water will be needed for cooling of industrial equipment and processes. Wealthy people will be using more water for their gardens and swimming pools. A growing population with increased access to domestic water (we hope!) will also be competing for access to potable water. As food prices rise, and there is a movement towards households growing their own food, the demand for water for home garden irrigation will also grow.

Infrastructure at risk

Water treatment plants are vulnerable to damage from storms. Municipalities are not meeting water quality targets at existing treatment plants – maintenance is poor and there is insufficient capacity to treat the volumes of waste water that need to be treated. Mudslides, rockfalls and heavy rain will damage roads, bridges and houses.

Reliance on alternative water sources

As available water sources become less reliable, we will need to consider more remote or alternative sources, which will often carry much higher energy and financial costs (Griffiths-Sattenspiel & Wilson 2009). DWAF has prioritized 'diversifying the water mix', by relying less on surface water sources and increasing the use of groundwater, treated effluent, and desalination (DWAF 2009). In Cape Town, future supply options have been identified and are being researched and piloted – in particular, the Table Mountain Group Aquifer, waste water re-use and a desalination plant (City of Cape Town 2008). All of these alternatives are likely to carry higher financial costs than existing bulk water resources.

## IMPLICATIONS OF CLIMATE CHANGE FOR DOMESTIC PROVISION

What all of these projections point to is the strong likelihood that we will face water shortages as a result of climate change, particularly in the Western Cape. These shortages will not only be the result of dwindling water resources but also increased cost – climate change is going to make water provision more expensive. This means that municipalities are going to be trying to make less water go further, at the same time as they are trying to deal with greater expenses. We can therefore anticipate an increase in the price of water, and greater competition over access to domestic water.

How will we see these trends unfolding? Some of the responses we are already seeing, and need to challenge, are:

- More punitive measures taken against those who do not or cannot pay their water bills
- More outsourcing of aspects of water and sanitation service provision to private contractors (with less regulation of these contractors)
- Deeper conflation of debt recovery and water conservation – i.e. restricting water to those who cannot afford to pay for it, in the name of water resource conservation.

We need to ensure that official responses to climate change induced water scarcity will not make things harder for poor households. This means we need to understand better the impacts of current approaches to water demand management, and take corrective action where it is harmful.

## WATER DEMAND MANAGEMENT (DIFFERENTIAL IMPACT ON POOR PEOPLE)

Reducing total water use is the easiest, cheapest and most environmentally friendly way of responding to increased water scarcity. Yet it requires us to interrogate *who* is being asked to use less water, and why. We also need to examine short term (crisis) reduction in water use, for example during a drought, and long term water conservation practices.

The City of Cape Town aims to reduce *projected* water demand by at least 20% by 2012 (emphasis added). They also aim to reduce unaccounted for (non-revenue) water to below 15% by 2010. Water wastage by consumers should be reduced and maintained to below 2% of total demand by 2012. By 2016, most consumers should achieve 'acceptable water efficiency benchmarks' (City of Cape Town 2008). Strategies to achieve this include water-use restrictions, pricing, pressure reduction, awareness raising, leak-fixing, and water metres – known as 'water management devices' – that cut off after a certain amount of water has been used.

All of these strategies need interrogating, in terms of *how* they are being employed, in which areas, and for what reasons. Too often, strategies carried out in the name of water demand management end up being harmful and manipulative, particularly towards poor households.

It is common for government to conflate *debt or cost recovery* objectives with *water conservation* objectives. In other words, the first target for reducing water use, is

those who cannot (or do not) pay, rather than those who are consuming vast, luxurious quantities of water, and paying for it. The de facto aim is therefore to reduce *non-revenue* water, rather than total or wasteful water use – hence the logic (from government's point of view) of prepaid water meters and the water management devices. These approaches are really about cost recovery and debt management, more than anything else; they discriminate on the basis of class, and require that the poor bear the largest burden in terms of water and cost savings.

The target of reducing *projected* demand is inadequate. Intended benchmarks need to be made against *actual* use. If the more dire climate change predictions of a 30% reduction in rainfall come true, we need to be reducing water use by as much or more (given the multiplier effect of reduced rainfall on surface and ground water). Augmenting supply should be a last resort for many reasons, not least its cost, feasibility and environmental impact. So we all need to use less water, especially the rich and middle classes. In Cape Town, water consumption increases with both property size *and* property value, independently (Taylor 2004), so both of these categories need to be targeted. But because most people in Cape Town are neither rich nor live on vast estates, reducing water use in poorer households by a small amount can make a massive difference to the total amount of water used.

Water demand management is not inherently bad in principle, but when it is confused with debt collection, and is carried out in ways that many people experience as 'punishment for being poor', the mistrust and anger that people feel towards the government deepens, and spaces for real collaboration and sharing of responsibilities close down. In order for water demand management strategies to be successful, and to be acceptable to the citizens who are asked to adhere to these strategies, there is a need for real participation in these processes. New approaches to water demand management, as part of a larger process of participatory budgeting, need to be pursued.

One example of such an approach is the Water Leaks Project, a project of the Western Cape Water Caucus, which was an attempt to mobilise and train community members to detect and fix leaks in their areas. This project has encountered several obstacles and has not yet been fully realised, but the idea remains alive and vital, and it is something to support wholeheartedly as part of our local response to climate change. Fixing water leaks saves not only water but electricity as well because a lot of electricity is used in cleaning water and pumping it to households. Given the high carbon dioxide emissions associated with electricity production in South Africa, it is critical that *this* aspect is also looked at.

## OPPORTUNITIES FOR CLIMATE CHANGE MITIGATION IN WATER SERVICES

The South African water sector's response to climate change has largely been from the perspective of the projected impacts of climate change on water, the added pressure on resources, and strategies for *coping with* or *adapting to* climate change. But the water sector also contributes to climate change. The process of getting water from a 'raw' or natural state to users, and treating it so that it is drinkable and so that the final effluent is safe to release into the environment, involves using a lot of

carbon-burning electricity, as well as the emission of other greenhouse gases. While water's carbon footprint may not seem very big compared to other sectors, like mining or transport, this footprint is going to continue to grow, and we must address it if we are to uphold our commitments to mitigation across all sectors.

Mitigation in the water sector is essentially about sustainable development. It is about closing loops and minimising waste. Furthermore, mitigation in the water sector overlaps strongly with climate change adaptation. To mitigate, we need to improve water use efficiency (because water efficiency = energy efficiency); we need to have cleaner water (because it takes energy and chemicals to clean water); we need to think about alternative ways of building water infrastructure and storing water (because the concrete used to construct large dams produces carbon dioxide, dams themselves release methane, and both methane and carbon dioxide are key greenhouse gases). And we need to think about doing all of these things in ALL communities. Providing water with a lower carbon footprint means we need to rethink technologies used to capture, store, clean and distribute water, as well as improving water efficiency.

EMG has identified three immediate opportunities for mitigation in Cape Town (Pereira 2009). These are likely to be similar to opportunities in other metros. The first is to replace old pumps and motors with energy efficient alternatives; the second to refurbish existing biodigestors at wastewater treatment plants in Cape Town to make use of the methane they generate; and finally to make it clear that water demand management strategies, such as water management devices, which restrict access to water for the poor are unacceptable.

Unsurprisingly the realisation that climate change severely affects water has led to numerous projects and responses, particularly in the Western Cape where water scarcity is predicted. There are three main areas of response: managing demand, augmenting supply and putting systems in place for unpredictable weather (including disaster management).

## EXISTING PROJECTS AND STRATEGIES RELATING TO WATER AND CLIMATE CHANGE

### Municipal water conservation and water demand management strategies

Water conservation (WC) and water demand management (WDM) strategies require changes in behaviour, at a municipal, household and personal level. In terms of climate change, appropriate WC/WDM should be a fundamental part of both mitigation and adaptation. This is especially true in the Western Cape, where projected water shortages mean that far-sighted water conservation is going to be essential. The role of WC/WDM in 'postponing the need for expensive capital infrastructure projects... and minimizing water wastage' (City of Cape Town 2008) has significant implications in terms of avoiding major new sources of greenhouse gas emissions.

According to the Western Cape Reconciliation Strategy of 2005, WDM is currently pursued via the following methods:

- Leakage detection and repair
- Leakage repair beyond the meter
- Pressure management (e.g. Khayalitsha Pressure Reduction Scheme)
- Use of water efficient fittings
- Elimination of automatic flush urinals
- Adjustment of water tariffs, metering and credit control
- User education.

Other decentralised water supply options, such as rainwater tanks, grey water re-use and boreholes, are also being considered as part of municipal WDM strategies.

Berg River Project (www.bergriver.co.za) IDRC funded, UCT and University of the Free State

The project will develop an integrated assessment framework (a planning model) to quantify the costs, benefits and risks associated with planning and management alternatives. The case study is the Berg River catchment area, which includes Cape Town, is home to over 5 million people, and supports much of the Western Cape's agriculture and industry. The project will address two significant problems related to adaptation to climate change in the water resources sector of African countries. The first is that relevant and important information from climate change forecasts is not being disseminated to water resource managers, nor is it being integrated into water resources policy, planning and management in a systematic way for agricultural and human use in Africa. The second, related problem is that there is currently a shortage of integrated approaches for evaluating and making adaptation decisions related to water resources in Africa.

Climate for Water Research Project (www.c4w.org.za) UCT's Climate Systems Analysis Group and Water Research Commission

This project explores how information about climate variability is currently used by water resource managers, and the potential opportunities for using it more effectively in the future. It provides daily, mid-range, monthly and seasonal weather forecasts.

Long Term Mitigation Scenarios (LTMS) (http://web.uct.ac.za/projects/ltms/)

The LTMS was launched in 2006. Findings and policy recommendations were presented to cabinet in July 2008. The intention is to limit global warming to 2°C (as required by science). The vision includes Theme 5: Vulnerability and Adaptation, and notes the importance of enhancing early warning and disaster reduction systems and adaptation in the roll-out of basic services, water resource management and infrastructure planning. A chapter on Water and Hydrology was written as input to the LTMS process.

Framework for Adaptation to Climate Change in the City of Cape Town (FAC4T)

This was written in August 2006 by UCT's Energy Research Centre and Climate Systems Analysis Group as a framework to reduce vulnerability to climate impacts and variability. From this, a City Adaptation Plan of Action will be developed and implemented. The Integrated Development Plan (IDP) already contains a goal of reducing water use by 30% and increasing renewable energy to 10% by 2020. The report states that because domestic consumption accounts for two-thirds of Cape Town's demand, any demand-side management strategy should focus there. (This is not necessarily the correct logic. For example, industry has very few customers so targeting them would be easier and could result in rapid reduction in water use; unaccounted for water of approximately 19% is also not included). The framework outlines impacts, vulnerability and adaptation initiatives for urban water, storm water, biodiversity, fires, coastal zones, livelihoods and health.

For urban water, adaptation proposals include a) integrated water resource planning b) long-term monitoring c) water demand-side management (current initiatives include: water restrictions, water tariffs, leak reduction, pressure management, awareness campaign); additional policies and measures could include incentives (e.g. rebates) and regulations (e.g. new buildings to have water saving devices) d) supply side interventions (Berg River schemes, Table Mountain Group Aquifer, effluent re-use, rainwater tanks, sea-water for non-drinking, desalination).

Climate Change Strategy and Action Plan Western Cape
(http://www.capegateway.gov.za/eadp)

Water is identified as a significant risk factor and the heart of the first of the four programmes. It is phrased as 'An integrated water supply and infrastructure management programme that integrates climate impact and risks' and includes using pricing to increase water efficiency, water conservancy targets, systems maintenance and the ecological reserve. DWAF is the proposed custodian of this programme, supported by a programme steering committee that includes communities.

It is notable that the involvement of civil society and the democratisation of decision making or strategy development are not mentioned as specific components in this programme, although a science-government dialogue is proposed. It would perhaps be important to lobby for civil society to be included in such a platform. Stakeholder engagement is identified as important outside the programme areas, and a (one-way) communications strategy is outlined to increase resilience of communities.

The other three programmes are i) links between land, livelihoods and economy ii) climate change research and weather information iii) reducing Western Cape's carbon footprint. A Provincial Climate Change Committee is proposed as overall custodian.

Western Cape Reconciliation study
(www.dwaf.gov.za/Documents/Other/WMA/19/WCWSSRSJun07.htm)

This is a seven volume report (each volume 1-2 MB), completed in June 2007. Of particular interest is Section E: Urban Water Conservation and Demand Management in Volume 3: scenario planning for reconciliation of water supply and requirement.

This is based on the City of Cape Town's IWRP Study and includes 10 elements (leakage detection and repair, leakage repair beyond the metre, pressure management, water efficient fittings, elimination of automatic flush urinals, adjustment of water tariffs metering and credit control, user education, grey water use, rainwater tanks, private well points and boreholes). Of interest also are Volume 4: Overview of Water Conservation and Demand Management in the City of Cape Town, and Volume 7: Summary Report.

Water for Growth and Development Framework Version 7. DWAF 2009

This strategic framework will provide guidance to the National Water Resources Strategy (NWRS), due for revision by late 2009. Climate change is recognised as one of the key drivers requiring us to find different and better ways of managing water. However, there is no deeper analysis about how to reconcile the goals of 'water for all', 'water for growth and development', and climate change related water scarcity.

Global Water Partnership (GWP), Southern Africa

GWP have a new programme managing risks in water resources management (WRM), in which climate change is one of the risks. The focus is on extreme events (such as droughts and floods) and infrastructure, balancing supply and demand concerns, and integration with other sectors such as agriculture, health and energy. They are aiming to build institutions – such as catchment councils and user associations – in the region and looking for local partners. Currently they are capturing examples of adaptation to climate variability. GWP has linked up with Oneworld and the DFID regional climate study.

All of these projects and strategies tend to focus on quantitative elements relating to the science (and modelling) of climate change, and to strategies to balance supply and demand at a macro-level. The primary impacts of climate change on water resources are quite well understood and, on paper at least, planned for. However, the secondary impacts of climate change on water services are not well understood. Work in the 'grey' areas of human relations, local dynamics and participatory response is weak. There is no thought given to the relationships and resilience required by government and communities to be able to cope with the added pressures of climate change. While *physical* and *infrastructural* scarcity is anticipated, *social* water scarcity – i.e. the inaccessibility of water due to unaffordable prices, water restrictions, conflict etc. – is not being addressed. Furthermore, some of these responses and strategies threaten to make things even more difficult for poor people – particularly some of the municipal water demand management strategies. It is here that civil society will need to engage, as well as to monitor whether official responses are fair and just.

## GAPS IN RESPONSE TO CLIMATE CHANGE IN THE WATER SECTOR

As we have seen, there are gaps when it comes to climate change and water responses. Generally speaking, there are many blind spots and inconsistencies within the water services sector. The government continues to promise water and flushing

toilets for all, even as the backlog grows and research shows that we have even less water than previously estimated. Water conservation is pursued through pre-paid water meters and other punitive devices, while vast amounts of water are lost through leaks in new government housing and the wealthy continue to consume hedonistic volumes of water. The underlying reasons for many people's inability to access adequate water – i.e. 'social water scarcity' – are ignored or glossed over.

For many people, the link between climate change and water services is tenuous or non-existent – we are warned not to use climate change as a 'scapegoat' for other issues, or not to complicate the already highly complex terrain of water services with climate change. But the truth is that climate change is going to exacerbate all of the existing pressures on water services – and clarifying and emphasising this link is the first gap that needs to be addressed. Closely related to this is the need to look for responses to climate change that put people's access to adequate domestic water at the centre.

At present, the engineers and managers and decision-makers in charge of our water are scarcely beginning to think about climate change adaptation, and are not even beginning to think about climate change mitigation. This is understandable. The people responsible for this fundamentally crucial role in our society are faced with so many pressing needs: trying to prevent outbreaks of disease, dealing with long overdue service backlogs, expanding to serve the needs of the ever-poorer population, the ever-expanding cities, and the ever-thirstier consumer. And on top of all this, to have to make contingency plans for coping with the uncertainties of water in a climate changed world. Dealing with something like climate change mitigation, particularly when, compared to other sectors, water seems so innocent, is therefore a very big ask. The changes to infrastructure and processes to incorporate energy efficient and greener practices are perceived as being risky, extravagant and unnecessary. In places where new infrastructure is going up, there is a resistance to 'environmentally-friendly' technologies in the water sector, because they are either viewed as inferior, inconvenient or health hazards.

However, many of the climate-friendly options suggested would have significant benefits beyond the context of climate change mitigation. Energy efficiency means cost efficiency – this is important to everyone, especially in the cash-strapped world of water financing. We need convincing and accessible analyses of the rates of return on different energy efficient technologies, and we need to put pressure on water managers to replace old infrastructure with clean and efficient alternatives. Reducing the amount of water we consume has benefits for the environment and for the water sector on the whole.

Another fundamental gap that needs to be filled is the apparent lack of forward thinking or planning in terms of the financial costs of climate change. According to Danie Klopper (pers. comm.) from the City of Cape Town: 'at the moment we consider that there is sufficient "inexactitude" in our forecasts to also cover climate change … damage to infrastructure is covered in the allowance we make for repairs and maintenance'. This seems to sum up the official water sector approach to financing for climate change. But not enough money is set aside for repairs and maintenance right now! The "inexactitude" in forecasts is insufficient, regardless of climate change. We need to ensure that governmental financial planners are taking

climate change predictions into account, and we need to look closely at where the money will come from to cope with the increased costs of water under climate change. Linked to this is the need for citizens to be more involved in deciding how public money is spent, through a more participatory approach to budgeting.

## APPROPRIATE RESPONSES

Although climate change will impact each and every person on the planet, it is also at heart a social justice issue. While there is a need to develop specific adaptation plans in response to direct impacts of climate change, such as extreme weather events, there is a perhaps more urgent need to reclaim the humanity of our social and economic system. Such a system must put people's health, dignity and livelihoods at the centre. We must strive at each point to embed equity, fairness and justness. An economy that extracts and accumulates resources while spitting out pollution with no thought is no longer possible. Our planet cannot sustain it; our societies cannot sustain it. The changes we need to make are fundamental and critical. Time is not on our side. We need a vision and we need practical steps.

A first step is to build and strengthen local initiatives. People have good ideas and the will to act but they need support. In urban areas, community-led leak fixing and other water demand management interventions are critical. These initiatives become not only technical responses to water scarcity, but mechanisms to build social relations and skills. Strengthening social relations through these kinds of initiatives is an important means of building resilience to climate change. Strong informed networks are able to respond more quickly and appropriately to changes. But – as we have seen in Cape Town – they can also threaten local political strongholds and local government. Thus strengthening local initiatives also requires working with local government and more open and supportive relations between citizen and state.

One way of doing this is through multi-stakeholder dialogue – a process of bringing people into the same room, as equal players to understand each others' view points and ultimately to act with more integrity and intelligence on key issues. As water becomes more scarce and expensive to distribute, such a dialogue might be helpful on water allocation. The structure for this is already in place though the catchment management agencies. The secret is to ensure that all parties are able to participate equally and with joint commitment to universal service provision.

Budgeting is another important area for engagement. It is critical that the budgeting process should become more participatory and that ordinary citizens have greater say over how money is spent and collected. Opening up the process to citizen engagement means that better decisions can be made on tariff structures and creates space to lobby for investment in low carbon technologies for water treatment and distribution.

Even without full-scale participatory budgeting, there is room to improve financial planning and investment. Infrastructure will need to be 'climate-proofed' particularly from extreme weather events, changing flood lines, sea-level rise and storm surges. Already we know that financing mechanisms are insufficient to pay for universal service provision – climate change will make this gap even wider, particularly as

household budgets will be further stretched. New sources of money will need to be found. Adaptation funds, insurance for extreme events and safety nets for vulnerable people need to be put in place.

At present water resource planning is based primarily on historical data. This too will need to change. Having records for the past fifty years will no longer be the only information needed to plan. Planning based on predictive climate change modelling needs to be implemented.

And like, all sectors, water needs to look to its own carbon footprint and opportunities to mitigate it. Because of the close relationship between energy and water, mitigation opportunities are often also adaptation opportunities. Civil society has a role to play in lobbying for this and working in partnership to demonstrate viable alternatives. Some specific interventions are:

- Support and promote the replacement of old and damaged infrastructure with more energy efficient pumps, motors and piping, through further research, information sharing and persistent raising of the issue;
- Make managers and decision makers aware of situations where climate friendly alternatives have *worked* – challenging the idea that these alternatives are risky, inferior or expensive;
- Challenge the notion that different technologies or 'sustainability standards' are appropriate for different class groups;
- Work to shift perceptions about sustainable alternatives being inferior by actively promoting their implementation in wealthy areas;
- Make our voices heard with regards to new bulk water options (for e.g. pointing out the problems with desalination). According to Arne Singels, head of bulk water for Cape Town: 'there is space for citizen participation in these kinds of decisions' (pers. comm.);
- Call for guidance, leadership and regulation when it comes to climate change mitigation – challenging the national Department of Water Affairs and the rest of government to honour its written commitments to mitigation;
- Think about what kinds of financial incentives water services could be given to improve their 'carbon footprint' or improve energy efficiency;
- Identify the key decision making points where we should make interventions. As civil society and interested citizens, we should participate in Integrated Development Plan processes, and other spaces where legislation and policies about our water infrastructure are open to input.

It is critical that as we move towards a more just and sustainable society and one that is resilient to climate change, we understand the complexity of factors leading to water scarcity at a household level. Thus we need to expand our thinking to incorporate concepts of ‘social’ water scarcity beyond traditional understanding of resource and infrastructural scarcity. We need to challenge and reject water demand management strategies, carried out in the name of climate change response or water conservation, which discriminate on the basis of class, and which threaten the right of all to safe water and sanitation.

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