



LET'S RESPOND

A TOOLKIT TO INTEGRATING CLIMATE CHANGE RISKS
AND OPPORTUNITIES INTO MUNICIPAL PLANNING



environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA



cooperative governance

Department:
Cooperative Governance
REPUBLIC OF SOUTH AFRICA

LET'S RESPOND TOOLKIT

A toolkit to assist in integrating climate change risks and opportunities into municipal planning

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South Africa, April 2012

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TOOL

I



Preparation



Analysis



Strategy



Projects



Integration
Implementation

PHASE 1

PHASE 2

PHASE 3

PHASE 4

Climate Response Integration Process Planning Checklist and Timeframe

Objective: This tool is designed to assist the climate change coordinating committee to plan the climate response integration process. The tool should be used at the very beginning of the planning process, to develop the integration plan, but will also provide a useful checklist throughout. The Timeframe table supplements the checklist and provides a cross reference to key IDP milestones to facilitate integration of climate response into IDP planning. Adjust it to include any IDP processes of importance to your municipal process that may not be included here.

ACTIVITY	RESPONSIBLE PERSON	BY WHEN	RESOURCES
Preparation			
Establish climate change response coordinating committee with reps from relevant departments; schedule meetings.			
Familiarise with climate integration process outlined in the Guide			
Process plan development and presentation to IDP drafting team forum. Ensure that dates and activities align with IDP processes			
Phase 1: Analysis			
Identify key resources and conduct problem assessment looking at climate projections and GHG emissions issues			
Compile an Analysis Report on climate change in preparation for determining municipal strategic priorities			
Prepare presentation of Analysis Report information for stakeholder workshops (building on the PPT presentation provided in TOOL 2)			

ACTIVITY	RESPONSIBLE PERSON	BY WHEN	RESOURCES
Phase 2: Strategy			
Prepare and hold Stakeholder Climate Change Response Vision and Objectives workshop: <ul style="list-style-type: none"> • Set date • identify all stakeholders and any relevant experts for inputs • consider who will facilitate • make venue and catering arrangements • ensure presentations are ready 			
Develop Climate Response Strategy document for council approval and inclusion into objectives within the SFAs			
Prepare and hold Sector climate response planning sessions			
Phase 3: Projects			
Support departments to prioritise climate response projects and develop detailed project plans			
Phase 4: Integration			
Review draft IDP and budgets to make sure these include climate response dimension			
Review strategic scorecard and make sure dates for this revision are incorporated into this process			
Identify any other key areas for integration – such as the Municipal 2030 vision			
Communicate the municipal response to community: identify how this will be done and develop necessary materials			
Identify useful learning networks to boost municipal climate response action capacity			





Climate Response Integration Process Timeframe

IDP Milestones		SFAs Process Plan
Climate Response Integration	Aug	
Preparation		
Climate change response committee established with rep on IDP Forum		
Climate response IDP Process plan development		
Phase 1: Analysis:		
Compile an Analysis Report on Climate change		
Prepare presentation of Analysis Report		
Feedback climate analysis into IDP Status Quo Analysis Report		
Confirm IDP Analysis Report (Status quo) has adequate climate analysis		
Phase 2: Strategy		
Stakeholder workshop establishes key climate objectives and related KPIs in line with SFAs		
Sector planning sessions		
SBU's and Sector plans include climate response dimension within their strategic plan-SFA alignment reviews		
Engage councillors on climate aspects of IDP priorities		
Phase 3: Projects		
Sector /department planning sessions		
Initial budget projections		
Develop detailed climate response action plans		
Phase 4: Integration		
Climate response projects in the SDBIPs and MTEF budget allocations		
Review Climate Responsive IDP 'requirements'		
Communicate the municipal response to community		
Project and programme implementation and monitoring		

TOOL

2



Preparation

PHASE 1



Analysis

PHASE 2



Strategy

PHASE 3



Projects

PHASE 4



Integration
Implementation

Climate Change and Municipal Planning: a presentation

Objective: this tool will support communication of the climate change integration process to stakeholders and can be used in meetings and workshops. The presentation has 6 modules.

Modules 1 and 2 provide an overview of climate change (what it is and why it is happening);

Module 3 details the impacts of climate change globally and locally;

Module 4 looks at policy responses and why local government is a key player in climate response;

Module 5 outlines local government responsibilities with regard to climate change and how they can tackle these; and

Module 6 provides a picture of climate experience in your local municipality.

The tool has two components: a set of slides and speaker notes. Users of the tool are encouraged to use the presentation (set of slides) available on the accompanying CD and can adjust and modify it to suit their needs; and to bring in the experience of your municipality. The notes will provide you with important background information to the slides and direct you in 'localising' the slides for your particular municipality.







Speaker notes






Slide 1 Cover Slide: Let's Respond

Consider including a local image and/or your municipal logo

Outline

-  What is climate change?
-  Why is the climate changing?
-  Our national climate change picture
-  Planning in the face of uncertainty: national and local responsibilities
-  Integrating climate change response into our IDP: the process plan
-  Our local experience of environment, climate impacts and emissions responsibilities


Slide 2 Outline

Share with participants that during this presentation you will cover the following areas (if using in modular form, adjust accordingly):

- Explain climate change and its causes (**Modules 1 and 2**);
- Explore some of the impacts of climate change locally, nationally and globally (**Module 3**);
- Detail national government's response to climate change (**Module 4**);
- Show the relevance of climate change to local government in terms of its ability to deliver on its mandates (**Module 4 and 5**);
- Highlight how local government can respond to climate change (**Module 4 and 5**); and
- Provide a picture of key environmental issues in your municipality and your understanding of the impacts of a changing climate in your own municipality. Also mention any key greenhouse gas emissions areas in your municipality (**Module 6**).




What is climate change?









Slide 3 – Module 1: What is Climate Change?

Climate change is a change of the general weather conditions of which the most significant change is an increase in temperature of the earth's surface



Slide 4

This slide provides a definition of climate change.


Additional information or points you could raise:

- Climate naturally goes through warm and cold periods, occurring over hundreds of years. The environment is usually able to adapt to such a changing climate if these changes take place slowly;
- Human activity is currently causing the climate to change (in addition to the natural cycles of change) so quickly that different parts of the earth's system cannot adapt fast enough to ensure survival. This poses an enormous threat to the survival of humanity, plants and animals;
- Climate change is a **global problem**. The world shares **one** atmosphere, therefore we will have to solve this problem together.



Climate change is different to changes in weather.

Weather changes continuously on a hourly and daily basis while **climate change** occurs over large time scales ranging from 50 years onwards



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Besides an increase in average temperature, climate change also causes significant changes in rainfall patterns, and an increase in extreme weather events giving rise to floods and droughts.



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Why is the climate changing?

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Slide 5

This slide explains the difference between weather and climate and the timescales over which they occur.

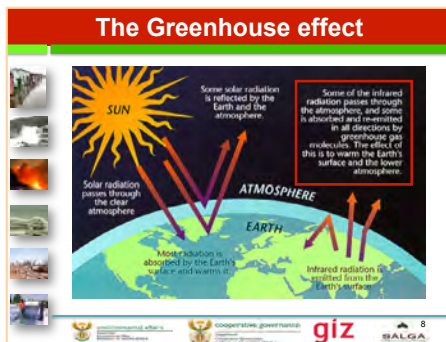
Slide 6

This slide gives an overview of what kind of changes in climate we can expect.

You may wish to further note:

- Climate change is real and is already upon us: we are experiencing these changes;
- Climate changes include: extended dry seasons, increasing temperatures, extreme storms and sea level rise;
- These changes give rise to impacts that include: drought, crop failure, livestock death, damage to infrastructure, runaway fires;
- Our vulnerability will determine how seriously the impacts affect us, for example, an increase in disease, disabling of existing livelihoods and damage to household assets will have the greatest effect on the poorest in our society;
- In general, the faster the climate changes, the greater the risk of damage. A changing climate poses an enormous risk to food production, availability and use of water, health risks and economic development.

Slide 7 – Module 2: Why is the climate changing?



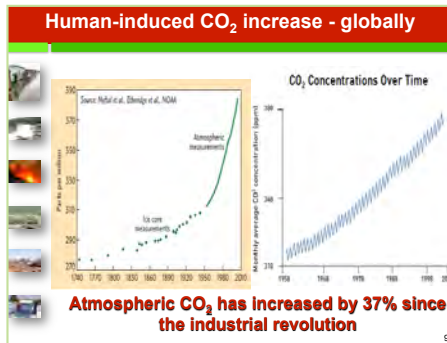
Slide 8 – The Greenhouse effect

Atmospheric science can be confusing! A quick overview of the Greenhouse Effect is provided. You can decide on how much detail you think your audience is interested in:

- The earth's climate is driven by a continuous flow of energy from the sun;
- As the sun's energy reaches the earth (mainly in the form of visible light), about 30% is reflected back into space, while the remaining 70% passes through the atmosphere to warm the surface of the earth. The earth warms up and then releases the heat (infrared radiation) slowly back into space (the earth being far cooler than the sun);
- Greenhouse gases (ghgs) keep the planet at a temperature essential for life on earth. Ghgs in the atmosphere trap some of the infrared radiation, preventing it from escaping from the earth's surface to space;
- The main greenhouse gases are water vapour, carbon dioxide, ozone, methane, nitrous oxide and halocarbons and other industrial gases. Apart from the industrial gases, all of these gases occur naturally. Together, they make up less than one percent of the atmosphere. This is enough to produce a natural greenhouse effect that keeps the planet some 30 degrees Celsius warmer than it would otherwise be. This is essential to support life;
- Climate change is occurring as a result of human activities that have introduced a massive increase in the **levels of greenhouse gases in the atmosphere**;
- The major human emissions of GHG come from:
 - Burning coal, oil, and natural gas (carbon dioxide)
 - Agriculture and changes in land use, i.e. chopping down of forests and thus reducing the earth's natural ability to absorb ghgs (**methane and nitrous oxide**)
 - Vehicle exhaust fumes and other sources (**ozone**)
 - Other industrial activities (**industrial gases** such as CFCs – chloroflourocarbons, HFCs – hydroflourocarbons, and PFCs – perflourocarbons)
- This is all happening at an enormously rapid pace. The result is known as the **enhanced greenhouse effect**;
- Warming up is the simplest way for the climate to get rid of the extra energy. However, even a small rise in temperature will be accompanied by many other changes: in cloud cover, wind patterns and ocean patterns for example.



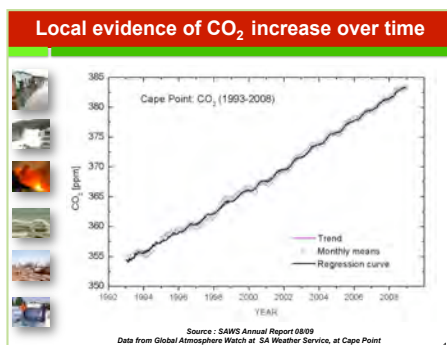
The following three slides present scientific evidence of the enhanced greenhouse effect taking place on our planet



Slide 9

The graphs in slide 9 show rapid increases in carbon dioxide emissions in our atmosphere over the last 300 years, mainly from burning fossil fuels.

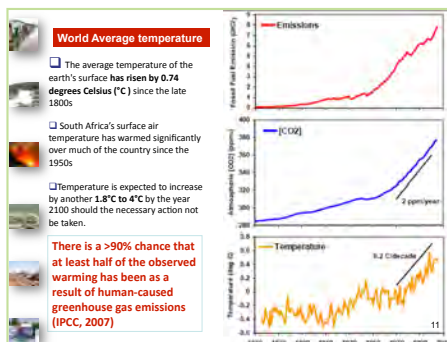
Over the 10,000 years before industrialization, carbon dioxide levels increased by less than 10%. In the 200 years since the industrial revolution in the 1800's, levels have risen by over 30% and continue to rise by over 10% every 20 years.



Slide 10

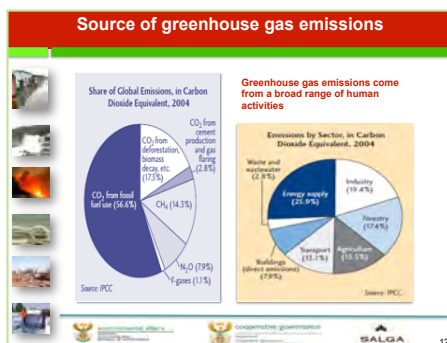
This slide brings the issue of climate change closer to home, showing that even South Africa is being affected.

Scientific data from the South African Weather Services station at Cape Point, Cape Town, reveals rapidly increasing concentrations of carbon dioxide over our country.



Slide 11

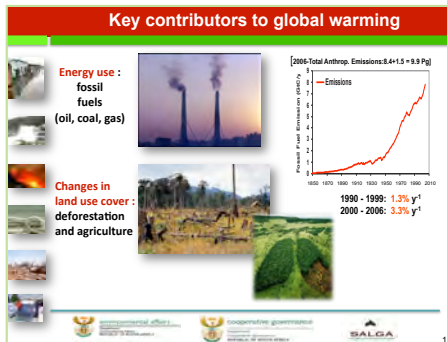
This slide demonstrates the link between the increase in greenhouse gases in the atmosphere and the warming trend (temperature rise) across the planet.



Slide 12

This slide illustrates the source of greenhouse gas emissions (ghgs) emissions, explaining where they really come from.

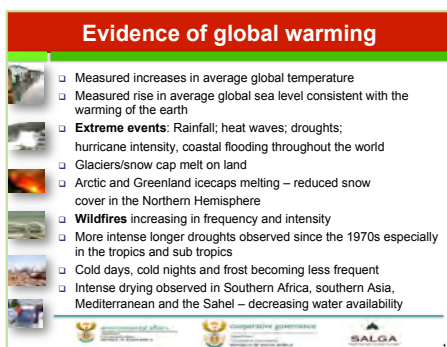
- The pie chart on the left shows that the burning of fossil fuels such as coal, oil and natural gas to power our countries (through use in transport, electricity supply) is the major contributor of carbon dioxide (56%). This is followed by deforestation (17%). The cutting down of trees destroys the earth's natural ability to absorb carbon dioxide;
- The pie chart on the right reveals the key sectors responsible for the emissions. It is evident that the energy supply sector contributes to a quarter of the globe's ghg emissions. Forestry and agriculture cumulatively contribute close to a third of our global emissions.



Slide 13

This slide provides a graphic illustration of the source of greenhouse gas emissions detailed in slide 12.

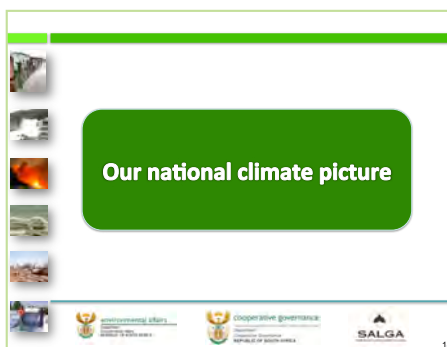
- GHG emissions from energy use and changes in land use are the major contributors to global warming.
- It is again worth noting the exponential growth of GHG emissions produced by humans over time. This is indeed alarming and poses a threat to survival, necessitating urgent action towards reducing emissions to levels 'required by science' to curb catastrophic climate change.



Slide 14

This slide provides a summary of the evidence that global warming is indeed happening. Additional detail worth noting includes:

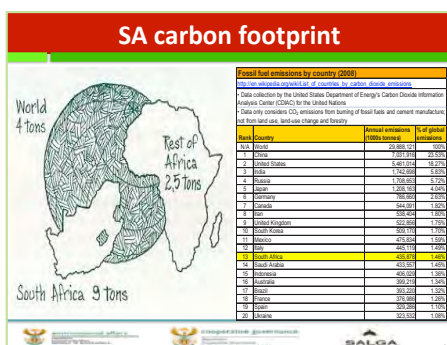
- The last ten years are the hottest on record. The warming trend over the previous century was reported as 0.6 degrees Celsius by the international panel for climate change. It now stands at around 0.7 degrees Celsius.
- Sea levels have risen at an average of 1.8 mm per year since 1961, but at 3.1 mm per year since 1993.
- The changes in temperatures, rainfall and climate are broadly predicted to get more and more severe, with impacts that include drought, water scarcity, extreme weather events and altered seasons.



Slide 15 – Module 3: Our national climate picture

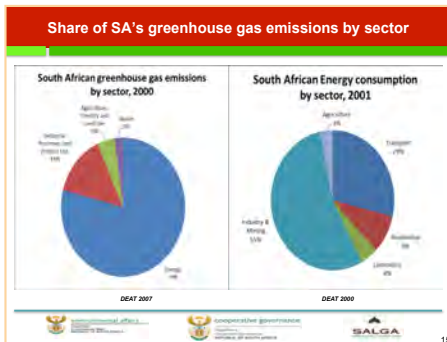
This 'module' will look at answering:

- What is South Africa's contribution to the global greenhouse gas (GHG) emissions?
- Which sectors are the main contributors to GHG emissions?
- What are the impacts of climate change on South Africa?
- How are we responding to these impacts?



Slide 16

South Africa is ranked as the 13th largest carbon dioxide emitter in the world (on an absolute emissions basis) and the largest in Africa. On a per capita basis, as illustrated in the slide diagram, our emission level is over double that of the world average and close to three times that of Africa. The reason is that South Africa has a very energy-intensive economy; heavily reliant on the use of 'dirty' fossil fuels (mainly coal) to power it.



Slide 17

This slide details the breakdown of GHG emissions sources in South Africa.

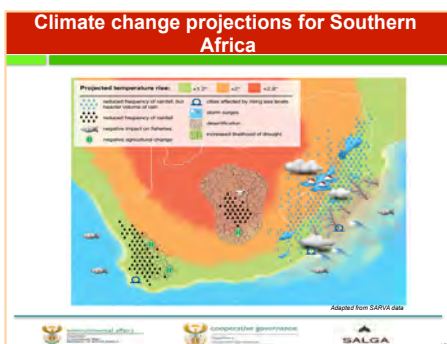
The pie chart on the left shows that the energy sector is responsible for the lion's share of South Africa's GHG emissions (79%). This is owing to coal providing an estimated 72% share of the country's total primary energy supply, much of which is used to produce South Africa's electricity generation capacity. Coal is a major feedstock for the country's synthetic fuel industry (e.g. Sasol's coal-to-liquid-fuel). Energy supply is therefore enormously carbon intensive.

The pie chart on the right details energy consumption by sector.



Slide 18

South Africa is already experiencing the impact of climate change. Conservative estimates of damage costs due to extreme weather-related events (flooding, fire, storms and drought) have been placed at approximately one billion rand per year between 2000 and 2009. Look at the information in the Introduction to the Guide for more detail on the cost of inaction.






Slide 19

This slide shows projected changes in South Africa's climate:

- All of Africa is projected to warm during the 21st century to levels greater than the annual global warming average. A generally drier southern Africa (5 – 15% reductions in current rainfalls) is forecasted.
- A distinct pattern of winter rainfall loss in the west and summer rainfall increase in the east, yet with some local scale variations. Rainfall is indicated to decrease for the Limpopo province in spring and for the Western Cape in winter.
- **Summer rainfall region** projected to become drier in spring and autumn (shorter summer); however, during summer, more frequent cloud-band formation takes place over **eastern** South Africa, resulting in increased summer rainfall totals.
- **General increase in relatively large rainfall events** over eastern South Africa in particular. This area is projected to experience an increase in frequency and intensity of rainfall concentrated mostly in the early summer (September, October, November).
- Dry spells (longer summers) may be expected to occur more frequently along the **western and northern margins** of South Africa, between spring and autumn.



Observed climate impacts in South Africa



- Increased severity of storms and resulting damage to coastal ecosystems and infrastructure
- Unseasonal cold spells affecting agricultural production
- Scientists have observed that the steadily shrinking range of the Quiver tree (Kokerbome) of the Northern Cape correlates with observed climatic changes.

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Slide 20

This slide illustrates some of the observed climate change impacts in South Africa.

We can expect (broadly):

- Extreme storms and rising sea levels affecting coastal cities and ecosystems;
- Changed seasons, and new minimum and maximum temperatures, affects when plants bloom and fruit, when insects hatch, or when streams are at their fullest. This in turn affects time for planting, pollination of crops, food availability, migration of birds, breeding of fish, water supplies for drinking and irrigation, forest health and more.
- Reduction in rainfall and increase of drought conditions on the western side: Scientists have observed that the steadily shrinking range of the Quiver tree (Kokerbome) of the Northern Cape correlates with observed climatic changes.


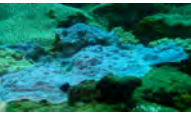


- Wetter with hotter temperatures on the eastern side of the country;




It is worth noting that these new conditions result in:

- Drought; crop failure; livestock death; damage to infrastructure; runaway fires; and an increase of vector-borne disease (e.g. Malaria).

These impacts all contribute to disabling of existing livelihoods and damage to household assets, which deepens poverty.

Observed climate impacts in South Africa







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Slide 21

This slide illustrates the impact of climate change on our coastal and marine environment.

- South Africa's weather and climate patterns are strongly influenced by the oceans bordering it. The country derives significant socio-economic benefits from marine and coastal resources.
- Climate change impacts the functioning of estuaries and coastal environments, which has profound consequences for marine and coastal environments. There is an increasing risk of species extinction and coral damage projected with warming of the oceans.






Bush encroachment

Open savannah, E. Cape S. Africa, 1955

Same place, 1998

(T. Hoffmann, IPC, UCT)



22

Slide 22

South African rangelands support a range of economic activities including conservation and tourism, commercial livestock production and smallholder livestock systems (browsing and grazing). These lands are vulnerable to bush encroachment (the expansion of the spread of bush growth) as a result of enhanced growth from rising atmospheric CO₂.



SA's vulnerability to climate change

The socio-economic factors that increase South Africa's vulnerability to climate change :

- ❑ Large proportion of SA's population has low resilience to extreme climate events (poverty; high disease burden; inadequate housing infrastructure and location)
- ❑ Climate change generated events exacerbate existing socio-economic challenges, inequalities and vulnerabilities
- ❑ Much of SA has low and variable rainfall
- ❑ A significant proportion of surface water resources is already fully allocated
- ❑ Agriculture and fisheries are essential for food security and local livelihoods

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Projected impacts of an unstable climate in South Africa

System/Conditions	Changes
Water	already fully allocated; reductions in availability, increased frequency of extremes
Agriculture	most scenarios suggest adverse impacts, particularly for small-scale farmers
Human health	strong interactions with environmental quality and current disease burden
Extreme events	weather-related impacts are already exacerbated by poor land management in parts of South Africa
Natural resources	degradation trends likely worsen without addressing sustainable management issues; opportunities for increasing resilience of rural and urban communities
Human settlements and livelihoods	emerging understanding suggests significant and adverse impacts

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Slide 23

Having discussed these observed impacts, it is important to point out that climate change is a complicated problem, linked to difficult issues such as poverty, economic development and population growth.

In South Africa, as with the rest of Africa and other developing countries, our socio-economic circumstances increase our vulnerability to the impacts of climate change.

Urgent action is needed to limit the degree of climate change and adapt to its impacts to shield the environment, people and the economy of our country.

Slide 24

Water

- Since South Africa is generally arid to semi-arid, less than nine percent of the annual rainfall ends up in rivers on average, and about five percent recharges groundwater in aquifers.
- Together with high rainfall variability, especially in drier areas, this means that rainfall and river flow are unpredictable and unevenly distributed, with only 12% of the land area generating 50% of stream flows. This results in some areas experiencing droughts, while others experience flooding.
- Climate change is one of drivers currently informing water resource planning decisions in South Africa. Most critically, surface water resources are already over-allocated and the country is experiencing water stress.
- Demand is expected to increase with economic growth, increased urbanisation, higher standards of living and population growth. Surface water (rivers, dams, etc) and groundwater is also exposed to pollution from urban, industrial and agricultural sources, e.g. water treatment works, land-fills and mines. All of these changes will have significant impacts on the future availability of water resources.

Agriculture

- Maize production in summer rainfall areas and fruit and cereal production in winter rainfall areas are likely to be significantly negatively affected.
- Small-scale and homestead dry-land farmers are most vulnerable. Intensive irrigated agriculture is better buffered, but vulnerable to water shortages.

(Slide 24 continued)

Human health

- The impacts of climate change on humans can be felt either directly (e.g. through heat stress) or indirectly through floods, fires and degradation of natural ecosystem services (e.g. clean air and water).
- Health impacts, e.g. a wetter, warmer climate would expand the spread of malaria. Cholera outbreaks have been associated with extreme weather events, especially in poor, high-density settlements.
- Some impacts due to climate change may already be occurring, as a result of rainfall (drought and floods) and temperature extremes.
- Vulnerable sectors of society will be susceptible to negative climatic changes, with effects on poverty levels and food security.

Extreme weather events

- The changes in temperatures, rainfall and climate are broadly projected to get more and more severe. Impacts include drought, water scarcity, food insecurity, extreme weather events (e.g. big storms) and changed seasons.
- Damage costs due to extreme weather-related events (flooding, fire, storms and drought) are conservatively estimated to be R 1 billion per year between 2000 and 2009.

Natural resources

- Our biodiversity will be severely affected, especially the grasslands, fynbos and succulent Karoo, where a high level of extinction is predicted.
- Commercial forestry is vulnerable to increased occurrence of wildfires and changes in available water in the south-western regions.
- Strong trends have been detected in the physical marine environment (rising sea level, warming of the Agulhas current and parts of the cold Benguela current) anticipated to threaten the survival of important fishery resources; however projections of climate change impacts remains uncertain.

Human settlements and livelihoods

Extended dry seasons, increasing temperatures, extreme storms and sea level rise result in drought, crop failure, livestock death, damage to infrastructure (e.g. buildings, roads, etc) and runaway fires. It will further entrench poverty with the increase of vector-borne disease (e.g. malaria), disabling of existing livelihoods and damage to household assets.





Slide 25 – Our local experience of climate: impacts and vulnerabilities

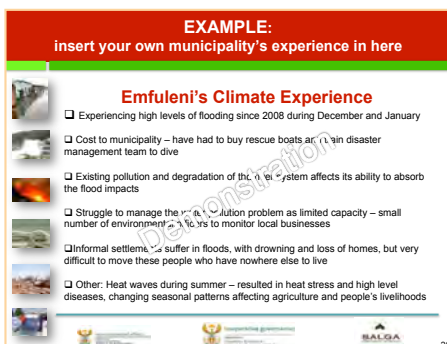
INSERT YOUR OWN MUNICIPAL EXPERIENCE IN HERE

It is a good idea to start with existing issues and concerns relating to climate. Working from existing problems outwards helps to draw people into something that they can relate to. It also ensures that your climate response moving forward builds on the valuable existing experience you have in your municipality in handling current climate variables.

Some examples include:

In Thulamela Local municipality: Deforestation of indigenous Mopane wood, which is illegally harvested as it fetches a good price. Deforestation affects the grazing environment and causes severe erosion which in turn makes the effects of flooding far worse. Local people are very dependent on the land for their livelihoods.

In Emfuleni Local Municipality: Pollution (illegal dumping, oil spillage, sewage) of water resources by industrial businesses and informal settlements is affecting people living downstream and degrading the river ecosystem, Emfuleni's major water source, the health of which is critical as a 'buffer' to absorb flooding impacts.



Slide 26

EXAMPLE ONLY – REMOVE THIS SLIDE FOR YOUR PRESENTATION

This slide shows you how you could detail the current climate and environmental experience in your municipality.



Slide 27

Module 4: Planning in the face of uncertainty: national and local responsibilities

This 'module' looks at what the role of government (national and local) is in responding to climate change. It outlines the local government mandate in terms of climate response and introduces the process to integrate climate change response into local (IDP) planning.

National response to climate change


Significant national response to climate change includes:

- National Climate Change Response White Paper; and
- National commitments to greenhouse gas (GHG) reductions.

In support of this the government has developed a number of policies and programmes such as:

- the National Energy Efficiency Strategy;
- a Renewable Energy Programme; and
- A research programme on national vulnerability to projected climate change impacts.

Municipal actions therefore have a well developed national framework in which to work.



Slide 28

- There has been significant national leadership in response to the challenge of climate change.
- South Africa is committed to contributing its 'fair share' to the global efforts of reducing GHG emissions levels and managing the unavoidable impacts of a climate already undergoing change.
- Government has policies and programmes to meet energy efficiency and renewable energy targets, sustainable development, green economic development and extensive national research programmes on climate change and associated vulnerabilities. These all support local action.
 - **National commitments to GHG reductions:** South Africa has committed to reduce its GHG emissions by 34% below the current emissions path by 2020; and by 43% by 2025.
 - **National Climate Change Response White Paper:** The policy on South Africa's GHG reduction commitments and how the country will achieve them.
 - **National Energy Efficiency Strategy:** This strategy outlines South Africa's energy efficiency goals and how it aims to achieve them.
 - **Renewable energy programme:** The national Department of Energy aims to have 3,725 Mega-Watts of renewable energy (e.g. wind power, solar power, etc) installed by 2016. The bidding process for these projects is currently underway.
 - **A research programme on national vulnerability to projected climate change impacts.**





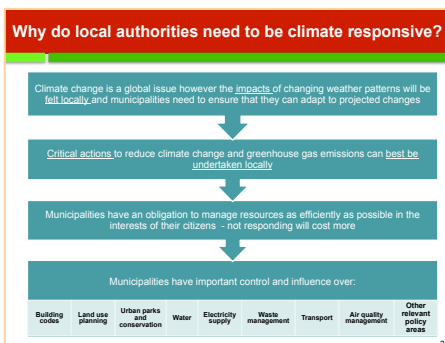
The local government climate response mandate

- The national Climate Change Response White Paper recognises local government as an important site of delivery.
- Section 10.2.6 identifies the key constitutional mandates of local government that are critical in developing our national climate response:
 - Planning and urban development
 - Municipal infrastructure and services
 - Water, energy and waste demand management
 - Local disaster response
- Points to support needs: Clarify mandates (DCOG), Fiscal support (NT), Intergovernmental coordination (SALGA), Response strategies (Province)
- **Climate change toolkit**

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Slide 29

- The National Climate Change Response Strategy (NCCRS) is the blueprint for South Africa's response to climate change. The policy recognises local government as an important site of delivery. Its twin objectives are (1) to contribute to the global efforts to bring GHG emissions to levels 'required by science' to curb catastrophic climate change; and (2) to manage the unavoidable impacts of a climate already undergoing change.
- Section 10.2.6 in particular notes the key role of local government in (1) planning and urban development; (2) municipal infrastructure and services; (3) water, energy and waste demand management and (4) local disaster response. It indicates awareness that local government will need support to fulfil these mandates. In particular, it identifies the following support needs and responsible institution:
 - Clarifying of mandates (national department of Cooperative Governance);
 - Fiscal support (National Treasury)
 - Intergovernmental coordination (South African Local Government Association)
 - Response strategies (provincial government)



Slide 30

Moving on to the local sphere of government, where the actual impacts of climate change will be felt, the question arises: why does local government need to be climate responsive?

- Many of the critical actions to manage climate variability and reduce climate change impacts, as identified in national policy, fall within local government responsibilities as detailed in the **Constitution of South Africa (Act 108 of 1996) and the Municipal Systems (Act 32 of 2000)**.
- There are important benefits and opportunities for local government in responding to climate change challenges, notably:
 - Energy efficiency improves economic competitiveness
 - Business opportunities may arise through new, 'green' industries such as energy efficiency
 - Public transport reduces pollution and congestion; improved mobility of people stimulates economic activity
 - Improved building quality, particularly in low-income housing, greatly improves health and quality of life
 - Replenishing the natural resource base through rebuilding wetlands, planting trees and clearing alien plants creates jobs and enhances important environmental services such as water, flood protection, fish and plant stocks
 - Urban greening (planting trees/shrubs in the urban area) absorbs carbon and provides shade and beauty
- Not responding will cost more, for example:
 - In 2007 and 2008, floods in the Western Cape Province cost the government more than one billion rand each year.
 - Losses of R2.5 billion were caused by eight extreme weather events in the Eden District (Knysna, George, etc) alone, between 2003 and 2008. The damage was largely to property and roads.
 - In 2007, the cost of road repairs resulting from extreme weather events used up almost 97% of the total transport budget of the Western Cape Province for that year. The province estimates that damages from unmitigated climate change could range between 5% and 20% of GDP annually by 2100.

Municipalities have important control and influence over building codes, land use planning, urban parks and conservation, water and electricity supply, waste management, transport, air quality management, and other relevant policy areas. **Look at the Local Government Mandates section in the Introduction to the Let's Respond Guide for more detail.**





How do we respond to the local impacts of climate change?

"How do we plan for the local effects of climate change when they could very well range from relatively manageable to catastrophic?..."

The challenge for municipalities is not to predict the future, but to approach the future with the right tools and the right information."

Post Carbon Cities, Daniel Lerch, Post Carbon Institute

How do local authorities respond to climate impacts?

Mitigation and Adaptation are the 2 broad ways that local governments can respond to climate change

MITIGATION	ADAPTATION
<ul style="list-style-type: none"> Focus on reducing greenhouse gas emissions, through: <ul style="list-style-type: none"> energy efficiency and renewable energy use, <p>In an international effort to bring emissions to a level required by science to curb global warming.</p>	<ul style="list-style-type: none"> Focus on building resilience to the impacts and effects of a changing climate within our communities. This requires: <ul style="list-style-type: none"> an assessment of localised risks, and the integration of climate change considerations into all areas of decision-making.

Lower carbon development - examples of actions (mitigation)

Efficient lighting

Solar water heaters and Ceilings

Energy efficient street/traffic lighting

Invest in public transport

Slide 31

How then does local government respond? The key is that municipalities **need to plan and respond appropriately**, considering the impacts (which vary from manageable to catastrophic) of climate changes that expose communities to a number of risks (large and small) and influences the ability of local government to deliver on its mandate.

Slide 32

As per the text on the slide

There are two broad ways that local governments can respond to climate change:

- **Mitigation** efforts focus on reducing greenhouse gas emissions, through initiatives related to energy efficiency and renewable energy use, in an international effort to bring emissions to a level required by science to curb global warming.
- **Adaptation** efforts are an attempt to build resilience within our communities to the impacts and effects of climate variability and a changing climate. This requires an assessment of localised risks, and an integration of climate change considerations into all areas of decision-making.

In short, mitigation tries to minimise climate change, while adaptation helps people cope with the climate changes that are already occurring or will occur soon.

Slide 33

These are examples of mitigating actions. All interventions focus on the reduction of greenhouse gases (GHGs) through renewable and energy efficiency initiatives:

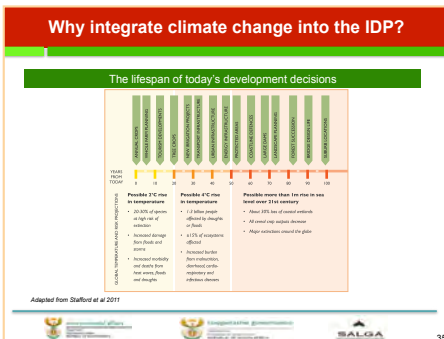
- **Efficient lighting:** provides good quality lighting and uses less electricity generated from the country's coal-fired power stations (coal-fired electricity creates a lot of greenhouse gas emissions)
- **Solar water heaters** installed on the roofs of homes heat water using the sun's energy; avoiding the use of electricity to heat water
- Installation of **ceilings** in homes keeps them cooler in summer and warmer in winter making homes more comfortable; saving on money needed to buy electricity, paraffin, gas, etc, to heat/cool the house; improving building quality, particularly of low-income housing; and greatly improving health and quality of life.
- **Public transport:** safe, affordable and reliable public transport is more energy efficient than private car use. Public transport reduces pollution and traffic jams, improves mobility of people and stimulates economic activity.



Slide 34

Includes examples of building resilience within communities through adaptation actions:

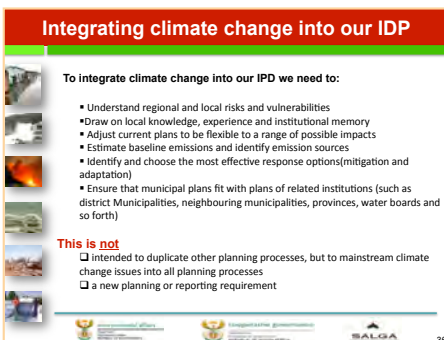
- Restoring wetlands helps with flood prevention, because a wetland is a natural flood “buffer,” acting as a storage space for all the water
- The **National Working for Water programme** involves the removal of alien plants/trees. It has many benefits:
 - creating jobs
 - saving water (alien plants generally absorb more water)
 - protecting from floods (alien plants sometimes block rivers and cause them to flood)
 - increasing the amount of local plants/fish (alien plants generally kill local plants/fish, because they use most of the water/nutrients)
- Urban greening (tree planting) absorbs greenhouse gases and provides shade and beauty.
- Rainwater tanks collect rainwater from roofs of homes. This water can be used for washing, local food gardens, etc.



Slide 35

The development planning decisions made today will greatly affect the vulnerability of people to climate change in future. For example water-related infrastructure (dams, pipes, storm water system, etc) is typically designed to last 50 to 100 years, which is when there might be severe climate change (if climate mitigation is not enough). Climate change will cause water shortage, flooding and water quality reduction, with related deaths and disasters.

It is therefore critical that the planning decisions made by local government today are made in consideration of the severe impacts of climate change in the next 5, 10, 20 and 50 years.



Slide 36

Slide text refers.



Integrating climate change: Phases	
Preparation	Allocates responsibility to drive the process, plans the way and develops council commitment to the climate change response approach
Phase 1 Analysis	Development of Climate Change Analysis Report for inclusion in the IDP Situational Analysis (Status Quo Report)
Phase 2 Strategy	Supports a participatory planning exercise to develop a municipal climate response vision and objectives, for inclusion within the IDP Strategic Focus Areas and alignment of Sector Plans with these
Phase 3 Projects	Takes the new climate priorities into detailed project development plans, and identifies capacity, resources and performance management systems to integrate this into the Municipal operational systems
Phase 4 Integration Approval Implementation	Ensures that climate response work is visible throughout the IDP and related development plans. Communicating what the municipality is doing about climate change to its citizens and residents, and establish important learning networks

Slide 37

The slide outlines the major phases of the integration process that the municipality will be undertaking. This involves a simple, five phase process, aligned with the IDP planning approaches. Each phase includes steps to integrate the unfolding climate response into the IDP drafting process. The steps are accompanied by support tools.

- **Preparation** allocates responsibility to drive the process, plans the way and develops council commitment to the climate change response approach.
- **Phase 1: Analysis** will develop a municipal Climate Change Analysis Report for inclusion into the IDP Status Quo Report (Situational Analysis).
- **Phase 2: Strategies** supports a participatory planning exercise to develop a municipal climate response vision and objectives, for inclusion within the IDPs Strategic Focus Areas (SFAs) and the alignment of Sector Plans with these.
- **Phase 3: Projects** takes the new climate priorities into the detailed project development plans, and identifies capacity, resources and performance management systems to integrate this into the Municipal operational systems.
- **Phase 4: Integration, Approval and Implementation** ensure that the climate response work is visible throughout the IDP and related development plans.

INSERT OWN MUNICIPAL CLIMATE CHANGE ANALYSIS REPORT INFORMATION:

- Likely climate changes, impacts and vulnerabilities
- GHG emissions picture and key energy and emissions issues

Slide 38

Include your own municipal information on climate here: likely changes, experience of changes and/or extreme weather events, local experience of impacts on climate, communities, business.

Participants developed an understanding of energy issues and key responses towards improving energy services for development and mitigation of climate change:

- Deforestation: Mopane wood sought after and is illegally harvested
- Local air pollution from boilers, wood, etc
- Solar home systems – frustrations due to limited application and preference is for electrification
- Non compliance with regulations causes short circuiting of electricity wiring in \approx \forall houses
- Diesel pumps along rivers \forall \forall jarred away in floods, polluting the rivers
- Increasing price of fuel impacts trade and commerce
- Mid-high income households consume large amounts of electricity

Slide 39 - 41

DEMO SLIDES: These show examples of the kind of information you could present here.

Slide 42 - 43

To conclude: Thank you.





Preparation

PHASE 1



Analysis

PHASE 2



Strategy

PHASE 3



Projects

PHASE 4



Integration
Implementation

A Directory of Key Regional Climate Change Resources

Objective: This tool provides an overview of essential resources available to support municipalities while developing the climate change analysis report for the municipal area (Phase I).

All documents outlined in this tool are available in the **accompanying CD**.

Regional Climate Change Programmes

The **Southern Africa Regional Climate Change Programme** is a five year programme (2007-2012) that plays a facilitation and technical assistance role in building the region's adaptive capacity, strengthening the evidence for adaptation, and partners with institutional structures to strengthen the region's climate finance absorptive capacity. The initial phase of the study produced a sub-regional map identifying adaptive capacity "hot spots." A host of useful publications are available for download from the programme's website. Website and contacts: <http://www.rccp.org.za/>

National climate change Reports and Policies

- **South Africa's Second National Communication** was published in 2011. The document reports on the current status of projected climate change in South Africa, together with a status update on mitigation and adaptation measures, plans for the future, and the challenges in implementing them. This forms part of the country's commitments as signatory to the United Nations Framework Convention on Climate Change.

Document [size: 4MB]: <http://www.sanbi.org/sites/default/files/documents/documents/sncdraftnov2010.pdf>

- **The National Climate Change Response White Paper** was published in 2011 by the Department of Environmental Affairs. The objective of this policy is to make a fair contribution to the global effort to stabilise greenhouse gas concentrations in the atmosphere at a level that prevents dangerous anthropogenic interference with the climate system. It aims to adapt to, and manage, unavoidable and potentially damaging climate change impacts, through interventions that build and sustain South Africa's social, economic and environmental resilience, and emergency response capacity. Document: <http://www.info.gov.za/view/DownloadFileAction?id=152942>
- **The Long Term Mitigation Scenario (LTMS)** for South Africa was released by the Department of Environmental Affairs in 2008. It explores how South Africa can meet a 'required by science' emissions scenario to curb catastrophic global warming. Although the focus of the study was on mitigation, there was also an adaptation component.

- A report titled **Impacts, Vulnerability and Adaptation in Key South African Sectors: An Input into the Long Term Mitigation Scenarios Process** was published by Midgley et al (2008).



Provincial climate change reports

Western Cape:

- **A Status Quo Vulnerability and Adaptation Assessment of the Physical and Socio-Economic Effects of Climate Change in the Western Cape** (Midgley GF, Chapman RA, Hewitson B, Johnston P, De Wit M, Ziervogel G, Mukheibir P, Van Niekerk L, Tadross M, Van Wilgen BW, Kgope B, Morant PD, Theron A, Scholes RJ, Forsyth GG, 2005)
- **A Climate Change Strategy and Action Plan for the Western Cape** (The Department of Environmental Affairs and Development Planning, Western Cape, December 2008)
Document: http://www.capegateway.gov.za/other/2009/11/cc_strategy_and_action_plan_finaljanuary_09.pdf



Eastern Cape

- The Eastern Cape Department of Economic Development and Environmental affairs released the Provincial Climate Change Response Strategy, 2010.
Document available on: www.deaet.ecprov.gov.za



Municipal Adaptation Plans and Documents

- **eThekweni Municipality** published a **Climate Change Municipal Adaption Plan - Health and Water** in 2009. In the **Headline Adaptation Strategy**, public health and water supply sectors were identified as the key sectors that would be impacted severely by climate change. The municipality is currently developing sector-specific adaptation plans for the water and health sectors.
Website: <http://www.erm.com/>
Contact: Dr. Debra Roberts, Deputy Head: Environmental Management, Development Planning, Environment and Management Unit, eThekweni Municipality, e-mail: RobertsD@durban.gov.za
- **eThekweni Municipality: Roberts, D. Thinking globally, acting locally: Institutionalizing climate change at the local government level in Durban, South Africa** 253-270 in Bicknell, J. D. Dodman, et al., Eds. (2009). *Adapting to Climate Change: understanding and addressing the development challenges*. London, Earthscan. Available at <http://eau.sagepub.com/content/20/2/521.abstract>
- **A Framework for adaptation to Climate Change**, 2006, was developed by the **City of Cape Town**. The framework guides the city in prioritising the most urgent adaptation activities.
Document: <http://www.erc.uct.ac.za/Research/publications/06Mukheibir-Ziervoge%20-%20Adaptation%20to%20CC%20in%20Cape%20Town.pdf>.
- **eThekweni Municipality (2011). Durban: a climate for change- transforming Africa's future**. Environment Planning and Climate Protection Department AND the Energy Office, Ethekeeni Municipality. Available online at <http://www.erm.com/> or for more information contact Debra Roberts: RobertsD@durban.gov.za; Tel: +27 (31) 311 7875 or Derek Morgan, MorganD@durban.gov.za; Tel: +27 (31) 311 1139.
This booklet provides a wide range of cross-sectoral interventions with which the Municipality is involved in response to climate change. It also emphasizes the strong linkages that exist between climate protection agenda and the sustainability agenda at the local level.
- **Ziervogel, G & Methner, N (2009).** *Adapting South African Cities and Towns – a local government guide to climate change adaptation planning*. Sustainable Energy Africa, Cape Town.
Available for download from www.cityenergy.org.za



Scientific institutions

These institutions are important sources for gathering specific information on climate change. South African universities are doing leading work in climate change research. All universities, and research institutions are engaged with climate change work.



- The **South African Risk and Vulnerability Atlas (SARVA)**, CSIR was developed with the intention of providing up-to-date climate information for key sectors to support strategy development in the areas of risk and vulnerability. SARVA is also developing important briefing sheets detailing South African socio-economic risk, vulnerability and resilience.
SARVA Atlas: http://www.rvatlas.org/download/sarva_atlas.pdf
Contact: info@rvatlas.org
- The **Climate Systems Analysis Group (CSAG)**, based at the University of Cape Town, South Africa, operates one of the few empirical down-scaled models of the whole of Africa, which simulates responses to global climate change at a growing number of meteorological station locations across the African continent. The approach delivers daily and monthly climate change information, including multiple rainfall and temperature parameters, for multiple models and two future time horizons (2046-2065 and 2081-2100). The web portal is the Climate Information Portal (CIP) and can be found at www.cip.csag.uct.ac.za.
Contact: www.csag.uct.ac.za
- **DiMP (Disaster Mitigation for Sustainable Livelihoods Programme)**, based at the University of Stellenbosch, South Africa is involved in very useful community based risk reduction work that may be useful to municipalities. For more information contact: Dr Ailsa Holloway, DiMP Director or, ailsaholloway@sun.ac.za
- **REVAMP** is research group based at the University of Witwatersrand, South Africa, and looks at vulnerability to global environmental change such as climate variability and disaster risk reduction, adaptation and mitigation (including the institutional arrangements that may be required for effective adaptation, mitigation and disaster risk reduction), and how findings from these might translate into planning and practices (such as development and disaster risk reduction planning and policy).

Sector analyses and studies

The work of the following academics or institutions is of relevance in climate impacts analysis:

Water sector:

- **Water Research Commission** Report No.1843/2/11: A 2011 Perspective on Climate Change and the South African Water Sector
- **Water Research Commission Report** No.1843/3/11: Handbook on Adaptive Management Strategies and Options for the Water Sector.
- **Water Research Commission website:** www.wrc.org.za
- **Climate Change and the South African Water Sector: Where from? Where now? Where to in future?** by Roland E. Schulze of University of KwaZulu-Natal
Document: <http://www.dwaf.gov.za/aww/vdfileload/file.asp?val=22&tablename=EventSessionDocs2&fld=ID>

Agriculture sector:

- Assessments done by Rashid Hassan of the Centre for Environmental Economics and Policy in Africa (CEEPA).
Contact: rashid.hassan@up.ac.za
Discussion papers from CEEPA: <http://www.ceepa.co.za/discussionp2006.html>
- Professor Sue Walker of the **University of the Free State**.
Contact: swalker@landbou.uovs.ac.za

Transport sector:

- **A Guide to Low-Carbon Transport**

This easy to read guide provides very useful information on the impact of transport on climate change and the potential for low-carbon and sustainable transport to mitigate climate change effects. It outlines a number of the potential approaches that can be applied in **urban areas** to reduce consumption of fossil fuels, decrease emissions of greenhouse gases and contribute to more livable cities. This guide was developed in partnership with the South African Sustainable Transport Project, an initiative of the South African Department of Transport, with grant funding from the Global Environment Facility and implementation assistance from the United Nations Development Programme. The Sustainable Transport Project has supported low-carbon transport projects in seven South African cities in the areas of Bus Rapid Transit, High Occupancy Vehicle Lanes and Non-Motorised Transport, together with a skills and capacity development programme. A number of these projects are described in this document.

- Gail Jennings, 2011, **UNDP-GEF Guide to Low-Carbon Transport: Transportation, climate change and the UN Framework Convention on Climate Change**, South African National Department of Transport.
Available online: <http://issuu.com>





TOOL

4



Preparation

PHASE 1



Analysis

PHASE 2



Strategy

PHASE 3



Projects

PHASE 4



Integration
Implementation

Determining Local Climate Change Impacts (risks, vulnerabilities and opportunities) Support Sheet

Objective: this tool introduces and makes the links between climate changes, changing environmental conditions and the impacts of these. It is important to understand that climate changes are climatic events, whereas climate impacts (i.e. how the variability and extreme events are experienced) is very much linked to existing social, economic and environmental conditions.

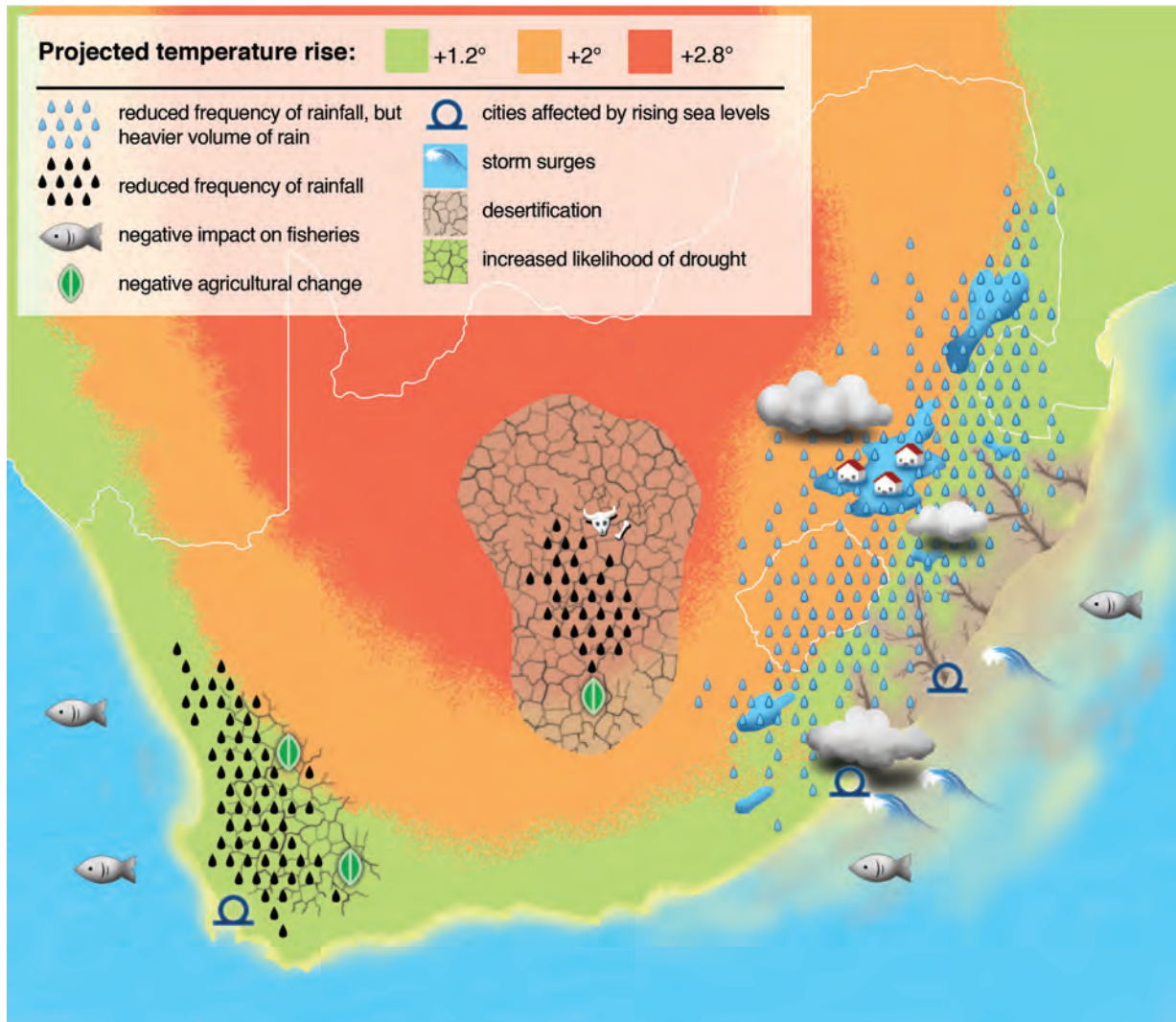
This tool is a useful introduction to climate change (Preparation and Phase 1) and understanding impacts as a basis to response planning (Phase 2, particularly within the Stakeholder workshop).

Change in Climate Variable	Direct and indirect impacts: risks, vulnerabilities and opportunities to manage
Reduced rainfall, droughtExtended dry season	<ul style="list-style-type: none"> Less available surface water and run-off = water shortages Less soil moisture Increasing frequency of droughts Weakening of food security (crop failure, death of livestock, wind erosion of top soil), especially in poor communities that depend on subsistence farming Impacts negatively on livelihoods Emergence of 'climate refugees' forced off land and into urban settlements – increased joblessness and depletion of rural communities Increased risk of wild fires and fires in informal settlements Compromised biodiversity and associated impacts on agriculture and tourism
Increased rainfall, floods	<ul style="list-style-type: none"> Human health implications, e.g. Cholera, diarrhoea, vector-borne diseases, floods, etc Increase in flooding (esp. in informal settlements due to their risk-prone locations)



Change in Climate Variable	Direct and indirect impacts: risks, vulnerabilities and opportunities to manage
Increasing frequency/ magnitude of storms; more intense and erratic rainfall	<ul style="list-style-type: none"> • Increase in damage to infrastructure from hail, wind, rain (roads, dams, sewage systems, etc) • Roads washed away or blocked can affect communication and local economy in remote areas • Damage to communication or energy network lines can affect economy, social, health • Damage of beaches and coastal infrastructure • Damage to personal property (e.g. homes, cars) – informal households particularly vulnerable to loss of household assets in fires or floods • Damage to agricultural crops • Flash flooding (e.g. landslide, mudslide) • Inability to guarantee utilities (e.g. energy, water) • Strain on emergency services • Soil erosion, which will affect agricultural livelihoods and biodiversity
Sea level rise & storm surges	<ul style="list-style-type: none"> • Saltwater intrusion into groundwater and coastal wetlands • Declining livelihood opportunities, e.g. fishing, etc • Erosion of coast/damages of beaches and coastal infrastructure • Flooding
Increasing temperatures: higher mean temperatures	<ul style="list-style-type: none"> • Less soil moisture • Increased incidence of pests (e.g. fruit flies); conversely, reduction or disabling of insects vital to agriculture and biodiversity in an area • Increase in invasive alien species & destruction of biodiversity hotspots • Human health implications, e.g. heat stroke, vector-borne disease, dehydration, etc • Declining livelihood opportunities • Damage to infrastructure (ground shrinkage, etc)
Change in Climate Variable	<ul style="list-style-type: none"> • Direct and indirect impacts: risks, vulnerabilities and opportunities to manage
Higher maximum temperatures, more hot days and more heat waves	<ul style="list-style-type: none"> • Heat stress in livestock • Increase in human deaths through heat stroke • Increased incidence of pests (e.g. fruit flies) • Higher energy consumption in cooling buildings
Higher minimum temperatures, fewer cold days and frost days	<ul style="list-style-type: none"> • Decreased chill unit accumulation from fewer frost days = decreased crop yields • Increased incidence of pests (e.g. fruit flies) • Health impacts with increase in vector borne disease • Increased wildfire danger and fires in informal settlements due to their risk-prone locations • Loss of tourism revenue in areas where cold/snow an attraction • Decreased energy consumption where buildings less cold

A simplified representation of climate change projections for South Africa (adapted from SARVA data)



TOOL

5



Preparation

PHASE 1



Analysis

PHASE 2



Strategy

PHASE 3



Projects

PHASE 4



Integration
Implementation

Responding to Local Climate Impacts Support Sheet

Objective: This tool will enable municipal stakeholders to identify key responses to likely climate impacts. Response actions are ‘fleshed’ out into key sector interventions and projects in **Tool 12: Sector Climate Change Response Options**.

Change in Climate Variable	Key response areas
Overarching	<ul style="list-style-type: none"> improved forecasting and early warning systems enhance natural barriers: remove alien species, improve wetlands and river courses, land care to avoid soil erosion health facilities to prepare for increase in vector borne disease and heat stress related incidences sanitation improvement, better housing stock thermal performance and increase green space to support management of health impacts planning to identify high risk areas and associated management plans (relocation programmes, early warning systems, improved settlement plans, enhanced natural barriers) infrastructure development to incorporate evolving climate conditions, including building guidelines that support mitigation (energy efficiency) and local service supplies (rain water tanks, solar water heating) poverty alleviation to improve resilience to impacts on household and livelihood assets

Change in Climate Variable	Key response areas
Reduced rainfall, drought Extended dry season	<ul style="list-style-type: none"> • Water demand and supply management • Change agricultural practises to improve resilience in drier conditions • Drought relief programmes (including nutrition support) • Explore livelihoods less dependent on subsistence farming, tourism • Research drought or peak water shortage options: consideration of emergency water provision through trucking, increased storage capacity, desalination • Poverty alleviation in face of 'climate refugees' forced off land and into urban settlements – increased joblessness and depletion of rural communities • Improved planning and disaster management to manage wild fires and fires in informal settlements, including alien plant control, fire breaks, spacing between houses
Increased rainfall, floods Increasing frequency/ magnitude of storms; more intense and erratic rainfall	<ul style="list-style-type: none"> • Enhance natural barriers, such as wetlands and river courses and improve land care management (slows flooding and soil erosion, etc) • Ensure storm water infrastructure is well maintained and upgraded according to new water flow conditions • Widening of dams a consideration • Adapt/improved health services to manage increase in disease • Map high risk/flood prone areas and institute land-use planning and zoning to avoid development here • Develop relocation programmes in high risk areas • Develop early warning systems and disaster management plans to improve response to flood events, particularly in informal settlements • Design and develop infrastructure resilient to increase in hail, wind, rain intensities (roads, dams, sewage systems, etc) • Institute sound waste management practises (rising water tables, flooding, coastal erosion can impact badly on disposed waste sites) • Poverty alleviation to build resilience to loss of personal assets, loss of annual agricultural crops, etc • Diversify household water and energy services with rain tanks, solar heating systems to improve services when network systems damaged • Develop and boost appropriate emergency services
Sea level rise & storm surges	<ul style="list-style-type: none"> • Develop alternative livelihoods for those dependent on coastal tourism, subsistence fishing and agriculture • Enhance and manage natural barriers, such as coastal wetlands, dunes • Map highly vulnerable areas and implement development bans or more stringent set-back lines and/or buffer zones • Relocate existing development from coastal areas at high risk • Reinforce/retrofit infrastructure (sea walls, storm drainage etc) at risk from surges





Change in Climate Variable	Key response areas
Increasing temperatures: higher mean and maximum temperatures	<ul style="list-style-type: none"> • Consider agricultural practises that will be more resilient in face of less soil moisture, heat stress in animals and increased incidence of pests • Support livelihood development in areas less dependent on agriculture that might be under threat • Develop alien species clearing programmes • Set in place strong conservation measures for biodiversity hotspots • Improve health services for increase in disease, consider approaches to reduce heat stress related health impacts • Develop infrastructure design that takes into account changing conditions, for e.g. less soil moisture means ground shrinkage • Enforce building guidelines that improve thermal performance of buildings and efficient heating, ventilation and cooling appliances
Higher minimum temperatures, fewer cold days and frost days	<ul style="list-style-type: none"> • Research best agricultural options for new conditions and support transition, particularly for poor and subsistence farmers • Management of vector borne diseases and associated health costs • Where tourism reliant on disappearing weather condition (e.g. snow) or related plant/animal life, consider alternative livelihoods • Fire management – improved informal settlement planning, early warning systems and fire fighting abilities

TOOL

6



Preparation

PHASE 1



Analysis

PHASE 2



Strategy

PHASE 3



Projects

PHASE 4



Integration
Implementation

Climate Information Web Portals

Objective: this tool provides an overview of the leading climate science information portals available for South African planners and decision makers. These sites provide information on climate history and projected climate change, looking at variables such as temperature and precipitation.

This data should inform the municipality's policy development and the stakeholder discussion on climate and related impacts. **Tool 4: Determining Local Climate Change Impacts** will help planners understand what the potential impacts of higher temperatures, altered precipitation and seasonal patterns can mean. Together, this information will inform the municipality's analysis of local climate change impacts.

Climate science is complex. While these sites are worth exploring, the information often remains difficult for lay people to understand and analyse correctly. Direct assistance in compiling a climate information report can be obtained from the Climate Science Analysis Group (CSAG) at the University of Cape Town. **Tool 7: CSAG Local Climate Report Example** will give you an idea of the kind of report you can get from CSAG for development planning purposes.

The Climate Information Portal CIP Tool : <http://cip.csag.uct.ac.za>¹

The University of Cape Town's Climate Science Analysis Group (CSAG) is the premier climate science data hub in Africa. The web based **Climate Information Portal** tool has been developed by CSAG to enable easy and effective exploration of climate history and future projections, with the idea of enabling science to support decision-making.

The tool is able to display the outcomes of climate projections using dynamic Global Climate Models, which are at the 200km (2 degree) scale (visible as grid tiles); it also houses the only statistically downscaled projections available, based on historically observed records at local weather stations across the country (accessible by clicking on the yellow dots).

The intention of the tool is to guide users through a process that first looks at observed data. This historical picture allows decision makers and planners to consider issues such as inter-annual variability in rainfall, extremes in seasons, dry and wet years and how these have been experienced and managed to date. This lays down an important context for future change.

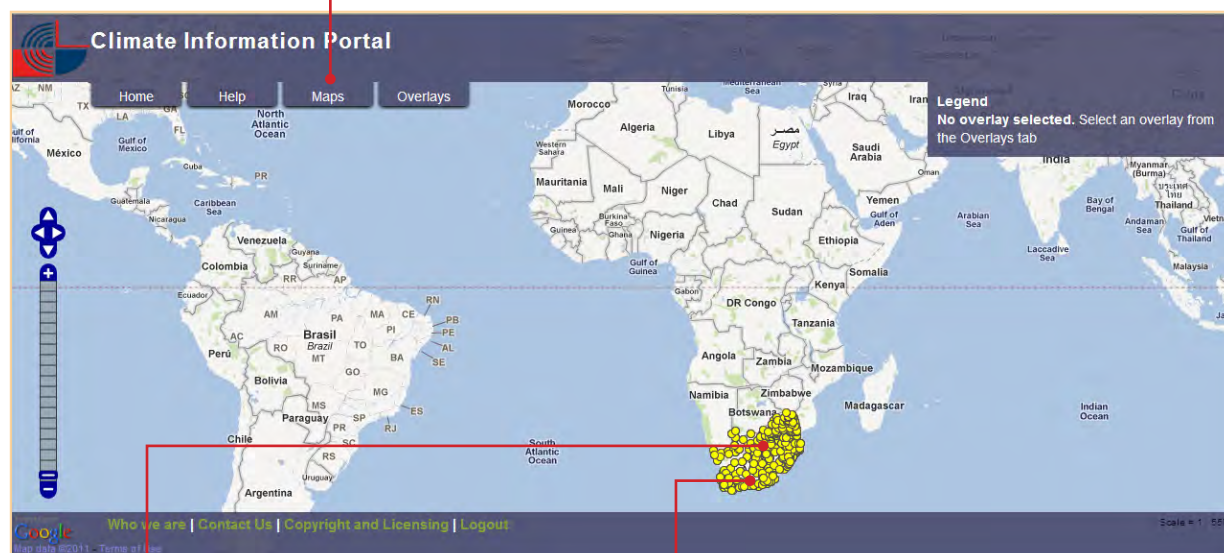
1. The Climate Information Portal (CIP) emerged out of the Climate Change Explorer tool, developed through collaboration between AWhere (a GIS development company), the Stockholm Environment Institute (SEI Oxford) and the Climate Systems Analysis Group (CSAG) at the University of Cape Town.

When working with climate models it is useful to understand the concept of **percentiles**. Climate involves a complex set of dynamic interactions between a range of variables. A number of different models have been developed by climate scientists to approximate this complexity. Climate science looks at the outcomes of a number of these models in order to be as thorough as possible in an uncertain environment. The results of modeling exercises are grouped in percentiles: the **median** (or 50th percentile) is the line through the middle – half of the model prediction results lie above this; half below; the 10th percentile indicates the line below which the lowest ten percent of predictions are grouped; the 90th percentile indicates the line above which the highest ten percent of predictions are grouped. For an initial sense of future projections, the median is usually the simplest guide with the range between the 90th and 10th percentiles indicative of the agreement, or lack of agreement, between the various models.

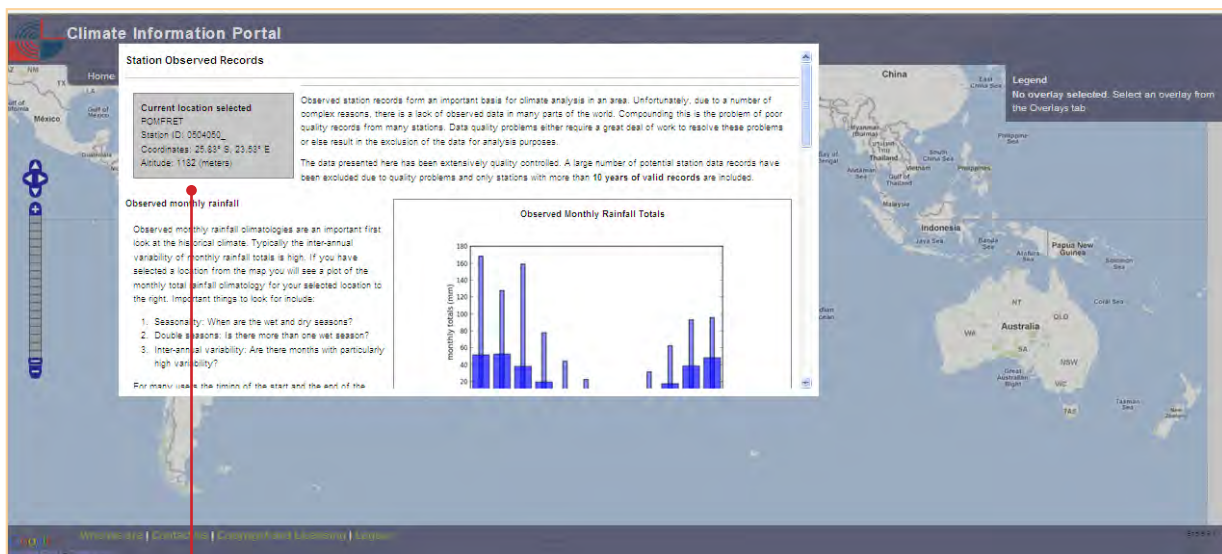
Navigating the portal

1. Go to <http://cip.csag.uct.ac.za> register yourself and login.
2. If you wish to see projected change at the Global Climate Model scale, click on the overlays tab along the top of the screen; select an overlay, for example the 50th percentile for the month of January, and you will see a shaded picture of median projected climate change (hotter, wetter) for the selected month

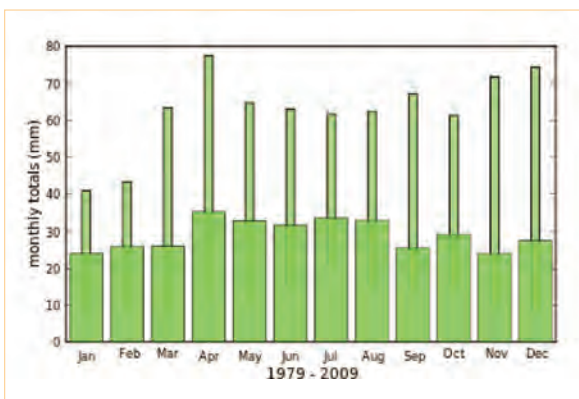
3. For locally specific information (statistically downscaled data), click on the maps tab along the top of the screen, and select South Africa from the drop-down menu.



4. Double click to zoom in on your region.
5. Then click and briefly hold on the yellow dot closest to or within your municipality.



6. A box will pop up like the one here, with information on observed rainfall and on maximum and minimum temperatures.

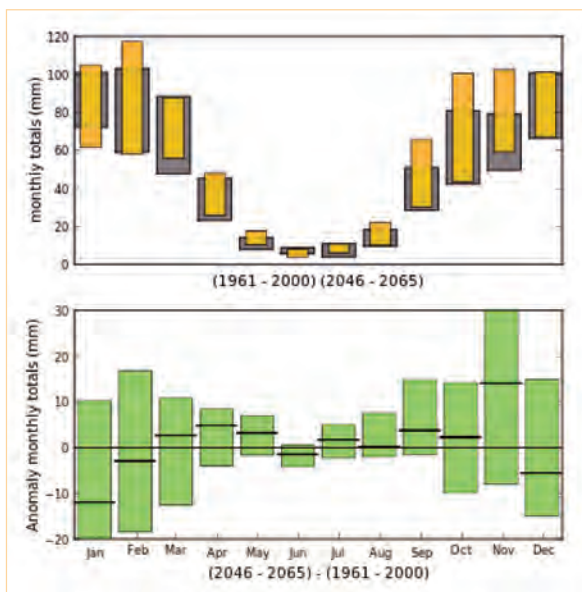


Monthly total rainfall: historically observed data

The fat green blocks show the annual average rainfall total for each month. The longer, thin, green line shows the range of total rainfall in a month over the 20 year period (inter-annual variability). Typically the inter-annual variability of monthly rainfall totals is high, indicating dry and wet years. Important things to look out for when examining the rainfall data:

1. When are the wet and dry seasons?
2. Is there more than one wet season?
3. Are there months with particularly high variability?
4. When does the rainy season start and end?

For many people the timing of the start and the end of the rainy season is very important. Months with high inter-annual variability are also important as this variability can have consequences for agriculture and other sectors.



Monthly total rainfall: future projections

The tool then offers you the option of continuing to future rainfall projections. **Note: If you are unable to obtain this information, or understand its content, contact the CSAG directly for assistance.**

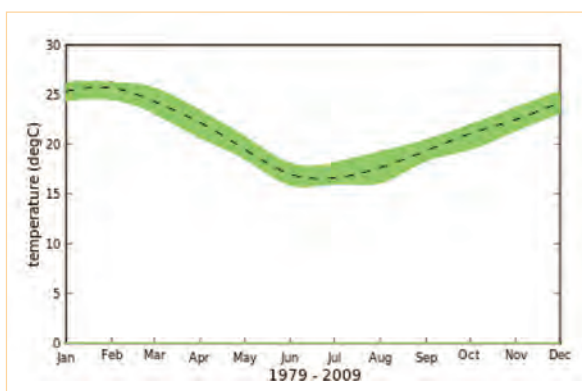
The second (green bar) graph is the most important one to read. Here the short black line through each bar shows the median¹ (50th percentile) of projection models. Statistically downscaled projections for precipitation, particularly in arid areas where there are few rainfall events each year, is difficult and this should be kept in mind. Important things to look out for and consider when examining the projected rainfall data:

1. Where is the median line (black line through each green bar) above or below zero? This indicates a projected change in rainfall conditions. Above the line indicates wetting, below the line indicates drying.
2. Note where the changes fall on the outer edges (or 'shoulder') of a season – this could indicate the extension of seasonal conditions.
3. Consider how your local conditions are affected by climate conditions further afield. For example, if your municipality is in the floodplain area of a larger catchment affected by inland changes in rain conditions, this may not reflect in your local rainfall, but may still result in substantial impacts, such as flood events.
4. Is agriculture in your municipal area river or rainfall irrigated? The impacts of changing climate conditions will be felt differently depending on the nature of your climate dependency.

Daily maximum & minimum temperatures

Things to look for here include:

1. When are the warm and cool seasons?
2. What is the range of temperature between warm and cool seasons?
3. Does the wet season correspond to the warm or cold season?
4. Consider changes in both maximum and minimum mean daily temperatures. Often it is the changes in minimum temperatures that can have a substantial impact on agriculture (e.g. deciduous fruit requires a certain number of chilly days in order to bud properly).



2. Midterm of a distribution of observed values.

Daily maximum & minimum temperatures: future projections

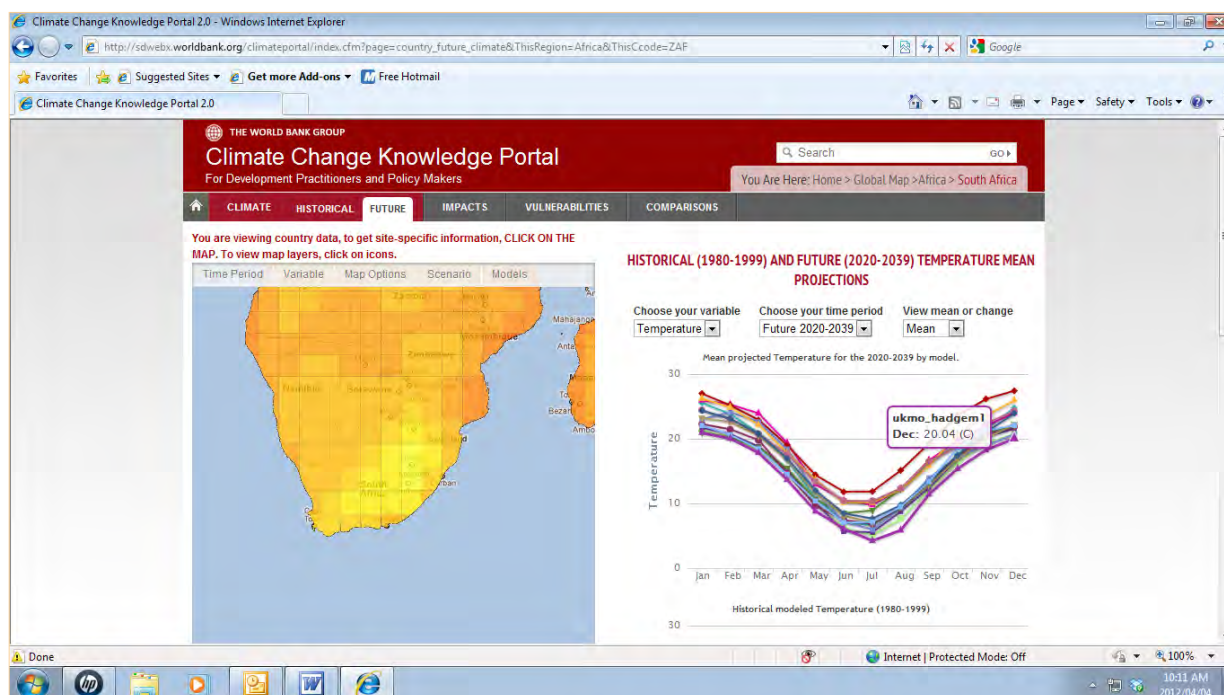
Temperature is far easier to statistically down scale than precipitation. When exploring future daily mean maximum and minimum temperatures, ask yourself how will the answers to the questions above be different in the future?

The Climate Change Knowledge Portal:

<http://sdwebx.worldbank.org/climateportal>

The data for the South African and African dimensions of this tool was supplied by the CSAG. This data is at the Global Climate Models scale (a 200km by 200km scale) and this portal cannot provide the downscaled level of analysis available in CSAG's CIP tool.

The tool does, however, have a nice, easy user-interface and some useful links and derivative statistics in the Variables drop down box (e.g. extreme rainfall event day projections, etc). The tool also provides links between changing climate variables and impacts on water, agriculture and related vulnerabilities. Although useful, the information is on a scale that provides indicative information, rather than anything locally specific.





Preparation

PHASE 1



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PHASE 2



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PHASE 3



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PHASE 4



Integration
Implementation

Climate Summary Report for Thohoyandou

Introduction

Thohoyandou is located in the Thulamela municipality in the north-east of South Africa. The region is situated on the northern limb of the South African escarpment and is characterized by low topography to east rising up to higher topography in the west.

It is always important to consider current climate inter-annual variability when one investigates the climate of a region. This gives an indication of the range of variability currently being experienced which is critical when one considers future changes. It is often the case that the current inter-annual variability of precipitation is very large compared to future projected changes, particularly for the near future (50 years). This is an important consideration for end users depending on the sector and the type of vulnerability under question.

The observed climate for the location is presented below in the form of graphs and summary tables. A map of the station location is presented in Figure 1 with station names of the selected stations.

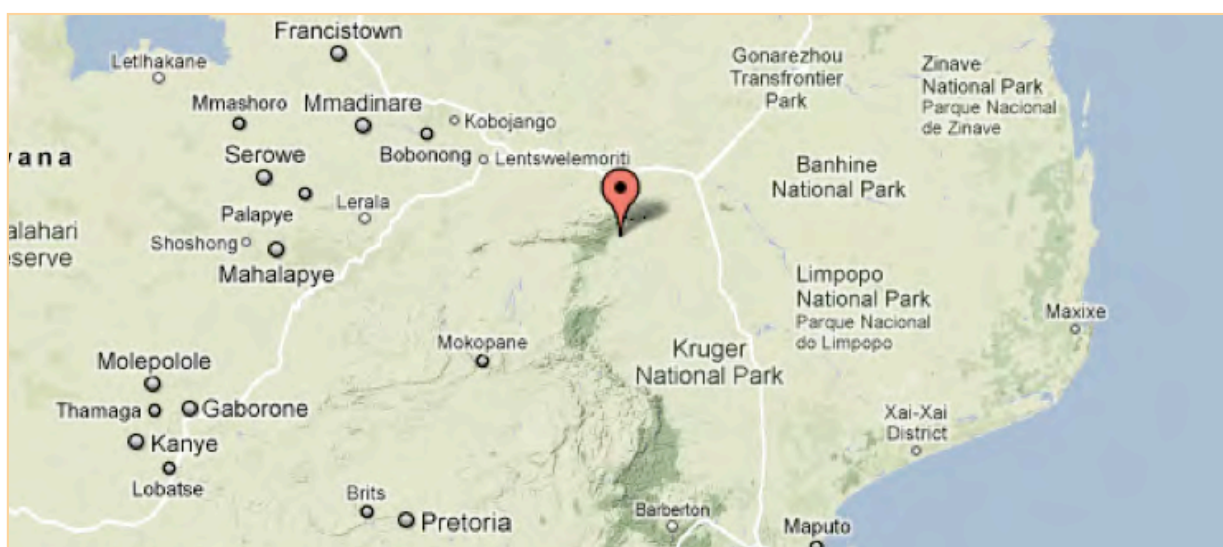
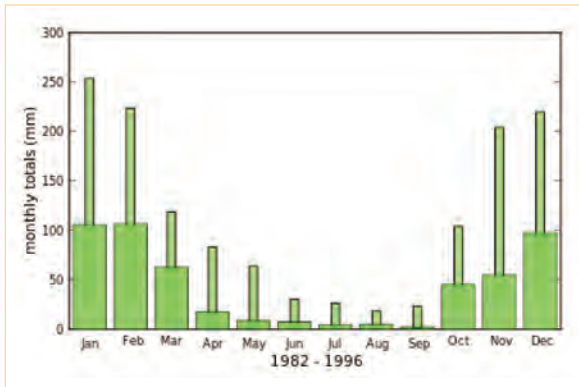


Figure 1: Map showing location of THOHOYANDOU observation station. THOHOYANDOU (603 meters above sea level)

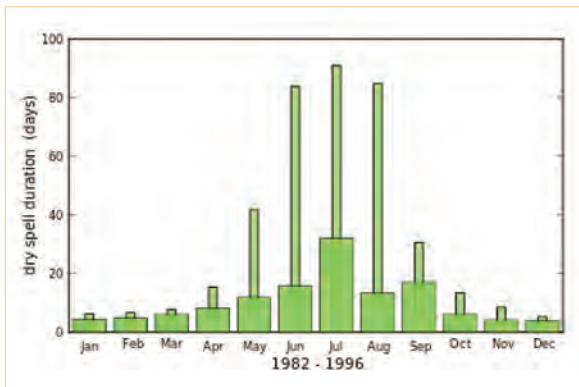


Observed climate

Observed seasonal rainfall

Figure 2: Annual cycle of monthly rainfall (mm) for THOHOYANDOU station.

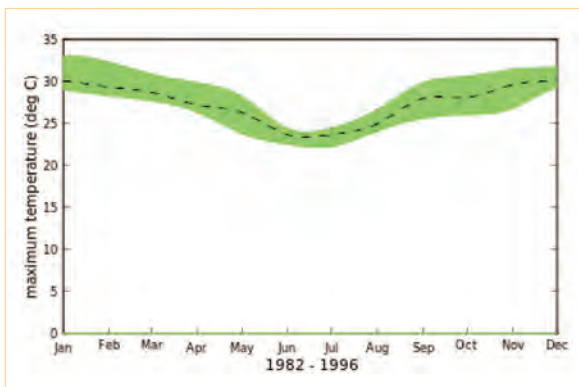
Wide bars indicate the median monthly rainfall for the climate period. Narrow bars indicate the 10th to 90th percentile³ range of monthly rainfall for each month during the climate period.



Observed seasonal mean dry spell duration

Figure 3: Annual cycle of monthly mean dry spell duration for THOHOYANDOU station.

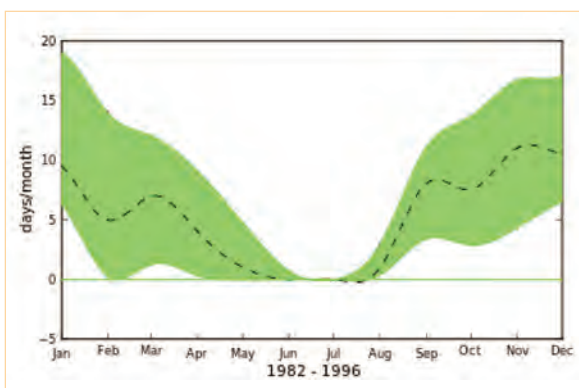
Wide bars indicate the median dry spell duration for the climate period. Narrow bars indicate the 10th to 90th percentile range of dry spell durations for each month during the climate period.



Observed seasonal daily maximum temperatures

Figure 4: Annual cycle of monthly mean maximum daily temperatures (degC) for THOHOYANDOU station.

The green envelope represents the 10th percentile to 90th percentile inter-annual range.



Observed seasonal days/month exceeding 32 degree Celsius

Figure 5: Annual cycle days/month exceeding 32 deg C for THOHOYANDOU station.

The green envelope represents the 10th percentile to 90th percentile inter-annual range.

3. Percentile is the value of a variable below which a certain percent of observations fall e.g. the 10th percentile is the value below which 20% of observations/incidences may be found.



Observed climate discussion

The region experiences a sub-tropical, summer rainfall, climate. The spatial variability in rainfall is high with drier climates in the higher areas to the west and north and wetter climates to the south and east. The regional topography plays an important role in controlling local climates.



The inter-annual (year on year variations) variability is significantly high suggesting that the region experiences years of severe drought as well as years of heavy rains. This variability is likely to place a significant stress on water resource management in the region as well as community livelihoods tied to water dependent activities such as agriculture.



The wet season starts around October-November and ends around March-April with the wettest months being January and February. The dry season extends from April through to September and the dry spell durations (continuous periods with no rain) during this dry period can extend for as long as 90 days in some years.



Temperatures are highest in December and January but are fairly high throughout the year with only a short cool season between May and August. During November through to January a significant number of days (~10) per month exceed 32°C suggesting heat stress may be a significant factor for some activities during this period.



Climate Projections

Global Climate Models (GCMs) are the foundation of climate change projections. These models attempt to simulate the global climate system by integrating known atmospheric physical processes through time. The models simulate the heating effect of the sun, the heat and moisture fluxes from the oceans, the effect of the land surface and vegetation, as well as the effect of green house gases on the atmospheric temperature profile. However, many processes occur at scales that cannot be resolved by the GCM numerics. These processes are approximated through parameterisations. Parameterised processes included cloud radiative effects, convection and precipitation, boundary layer mixing and many aspects of surface heat and moisture fluxes. Many differences between GCMs are a result of the different approaches to these parameterizations, particularly cloud radiative effects and precipitation processes. Another consequence of importance is that the skill of a GCM to simulate a particular region varies. Each GCM has better skill in some areas than others.

Multi-model selection

The temptation is to pick the GCM that best represents the climate of your region of interest. However this is not a valid approach because when generating climate change projections we are looking for an accurate response to changes in GHG concentrations. A GCM that accurately simulates observed climate does not necessarily accurately respond to changes in GHGs. Of course we do not know what an accurate response should be so we have to assume that all models represent an equally likely response. This is the basis of the development of climate projection envelopes which represent to the range of responses produced by the GCMs.

Model Bias

It is acknowledged that each GCM has a particular bias for a particular variable in a particular region. This bias can be significant in the case of precipitation. When developing future projections it is therefore important not to look at the raw GCM output fields only, but to also look at the anomalies between the GCM 20th century simulate and the future simulation. These anomalies are calculated for each GCM and represent the GCM response or delta given the GHG forcing. In the figures below both the absolute downscaled GCM projection envelopes and the anomaly envelopes are presented. The absolute values are still useful to show the GCM seasonality as well as the agreement between GCMs.

Downscaling

The resolving scale of GCMs has improved significantly in the last 10 years with many state of the art GCMs able to resolve at a scale of around 100km. The CMIP3 archive GCMs are typically of lower resolution than 100km with resolution ranging between 200km and 400km. However, while the native resolution of GCM may be 200km, the skill of the model at this resolution is typically low due to the GCMs simplified topography and representation of regional processes. GCM skill is much higher when aggregated up to large scales such 500km to 1000km.

The problem is that these scales are far too coarse for most users who are dealing with regional issues such as water management and agriculture. Society and ecosystems typically operate at much finer scales. Downscaling is the concept based on the observation that local scale climate is largely a function of the large scale climate modified by some local forcing such as topography. There are two main types of downscaling, dynamical and empirical. Dynamical downscaling utilises a higher resolution, limited domain, dynamical model that follows the same principles as a GCM but because of the limited domain is able to be run at much higher spatial resolutions with moderate computation costs. Dynamical downscaling offers a physically based regional response to the large scale forcing. However dynamical modelling is complicated by similar problems to those of GCMs, namely bias and error.

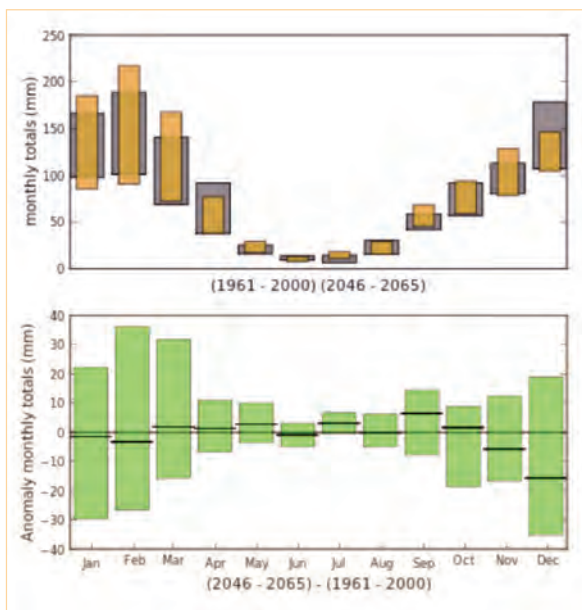
Empirical downscaling utilises various statistical methods to approximate the regional scale response to the large scale forcing. Various methods have been developed. The method used in this report is called SOMD (Self Organising Map based Downscaling) developed at the University of Cape Town. Details of the method can be found in the referenced paper. The method recognises that the regional response is both stochastic as well as a function of the large scale synoptics. As such it generates a statistical distribution of observed responses to past large scale observed synoptic states. These distributions are then sampled based on the GCM generated synoptics in order to produce a time series of GCM downscaled daily values for the variable in question (typically temperature and rainfall). An advantage of this method is that the relatively unskilled grid scale GCM precipitation and surface temperature are not used by the downscaling but rather than relatively highly skilled large scale circulation (pressure, wind and humidity) fields are used.

Projections

The CMIP3 archive GCMs are used in this study. The downscaling methodology requires daily archive fields which limited the number of suitable GCMs to a total of 9 out of a possible 21. Each GCM has a number of simulations. The first is a simulation of the 20th Century climate (1961 to 2000) forced by observed GHG concentrations. This simulation is the GCMs representation of the observed climate period. It is important to note that there is no correspondence between real years and the years of the 20th Century simulations. This means one can expect no likeness between a particular year in the 20th Century simulation and that year in the observational record.

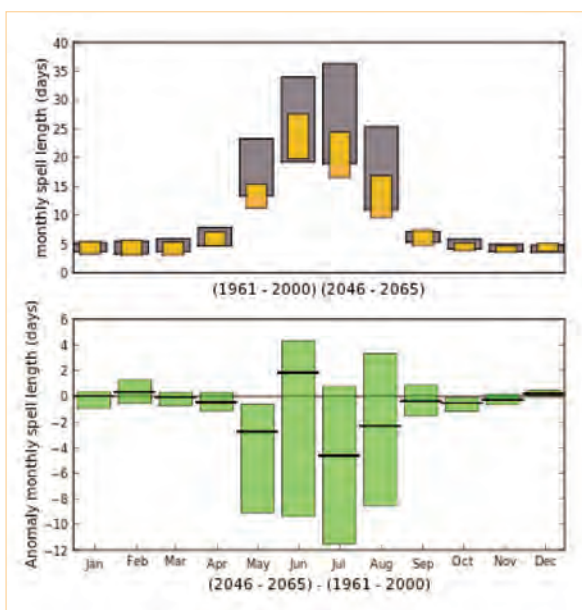
Then follows a number of simulations of future periods and GHG concentration scenarios. For this study the two future periods of 2046 - 2065 and 2081 - 2100 were selected and the future development scenarios A2. A total of 3 GCM simulations, one 20th Century period and 2 future periods are therefore analysed for each particular GCM. Each GCM simulation was downscaled to the station location and various appropriate climatological summary statistics were produced. These are presented below in the form of climate projection envelopes. As mentioned above, projection envelopes capture the range of GCM responses to GHG forcing and represent the level of agreement or disagreement between the GCMs.





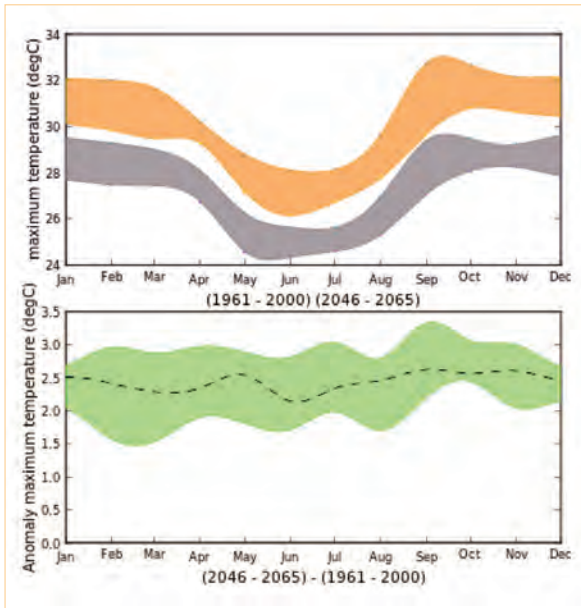
Monthly total precipitation change (SRES A2 Scenario)

Figure 6: Change in monthly total rainfall (mm) for THOHOYANDOU station. Grey bars represents 10th to 90th percentile range of the control period multi-model climatologies (1961-2000). Orange bars represents the same but for the future period multi-model projections (2046-2065). Anomaly plot wide bars represents 10th to 90th percentile ranges of the future - control anomalies with the median change marked as a solid black line.



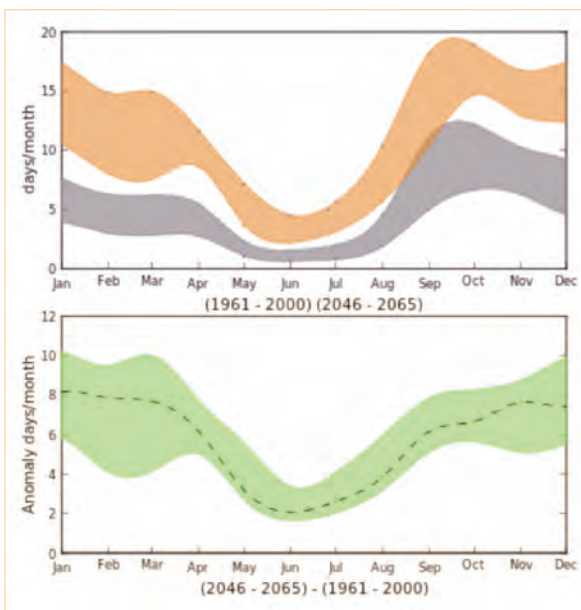
Monthly dry spell duration change (SRES A2 Scenario)

Figure 7: Change in monthly total rainfall (mm) for THOHOYANDOU station. Grey bars represents 10th to 90th percentile range of the control period multi-model climatologies (1961-2000). Orange bars represents the same but for the future period multi-model projections (2046-2065). Anomaly plot wide bars represents 10th to 90th percentile ranges of the future - control anomalies with the median change marked as a solid black line.



Monthly mean maximum daily temperature change (SRES A2 Scenario)

Figure 8: Change in monthly mean maximum daily temperature (deg C) for THOHOYANDOU station. Grey envelope represents 10th to 90th percentile range of the control period multi-model climatologies (1961-2000). Orange envelope represents the same but for the future period multi-model projections (2046-2065). Anomaly plot envelope represents the 10th to 90th percentile range of anomalies with the median anomaly as a dashed line.



Monthly mean change in days exceeding 32 degC (SRES A2 Scenario)

Figure 9: Change in monthly days exceeding 32degC for THOHOYANDOU station. Grey envelope represents 10th to 90th percentile range of the control period multi-model climatologies (1961-2000). Orange envelope represents the same but for the future period multi-model projections (2046-2065). Anomaly plot envelope represents the 10th to 90th percentile range of anomalies with the median anomaly as a dashed line.



Projected changes discussion



As is typical for projected changes in rainfall in this region, there is a fair amount of uncertainty. This is a result of the way different models represent the rainfall processes in the region including the flow of moisture from the Mozambique channel and the formation of convective rainfall systems that are the source of most rainfall in the area. The most significant feature of the rainfall projections is the reduction in early season rainfall in November and December. This later start to the season is commonly seen in projections across the North of South Africa and so the projections for this particular region are not unexpected. This may have a significant impact because of the longer period of higher temperatures with no associated rainfall towards the end of a potentially longer dry season.



Interestingly, the projected changes in the length of dry spells in the mid-winter are for shorter dry spells. This is likely due to the general increase in moisture as a result of a warmer climate. While this does not seem to indicate a wetter winter, it does suggest that small amounts of rain may fall more frequently during the winter months.



Temperature projections are associated with much less uncertainty and in common with the larger region show projected changes of around 2.5°C during the next 40-50 years. This increase is significant and will have important impacts in the region. One way of exploring this impact is to look at the change in the number of hot days (days exceeding 32°C). The projections suggest somewhere around 8 more days a month will be hot during the summer months. The observed records show that around 10 days a month are very hot currently, so it is likely that within the next 40-50 years somewhere around 18 days a month will be very hot (ie. twice as many very hot days)

Conclusions

It is important to note that this is a very summarized overview of the observed climate and future climate projections and should serve as a starting point in exploring climate vulnerabilities and impacts. The information presented here should not be used as the sole source of information in adaptation planning or decision making. Further sources of information and guidance should be obtained.

TOOL

8



Preparation

PHASE 1



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PHASE 2



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PHASE 3



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Integration
Implementation

Municipal Greenhouse Gas (GHG) Emissions Calculator and Electricity Sector Efficiency Planning Tool: www.cityenergy.org.za

Objective: The Municipal GHG Emissions Calculator aims to assist municipalities in identifying where and how much energy is consumed in their jurisdictional area and, assess the related GHG emissions challenges and opportunities.

Sheet 1: GHG Emissions Calculator can provide you with a baseline energy consumption and GHG emissions picture for your municipality. This will help you identify key challenges to manage, and will also enable you to track your emissions over time.

Sheet 2: Electricity Sector Efficiency Planning tool looks at the Electricity sector more specifically. It can identify and quantify your municipal electricity efficiency opportunities, and provides useful cost-savings information that will assist with prioritisation in developing an electricity efficiency programme. This part of the tool will be of value in Phase 3: Projects.

An interactive version of the tool can be found on: www.cityenergy.org.za. You can also use the tool in this hard copy version by following the calculation instructions provided along the top bar, beneath each table heading.

If you are unable to obtain data for your municipality, proceed to the **GHG Emissions and Energy Development Analysis tool (Tool 9)**, which will provide you with an indicative emissions and energy assessment picture for your municipal type.

How to use the tool

1. **Select the year** for which you will gather data. This should be a year where you can get the most recent data across all data types. Municipal liquid fuel data is available for 2009 (see below). It would make sense to try to get 2009 data for other energy sources, in order to be in line with this.
2. **Correlate data:** If available data for different fuel types comes from differing years, try to ensure the years are as close as possible. If within a couple of years of each other, this should not be a big problem, unless dramatic change has taken place, e.g. closure of industry, new industry, etc. If really necessary, data can be correlated by, for example, inflating earlier data by local growth rates (economic and population).



3. **Electricity data source:** Your local electricity department can provide electricity data. If Eskom services part or all of the electricity needs in your area, you will need to ask them for this data. If Eskom data is not available, the municipal electricity distribution department is likely to know the rough percentage of electricity needs they service in the municipal area versus Eskom. Based on this percentage and municipal electricity supply data, Eskom electricity supply can be estimated.
4. **Electricity by sector:** On the Electricity by Sector page (Sheet 2), fill in electricity data by sector (tariff categories will usually provide an indication) for both Eskom and municipal supply areas, if you have this data. Otherwise use just the municipal data, in order to find out which sectors use the most electricity. The sheet also provides detailed information on what efficiency interventions you could consider and the associated costs and savings.
5. **Liquid fuel data:** Liquid fuel data has been collated from SA Petroleum Association Industry (SAPIA) data to assist you. The Municipal Liquid Fuel Data File is available on request from info@sustainable.org.za or via www.cityenergy.org.za.
6. **Coal data:** Unless you have a local coal yard, or a local coal/coke supplier willing to provide you with information, coal use data is very hard to come by due to the coal sector being unregulated.
7. **Solid waste and waste water:** Emissions figures are generated automatically from the population figure, based on estimated per capita averages. If your municipality has real figures, these estimations can be replaced.
8. **Only fill in the orange cells** (existing figures in the table are dummy figures for table purposes). Where no data exists or no fuel of that sort is present, fill in zero. Do not forget to enter the POPULATION figure at the bottom.

Notes on data

1. Conversion and emission factors: officially approved IPCC (Intergovernmental Panel on Climate Change) conversion factors for South Africa are used.
2. Electricity emissions conversion factors:
 - a. municipal consumption figures take 'responsibility' for their portion of electricity generation, even though this takes place outside of the municipality's boundaries.
3. Liquid fuel emissions conversion factors:
 - a. while as much as 30% of liquid fuel in South Africa is produced from synfuel (coal to liquid fuel), a process that is very carbon-emissions intensive, these emissions are accounted for within the industrial processes undertaken by Sasol, and the standard fuel-burning emissions factors are applied to end-use consumption.
 - b. Different uses for liquid fuels, for example diesel for transport versus diesel for an electricity generator, will produce varying levels of emissions. These variations are not captured here. A standard emissions factor is applied. This is in the interest of simplicity and in the knowledge that accurate data on levels of consumption across different uses is not available.
4. Solid waste and waste water treatment: real figures for these are seldom available and the methodology for calculating organic content and related emissions is complex. This calculator works on an indicative per capita estimation based on detailed calculations for a range of South African cities and towns. However, circumstances differ and this figure is likely too high for more rural areas. This will be updated as new information becomes available.
5. Assumptions for electricity efficiency savings: the detailed set of assumptions behind the electricity efficiency opportunities analysis is available on the web-based tool. These have been drawn, largely, from Eskom studies of efficiency projects undertaken around the country.

Analysis

Once you have developed the 'picture', consider:

- Is there a particular fuel type or sector that stands out as making a substantial contribution to emissions in your area?
- Although the energy picture doesn't provide a sector breakdown, the petrol and diesel figures would fall into 'Transport'; Electricity is a combination of Residential, Industry and Commerce.
- A breakdown by sector can be found with the electricity sector analysis on Sheet 2. Which sectors consume most electricity? Do you know anything about the kind of activities this electricity is being used for, for example in mid-high income households hot water geysers are usually the electricity guzzlers; what sort of industrial activity takes place in your area?
- Can you identify any climate vulnerabilities within this picture? For example, an economy that is based on very carbon intensive fuels (notably fossil fuels) might mean your area is vulnerable to carbon taxes, or trade barriers; also, very low consumption of energy amongst poor households might indicate high levels of poverty, making particular communities more vulnerability to climate change impacts.

Look at the next tool: GHG Emissions and Energy Development Analysis for more information on typical energy and emissions challenges in our municipalities. Use both of these tools to develop your GHG Emissions and Energy report. This will inform the climate change response content for the IDP Status Quo report.



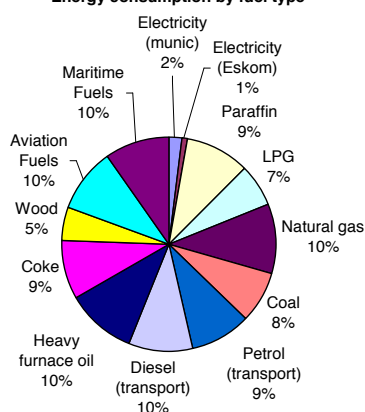
Municipal Greenhouse Gas (GHG) Emissions Calculator: www.cityenergy.org.za

Greenhouse gas data and calculations

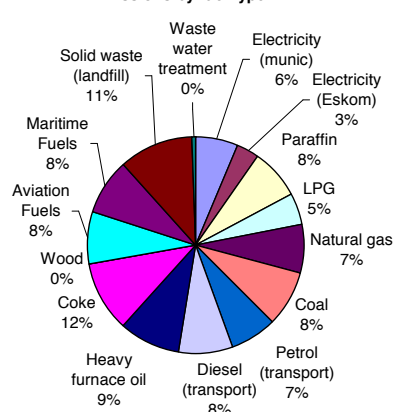
Fuel	Unit	Quantity	Suggested Data Sources	Conversion factor (GJ/unit)	GJ (GJ/unit conversion factor x quantity)	Conversion factor (tonnes CO ₂ /GJ)	Tonnes CO ₂ e (CO ₂ /GJ conversion factor x GJ)
Electricity (munic)	kWh	200,000	Source: Local distributor - municipality (in tariff categories)	0.0036	720	0.3056	220
Electricity (Eskom)	kWh	100,000	Source: Local distributor - Eskom (in tariff categories)	0.0036	360	0.3056	110
Paraffin	litre	100,000	Source: Municipal Liquid Fuel Data File (SAPIA) tool OR oil companies	0.036	3600	0.0717	258
LPG	m3	100,000	Source: Municipal Liquid Fuel Data File tool OR direct from oil companies, Afrox (may be difficult to obtain)	0.025	2500	0.063	158
Natural gas	m3	100,000	Source: Egoli/Sasol gas (if applicable)	0.039	3900	0.0642	250
Coal	kg	100,000	Source: Local merchants (may be difficult to obtain)	0.03	3000	0.0944	283
Petrol (transport)	litre	100,000	Source: Municipal Liquid Fuel Data File tool OR oil companies, Transport Dept	0.034	3400	0.0692	235
Diesel (transport)	litre	100,000	Source: Municipal Liquid Fuel Data File tool OR oil companies, Transport Dept	0.037	3700	0.0739	273
Heavy furnace oil	litre	100,000	Source: Municipal Liquid Fuel Data File tool OR oil companies	0.04	4000	0.0772	309
Coke	kg	100,000	Source: Local suppliers	0.034	3400	0.107	364
Wood	kg	100,000	Source: Local surveys (may be difficult to obtain)	0.019	1900	0	0
Aviation Fuels	litre	100,000	Source: Airports authority, SAPIA/Municipal Liquid Fuel Data File tool (if applicable)	0.036	3600	0.072	259
Maritime Fuels	litre	100,000	Source: Ports authority, SAPIA/Municipal Liquid Fuel Data File tool (if applicable)	0.037	3700	0.078	289
Solid waste (landfill)			Can be estimates at 0.76 tons CO ₂ e/capita			0.76	380
Waste water treatment			Can be estimates at 0.033 tons CO ₂ e/capita/yr			0.033	17
TOTAL tonnes CO ₂ e							3,405
Population							500
Tonnes CO ₂ e/capita							6.8

Analysis

Energy consumption by fuel type



Emissions by fuel type



- Typically close to 100% of fuels are from fossil-based sources.
- Analysis of data from South Africa's metros and larger towns indicates that just over half of all energy used is within the transport sector.
- Although electricity contributes to half of all energy used, it contributes significantly more to GHG emissions due to the 'dirty' nature of the coal burnt in its production.
- A detailed breakdown of electricity consumption by sector is available on the next sheet.



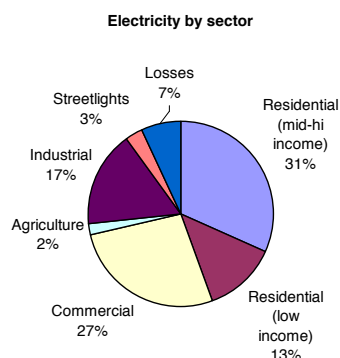
CITY ENERGY SUPPORT UNIT

a south african sustainable energy and climate protection initiative

Municipal Electricity Consumption Breakdown

*Only fill in orange cells

	MWh	%
Residential (mid-hi income)	50,441	32%
Residential (low income)	20,345	13%
Commercial	42,544	27%
Agriculture	3,000	2%
Industrial	26,566	17%
Streetlights	4,737	3%
Losses	11,168	7%
Total	158,801	100%



Summary of potential impact of Energy Efficiency (EE) interventions

	Technology	Behavioural	Total	Cost of Intervention per unit (retrofit)	kWh Saved over lifespan	c/kWh Saved
Residential (13% of total consumption)						
EE Lighting (mid-high income)	1.3%	0.2%	1.5%	R 25.20	480	5.25
EE Lighting (low income)	2.2%	0.3%	2.5%	R 25.20	480	5.25
Geyser thermostat adjusting (10 degrees)	0.0%	0.4%	0.4%	R 0.00	1,848	0.00
Aerated Showerheads**	0.6%	0.0%	0.6%	R 230.00	5,070	4.54
Geyser Blankets*	0.7%	0.0%	0.7%	R 110.00	2,560	4.30
Solar water heaters (SWH)	3.9%	0.0%	3.9%	R 14,500.00	20,000	72.50
Hot Boxes	0.4%	0.0%	0.4%	R 119.00	2,044	5.82
Ceilings in RDP houses-gypsum*	0.3%	0.0%	0.3%	R 1,600.00	23,600	6.78
Ceilings in RDP houses-isoboard	0.5%	0.0%	0.5%	R 2,587.50	38,000	6.81
Sub Total	8.7%	0.9%	9.6%			
*Not included in sub-total as effects are negated by other interventions						
**effect on sub-total is reduced due to simultaneous installation of SWH's						
Commercial (27% of total consumption)						
EE Lighting	0.7%	0.4%	1.1%	R 172.00	360	47.78
Heating, Ventilation and Cooling (HVAC)	1.7%	0.9%	2.6%	R 950.00	325	292.10
Sub Total	2.4%	1.3%	3.7%			
Industrial (17% of total consumption)						
Efficient Motors	0.6%		0.6%	R 14,700.00	90,560	16.23
Variable Speed Drives	0.4%		0.4%			
EE Lighting	0.3%	0.1%	0.4%	R 890.00	1,030	86.41
Heating, Ventilation & Cooling (HVAC)	0.0%	0.0%	0.1%	R 950.00	325	292.10
Sub Total	1.3%	0.1%	1.4%			
Streetlights (3% of total consumption)						
High Pressure Sodium (HPS) Streetlights	1.0%		1.0%	R 1,150.00	300,000	0.38
Sub Total	1.0%	0.0%	1.0%			
Total	13.40%	2.30%	15.70%			



CITY ENERGY SUPPORT UNIT

a south african sustainable energy and climate protection initiative



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GHG Emissions and Energy Development Analysis Table

Objective: The table below based on a growing understanding of key emissions and energy issues across the country. It is designed to support the GHG emissions analysis (previous tool) and assist municipalities unable to do a detailed GHG emissions analysis, to understand the climate mitigation and energy development issues they need to respond to. This information will contribute to your GHG Emissions and Energy report, which will inform the climate change response content of the IDP's Status Quo report (Situational Analysis).

A and B2: metros and large towns

Profile	Key issues
<ul style="list-style-type: none"> relatively high per capita carbon footprint (around 6 tonnes/capita for metros; 4 tonnes/capita for large towns); significant contribution to the national emissions picture: some 40% of national electricity generated is consumed within the largest 17 cities and towns transport responsible for around 30% of emissions households responsible for around 30% of emissions – most of this occurring amongst mid-high income households industry can be substantial built environment broadly is a significant emissions contributing sector landfill gas can account for as much as 10% of GHG emissions municipal activities account for only about 1-2% of emissions, but important area for quick wins and 'leadership by example'. 	<ul style="list-style-type: none"> Critical partner in meeting national GHG emissions reduction targets (as per international agreement) city economies vulnerable to increasing costs of carbon need to reduce intensity of carbon per capita and economic activity through greater efficiency, renewable energy and encouraging diversification of economic activity improved mobility (better public transport) to keep emissions levels from rising and improve the livelihoods opportunities/economic mobility of people mid-high income households are large contributors to emissions profile; usually 50% of household electricity in this sector is for water heating, so introduction of solar water heating is critical regulating to improve efficiency of the built environment engagement with commerce and industry to support more efficient electricity use unsafe energy use in poorer households contributes to fires and health issues that will be worsened by climate change – important to move to 100% electrification improve thermal efficiency of poor households, possible provision of solar water heating, for greater resilience (better health, reduction of energy poverty) waste recycling and management of landfill gas is an important area to address town planning and economic development approaches into the longer term



B3, C1: large town as core, and small towns with largely commercial farms	
Profile	Key issues
<ul style="list-style-type: none">carbon footprint ranging from approximately 2-6 tonnes/capita (4 tonnes/capita is the global average)Liquid fuels (mostly for transport) contribute significantly to the energy consumption picture (around 50%); but electricity is the largest contributor to GHG emissionsMid-high income households contribute significantly to electricity emissionsmunicipal activities account for only about 1-2% of emissions, but important area for quick wins and 'leadership by example'.	<ul style="list-style-type: none">mid-high income households large contributors to emissions profile; usually 50% of household electricity in this sector is for water heating, so introduction of solar water heating is criticalunsafe energy use in poorer households contributes to fires and health issues that will be worsened by climate changepoor and informal households suffer from energy poverty – thermally efficient houses and access to affordable, modern energy sources is importantwaste recycling and management of landfill gas is an important area to address
B4, C2: rural villages and largely retail service towns	
Profile	Key issues
<ul style="list-style-type: none">carbon footprint very small (1-2 tonnes/capita) – 'carbon space' for developmentelectricity contributes substantially to emissions (except in areas that are off-grid)households are the major contributors to electricity consumption; with commerce and agriculture followingelectrification of rural areas is still major issuesolid waste is a relatively large contributor to emissionsmunicipal activities account for only about 1-2% of emissions, but important area for quick wins and 'leadership by example'.	<ul style="list-style-type: none">unsafe energy use (wood and coal fires, paraffin, candles, illegal/poor electricity connections) in poorer households contributes to fires, accidents and poor health which will be worsened by climate changeelectricity distribution often 100% in hands of Eskom – need close cooperation to continue with electrification programmesdeforestation where wood is used for cooking and heatingeconomy and welfare held back by intermittent electricity supply and low voltage linesefficiency in lighting and appliances can contribute significantly to energy cost savingsimproved thermal quality of housing will reduce need for indoor heating (and related pollution/cost) and improve the health of residentswaste treatment – 'buy back' recycling centres may reduce waste and contribute to livelihoods; likely potential for energy from landfill or waste water gas is small; but some emissions savings may be gained through better management and/or technologies deployed in waste management

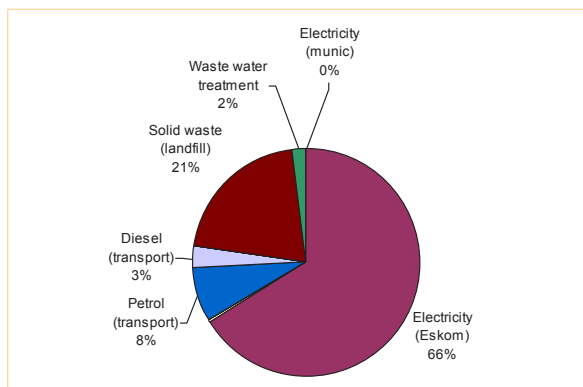


Figure 1: GHG emissions by fuel type, Thulamela Local Municipality (B4), Limpopo Province

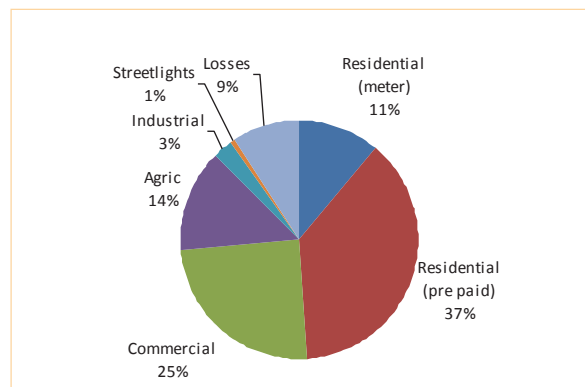


Figure 2: Electricity consumption by sector, Thulamela Local Municipality (B4), Limpopo Province



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Climate Change Analysis Report template

Objective: this template provides guidance in developing a report that provides key information on climate change for inclusion in the IDP Status Quo Analysis. Draw on the information you have developed in your climate change and related impacts analysis, as well as the GHG emissions and energy analysis.

This report will later also inform your municipality's Climate Change Response Strategy document (developed after the stakeholder workshop in Phase 2: Strategies).

Report Template

1. Introduction

Use the Introduction in the Let's Respond Guide and **Tool 2 Climate Change and Municipal Planning** to briefly outline what climate change is and why it is of relevance to municipalities in South Africa.

Note that climate response includes both mitigation (working to curb catastrophic levels of climate change) and adaptation (responding to changes already happening) activities. To respond in these ways the municipality needs to understand the problem of changing climate and GHG emissions and energy for development.

2. Climate patterns

2.1 Climate: current and future

Use the report you have obtained from CSAG, or information gathered during Phase 1: Analysis activities to outline current and future rainfall and temperature patterns (**Tool 3: Directory of Key Regional Climate Change Resources** and **Tool 6: Introducing Climate Web Portals** refer; and the overview note: Future Climate over Southern Africa).

Note your sources of information.

Provide an overview of current climate and a summary of likely changes in climate for the municipality.

Consider:

2.1.2 Rainfall

1. Seasonality: when are the wet and dry seasons? How is this likely to change?
2. Inter-annual variability: variability is a challenge for infrastructure development and service delivery – are there months with particularly high variability? How is this likely to change?
3. Source of water: if irrigation and water supply is rain fed, changes in local precipitation will be of importance; where water supply is river fed you will also need to consider changes in precipitation in the catchment area.

2.1.2 Temperature

1. Seasonality: when are the warm and cool seasons? How is this likely to change?
2. Seasonality: what is the range of temperature between warm and cool seasons? How is this likely to change?
3. Interaction with rainfall season: does the wet season correspond to the warm or cold season? How is this likely to change?

2.2 Climate challenges

Consider and outline the major challenges arising from the likely climate changes. **Tool 4: Determining Local Climate Change Impacts** will help you consider the major climate challenges facing your area, but also draw in any local information or experience.

Highlight particular vulnerabilities – this could be economic or livelihood sectors, communities, geographic areas. If you have done a detailed Vulnerability Assessment, include this information here.

Note where there are large uncertainties about future climate conditions (rainfall is generally very hard to predict, particularly in more arid areas).

3. GHG emissions and energy for development

3.1 GHG emissions picture and baseline

Use the information from your GHG emissions scan and analysis (Tools 8 and 9), to provide a picture and baseline of the energy use and GHG emissions output in your area.

Consider:

- How does your municipality compare with the rest of South Africa?
- What fuel type contributes most to GHG emissions?
- Which sectors are major GHG emissions contributors?

3.2 GHG emissions and energy for development challenges

- Are there particular activities that contribute substantially to GHG emissions in your municipality?
- Are many people in the municipality suffering from a lack of access to energy for household or livelihoods purposes?





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Workshop template: Developing a local climate change response vision and key objectives

Objective: this tool will help you plan and run a full day workshop designed to develop a municipal climate response vision and objectives. This session is really the heart of the climate response integration process. It will identify the objectives that will be integrated into the Strategic Focus Areas of the IDP. It will also form the basis for a Municipal Climate Response Strategy. Further, the session is a valuable public engagement, as supported in the integrated planning approach.

Various tools will support this workshop programme, notably: **Tool 2: Climate Change and Municipal Planning presentation; Tools 4, 5 and 12 which look at climate change impacts and response options;** and Your Climate Change Analysis Report (**based on Tool 10**) will provide valuable information to be presented here, as will **Tool 9: GHG Emissions and Energy Development Analysis Table** for an overview of energy and emissions issues.

Participants

All stakeholders that form part of your IDP stakeholder forum should be considered for the workshop. In addition, key Municipal councillors and staff must be here.

Inviting a **key councillor or top official** to formally open the workshop helps to build political commitment and leadership on the issue. This will ensure greater buy-in to the process by officials and stakeholders. If there are any **leading experts** you know of who could make a strong contribution to the workshop, consider inviting them to make a presentation.

Objectives of the workshop

- To deepen the understanding of the impacts and effects of climate variability and change on various sectors and livelihoods in the municipality – both threats and opportunities
- To develop a local climate change response goal and identify priority objectives and actions
- To detail a way forward towards the visible integration of these climate response objectives and actions into all dimensions of the IDP - Strategic Objectives and Focus Areas; Sector plans, Departmental plans, budgets and KPIs



Agenda

Draft an agenda based on the workshop sessions outlined below, and send this out with your workshop invitation. The draft agenda presented here is a guide and you should adapt and change it as suits your local situation. The material to be covered in this workshop is extensive, and a **full day** should be set aside for this.

Session	Time	Item
1	9.00 – 9.30	Welcome and Introduction
2	9.30 – 10.15	Climate Change and municipalities (PPT presentation and discussion)
3	10.00 – 11.00	Understanding local climate impacts and responses <ul style="list-style-type: none">• Presentation of climate projections for the region/area• Participant engagement: experience of extreme weather events and climate change and municipal response
4	11.00 – 11.45	Understanding GHG emissions and energy for development <ul style="list-style-type: none">• Presentation of GHG emissions and energy development analysis• Participant engagement: key energy and emissions issues and municipal responses
5	11.45 – 12.15	Developing a set of climate objectives, or elements of a climate response vision
	12.15 – 13.00	lunch
6	13.00 – 14.15	Sector plans and priority actions Identify key priority actions for each sector to take forward
7	14.15 – 15.00	Way forward, feedback and close Key steps to bring climate response objectives into IDP process (outputs and time frames and responsible persons) Thanks and closure

Session guidance notes

Session 1. Welcome and Introduction

- Welcome all and outline the aims of the workshop.
- Explain that in this workshop you will be drawing on their multiple perspectives to develop a municipal response to climate change and key actions to achieve this.
- Outline how the climate response will be integrated into the IDP.

Session 2. Climate change and municipalities

Method: This information could be presented in the form of a power point presentation (PPT), or could be presented in the form of a talk; alternatively an 'expert' may make an input. **Tool 2: Climate Change Municipal Planning presentation**, introduced in Phase 1, can be used here.

3 important points that must be covered:

- The mandate for local government to respond to climate change comes from the Constitution (108 of 1996) in that many of the critical climate change response actions identified in the National Climate Change Response White Paper, fall within local government responsibilities, such as basic service delivery (water, electricity, waste), storm water management, roads maintenance, sanitation, disaster management, human settlements, etc.
- **On adaptation:** climate change is happening and we need to develop resilience.
- **On mitigation:** national government has made national and international commitments to contribute its 'fair share' towards reducing global GHG emissions. In South Africa our **energy sector** is largely responsible for our high emissions per capita levels. While the country must reduce emissions, we must also ensure that the poorest have **fair access to energy** services for development.

Session 3. Understanding local climate impacts and responses (threats and opportunities)

Method: Begin the session with a short input on the climate projections for the region/area. Then move into an exercise/ participant engagement session. This can be done in plenary or in small groups depending on the size of the group.

Group discussion A: Understanding and identifying climate impacts

Draw on existing experience of climate challenges, and facilitate a discussion, by asking the group:

- What extreme weather events or climate changes have they experienced in the past 5 – 15 years (floods, droughts, warming, etc)?
- How did this impact on the municipality and local community (e.g. infrastructure damage, loss of livelihoods, etc. Note: this could also include opportunities, e.g. new crops being planted)?

Use a table format to record the discussion:

Weather event and/or climate change	Direct and indirect impacts
For example: drought between 1985 – 1992	<ul style="list-style-type: none"> • Water shortages • Food shortages from crop failure – malnutrition • Death of livestock
For example: floods December 2008	<ul style="list-style-type: none"> • Bridges and roads washed away • Work stopped, crops washed away

Tool 4: Determining Local Climate Change Impacts support sheet is designed to help you to facilitate this session.

NOTE: Don't present the support sheets to the group - it is always better for people to think through issues themselves, rather than be presented with information - rather use it as a prompt where an issue may have been overlooked.



Group discussion B: Understanding and identifying response action

Once a thorough discussion on impacts has taken place, look to identifying key responses to these by asking participants:

1. How did the municipality respond?

Guide the group/s to consider:

- was the municipality prepared for the event?
- did the municipality have access to information warning of the event?
- did the municipality have the capacity to respond to the event, or was it dependent on support from outside institutions/organisations?
- who were these organisation (provincial or national government, other)?
- who monitors this information today?
- did any planning decisions impact (negatively or positively) on the impact of the event?

2. Brainstorm a range of possible response options that would enable to municipality to be better positioned to manage the impacts.

Record the discussion in the table format below:

Sector	Response options	Comments on vulnerability or adaptive capacity
e.g. Water	<ul style="list-style-type: none">• Stepped tariffs• Water leaks programme	<ul style="list-style-type: none">• Already under stress due to increasing urban population;• Water conservation in times of drought have shown there is an ability to reduce consumption.

Use **Tool 5: Responding to Local Climate Change Impacts support sheet** and **Tool 12: Sector climate change response options** to help you guide and facilitate the discussion.

NOTE: 'hotspots' are identified where vulnerability happens across all three areas: vulnerable groups, sectors and biophysical geographic vulnerability. For example, poor, informal households living in a wetland area subject to flooding may be considered a 'hotspot'.

Group discussion C: Identifying 'hotspots' – particularly vulnerable groups, sectors or biophysical/geographic areas

- on a map of the Municipal area, identify existing vulnerabilities: climate hazards (fires, floods, drought), areas of high poverty, vulnerable environments, other.
- Considering the impacts you have just discussed, will these existing vulnerabilities deepen/improve with climate change; do new vulnerable areas or groups emerge?
- Within each sector, note the most pressing issue relating to the vulnerabilities identified. This should help to guide the Municipality in identifying climate response priorities.



Session 4. Understanding GHG emissions and energy development

Method: Kick start the session by asking participants where energy comes from in their municipality and what it is used for. Follow up this discussion with a short input on the GHG emissions and energy picture for the municipality (based on the GHG emissions and energy analysis) and then move into an exercise/participant engagement session. This can be done in plenary or in small groups depending on the size of the group. **Tool 9: GHG Emissions and Energy Development Analysis Table**, as well as the overview of emissions and energy in Phase I: Analysis, will provide guidance to this discussion.

Group discussion A: Identifying GHG emissions and energy issues

Facilitate a discussion on the key emissions and energy issues, by asking the following guiding questions:

1. Is the overarching municipal emissions contribution above or below the global average?
2. What are the key sectors that contribute to emissions?
3. Is your local economy based on using fossil fuels? Does this matter?
4. What contributes to waste?
5. Are there households in your municipality that still struggle to get enough energy for their use?

Note the points arising out of this discussion under **Key Issues**.

Group discussion B: Identifying local responses to energy and emissions related issues

Now ask the group to describe what would a more ideal situation look like and how to get there. Record this as **Response Options**.

Record the discussions in the following table:

Key Issues	Response options	Key sector or department
List the issues raised in discussion: for example: mid to high income households, although a minority, use the majority of electricity and contribute to GHG emissions	* get a efficient water heating programme under way	* electricity, environment, planning approval

Tool 12: Sector climate change response options support sheet provides a checklist to help you facilitate this session.

Although per capita emissions are relatively high in South Africa, this is largely due to industry and mid-high income residential households. Many poor households remain in energy poverty – i.e. energy uses up a large part of their household budget and/or they do not have access to an affordable, modern source of energy that does not pollute their home, require hours of wood/dung collection, etc. Improving the access of this group of people to energy will alleviate poverty and improve your community's ability to adapt to climate impacts.



Session 5. Developing the Municipal Climate Response Vision and Objectives

Method: plenary discussion

Drawing on the day's work and discussions, develop a climate change response vision (goal) and identify 5 priority objectives to reach this goal.

Your vision should state what the overarching goal of the municipality should be in response to the major issues you have identified in your discussions relating to climate variability and change:

- Managing climate change impacts in a sustainable way
- Reducing existing GHG emissions
- Ensuring low emissions levels from here onward (low carbon development)
- Addressing poverty and inequality.

Next, develop your climate response objectives. These should outline priority response areas that would work to achieve this vision. For ease of integration, develop these within the IDP Priority areas or Strategic Focus Areas (SFAs). It is recommended that you strive to make these objectives SMART (specific, measurable, achievable/assignable, realistic and time bound).

For example:

Municipal IDP priority area or SFA	Priority climate change response OBJECTIVE
Economy	Create a more efficient economy and society through municipal-wide electricity efficiency and green economic development
Environment	Manage scarce water resources and biodiversity in water catchment areas
Social	Build resilient communities with access to basic services, living in settlements located and built to minimise climate hazards
Infrastructure	Infrastructure development plans demonstrate an ability to accommodate a range of projected climate variables
Institution/governance	Develop a cross-cutting, coordinating structure to champion climate change, enhance predictive skills in the municipality and engage stakeholders on an ongoing basis

Session 6. Sector plans and priority actions

Method: There is unlikely to be time to go into a detailed discussion on Sector responses. This session should therefore take place in plenary and involve grouping all the proposed response options into sectors. These will need to be taken up within the Sector planning sessions.

Session 7. Next steps and closure

Method: in plenary, develop the next steps in the integration process and allocate tasks and responsibilities. Key actions to be considered:

- write up of the workshop outcomes into a Climate Change Response Strategy
- planning the steps to ensure the integration of the climate objectives into the SFAs
- set dates for sector/departmental work sessions

Thank participants for their input.



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Sector Climate Change Response Options (mitigation and adaptation)

Objective: this tool will provide each sector and related department with an overview of the climate response options (both for mitigation of climate change and adaptation to the impacts of climate change) that fall within their functional area.

These options chart the broad area of response. Specific projects will emerge from these, for example, the restoration of a specific wetland, or a programme to work with an informal settlement to develop emergency response plans. These will depend on the climate impacts and vulnerabilities affecting your municipality and identified 'hotspots' and priorities. At the stage of project development, more detailed assessment of projects and alternatives should be done. Tool 15: Project Selection Support tool will guide you through this kind of analysis, looking at your municipality's priority issues, the response impact, no regret aspects, cost and time frames.

Sector	Climate response option
WATER SECTOR	<ul style="list-style-type: none"> • Improve monitoring and forecasting systems for floods and droughts – develop links with water research institutes to ensure early preparation for drought or flood years • Preservation of wetlands for current and future flood risk • Water flow monitoring towards improved infrastructure planning and development <p>Demand side:</p> <ul style="list-style-type: none"> • Water tariff structures • Water restrictions: prepare plans to balance the needs of competing users when water availability is reduced (drought years, peak seasons) • Pressure management • Awareness and Education campaigns for water conservation • Encourage use of water conservation technologies such as low flush toilets and low flow showerheads • Changes in agricultural management practices in line with water scarcity (e.g. changes in crop types, dry land farming) • Planning approval to consider current and future water availability • Improve sanitation to curb disease spread

Sector	Climate response option
WATER SECTOR - continued	Supply side: <ul style="list-style-type: none"> • Rainwater harvesting for uses such as toilet flushing, car washing, irrigation • Re-use of grey water or water from sewage treatment • Control of invasive alien vegetation • Reduction of leaks • Response options for peak supply in drought years need further investigation (from cost benefit perspective and development approach): increased storage capacity/widening of dams, trucking of water; desalination, development approvals, etc
ENVIRONMENT / URBAN ECOSYSTEMS	<ul style="list-style-type: none"> • Vulnerability mapping and related management plans (e.g. shoreline management, informal settlement) • Protect and increase existing ecosystems and green spaces for flood risk management, reduction of heat island effect and agriculture and biodiversity support, notably: <ul style="list-style-type: none"> • wetlands • river courses • dunes • land care/erosion prevention • water sheds • Monitor and control alien plants and pests • Monitor biomass used for energy – is it increasing or dwindling? If dwindling, contingency plans for energy provision need to be considered • Increase shore line buffers to protect against increased runoff from more intense storms • GHG emissions data capture and reporting
AIR QUALITY	<ul style="list-style-type: none"> • Monitor and record local and global (GHG) air quality on a continuous basis • Exercise authority in sectors to reduce GHG emissions and use air management approval processes to leverage efficiencies
ELECTRICITY and ENERGY SERVICES	Energy Supply and Electricity Service delivery <ul style="list-style-type: none"> • Pursue 100% electrification, including in informal areas • Explore renewable energy development and procurement through PPAs, expeditious handling of EIA's. Options include wind power and landfill gas to electricity. • Explore free basic alternative energy sources for poor non-electrified households • Work to ensure low income housing is thermally efficient (put in ceilings) • Solar water heater roll-out programmes Regulations / Incentives <ul style="list-style-type: none"> • Solar water heater by-law for all new buildings requiring at least 40% of water heating requirements are from a renewable energy source • Implement thermally efficient housing delivery, e.g. legislate the provision of ceilings in government-delivered housing (ceilings a warmer house in winter; cooler in summer) • Building regulation to ensure efficiency in all new buildings, e.g. require energy efficiency plans for building/development plan approval • Provide incentives for energy efficiency when supplying new connections • Use air management approval processes to leverage efficiencies Behaviour / Awareness <ul style="list-style-type: none"> • Focused behaviour-change campaigns on energy use • Commercial and/or industrial energy forums that provide information and learning exchange on energy efficiency within the sectors





Sector	Climate response option
ELECTRICITY and ENERGY SERVICES - continued	Other <ul style="list-style-type: none"> • Implement efficient appliance programmes (e.g. fridges, kettles, lights) • Smart metering of top electricity consumers for better electricity management • Green procurement to ensure all municipal pumps, motors, lighting is efficient • Retrofit of municipal/public lighting and buildings • Greenhouse gas emissions data capture and reporting • Monitor and record local air quality on a continuous basis
WASTE	<ul style="list-style-type: none"> • Landfill gas capture and conversion to energy to reduce GHG emissions • Recycling and 'buy back centre' development • Ensure proper disposal of waste (rising water tables, flooding, coastal erosion can all impact badly disposed waste sites)
INFRASTRUCTURE, PLANNING and BUILT ENVIRONMENT	<ul style="list-style-type: none"> • Map vulnerable areas (flood lines, etc) and implement development bans in highly vulnerable zones • Implement land use planning and zoning to avoid building and development infrastructure in flood or landslide prone areas • Relocate existing development from areas of high risk • Strengthen building code requirements according to increased risks of flooding, heat waves, intense storms and wind speed on building and infrastructure development projects • Maintain and update drainage systems • Consider permeable pavements, green roofs and rain tanks to increase on-site retention of storm water • Building regulation to ensure efficiency in all new buildings – monitor and enforce and encourage best practise development • Densification of land use through zoning regulations to support high density living and work and mixed use • Development preference given to developments on public transport nodes • Ensure thorough planning reduces incidence of unplanned population and economic growth and ensure contingency for unplanned settlements/growth Coastal Areas: <ul style="list-style-type: none"> • Coastal vulnerability mapping • Shoreline management plans • More stringent set-back lines • Increase shoreline buffers to protect against increased runoff from more intense storms • Research and monitor climate change impacts on fisheries • Relocate existing development from coastal areas at high risk

Sector	Climate response option
TRANSPORT, ROADS and STORM WATER	<ul style="list-style-type: none"> • Road maintenance and storm water drainage maintenance and upgrade plans to cope with increased volumes and storm damage • Effective transport planning and management towards encouraging a shift from private to public transport <ul style="list-style-type: none"> • Roll out of bus rapid transport and school bus systems • Allocate road space to public transport vehicles • Park and ride facilities to encourage private car users to use public transport • Increase cost of private transport such as through road space charges • Support walking and cycling modes, e.g. cycle lanes, etc • Increase government vehicle fleet efficiency
SUSTAINABLE HUMAN SETTLEMENTS	<ul style="list-style-type: none"> • Improve sanitation to inhibit disease spread • Improve standard of social housing (new and retrofit of existing), particularly to include ceilings to improve thermal performance • Work to reduce fire hazardous settlements (too close together) in informal settlements • Disaster risk reduction measures in informal settlements, including improved infrastructure, planning and management • Disaster response improvements for fires/floods in informal settlements • Efficient appliance programmes (fridges, kettles, lights) to reduce energy poverty and reduce GHG emissions • Green space in settlements to absorb intense rain run off and improve sanitation • Avoid settlement in flood prone areas – or work to plan for disaster events
LED and LIVELIHOODS	<ul style="list-style-type: none"> • Assessment of vulnerable livelihoods and sectors dependent on natural resources or carbon intensive sectors • Ongoing research and monitoring of climate change impact on vulnerable livelihoods, e.g. fisheries, agriculture and tourism • Diversification of livelihood strategies (notably non-farm activities to cushion farming based livelihoods) • Reduce dependence on increasingly costly energy sources – improve efficiency across all sectors • Changes in crop types, dry land farming to diversify agricultural activities • Attract low carbon or 'green' economic activities, including renewable energy opportunities • Show visible commitment to sustainable tourism • Consider tourism alternatives where impacts interfere with existing tourism bases such as coasts, snow, etc • Implement recycling to increase landfill life-span and provide jobs • Invest in public transport to increase mobility and improve access to livelihoods • Work with the community on community-based adaptation projects
HEALTH	<ul style="list-style-type: none"> • Improved sanitation to curb disease • Increased awareness on/ preparedness for climate related health threats (vector-borne diseases, heat, air pollution, floods) • Pollution warning system • Interventions to reduce air pollution • Increase staffing and supplies (capacity support) for health facilities • Nutrition programmes where climate impacts affect livelihoods and food security





Sector	Climate response option
FIRE and DISASTER MANAGEMENT	<ul style="list-style-type: none"> • Install Early Warning Systems and develop links with key scientific and sector institutions to improve predictive ability • Increase flood response capacity (predictive skills, plans, training and equipment) • Increase fire fighting capacity (predictive skills, plans, training and equipment, community liaison) • Installations of fire breaks • Develop drought response plans and capacities • Have disaster management plans in place, particularly for informal settlements and vulnerable areas • Work to eradicate unsafe fuels in households • Work to reduce fire-hazardous settlements (too close together) • Encourage local voluntary action for disaster management
COMMUNITY SERVICES	<ul style="list-style-type: none"> • Documenting, developing and sharing information on climate change, vulnerability and adaptation • Working with community based adaptation projects • Encouraging a sense of community – local voluntary action for disaster management • Sharing experiences and lessons, to inform others and future actions and policies.
ADMINISTRATION, FINANCE AND GOVERNANCE	<ul style="list-style-type: none"> • Address procurement to ensure it support efficient resource use and that tender specs, particularly for large infrastructure projects, incorporate the wide range of future climatic conditions • Consider best institutional location of climate change issues, and incorporate climate change within agendas of all structures, from Council to management and operations • Budget allocations must ensure that spending supports development of BOTH new infrastructure development AND maintenance of existing infrastructure.



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Implementation

Sector Plan Climate Response Considerations Review Guide

Objective: This tool directs users to the key climate issues facing their sector and highlights the relevant municipal mandates to tackle these. This tool will be particularly helpful when sectors or departments are developing strategic plans (Phase 2) and when planning and prioritising new, climate responsive, projects and programmes (Phase 3).

Integrated Environmental Programme

- As the foundation for environmental management this would need to identify communities and ecosystems most vulnerable to the impacts of climate change in order to minimise its effect.
- South Africa is substantially affected by invasive alien species in the terrestrial, fresh water and marine environments. These invasive species posed a threat to rich biodiversity and water resources. Predicted climate change will result in invasive biota also distributed in areas currently not invaded by such species.
- Alien species invasion will reduce resilience to climate change by increasing the risk of runaway wild fires and reducing the functionality of natural barriers to extreme weather events.
- The environmental programme should consider the following:
 - Reduce increased risk of wildfire danger
 - Protect and increase existing ecosystems and green spaces
 - Monitor and control alien plants and pests
 - Enhance conditions for street tree survival and growth
 - Protect and conserve watersheds
 - Rehabilitate river banks

Municipal Powers and Functions

Schedules 4 and 5 of the Constitution of South Africa (1996) allocate powers and functions across the three spheres of government. Within the schedules there are several 'functional areas' of government which relate to elements of the environment and its management, including air pollution, beaches and amusement facilities, water and sanitation, and environmental health amongst many others, for which municipalities are assigned responsibility. Thus the Constitution does not specify one function (the environment) – rather it contains several functions which are related to the environment/ environmental management activities.



Key legislation and sector departments

The National Environmental Management Act (NEMA), Act 107 of 1998, provides the overarching legal framework for environmental management in South Africa.



The National Department of Environmental Affairs and the provincial equivalent departments are the main sector departments regulating and supporting municipalities for this function.



Given the integrated nature of this function, other sector departments may also play a role, including the Department of Cooperative Governance and the Department of Water Affairs.



Coastal Management Programme

- Rising sea levels pose challenges for coastal cities and communities. The implications of higher sea levels include damaged buildings close to shore, increased flood potential, and the contamination of the fresh water supply.
- The coastal management programme should consider the following:
 - Coastal vulnerability mapping
 - Shoreline management plans
 - More stringent set-back lines
 - Increasing shoreline buffers to protect against increased runoff from more intense storms
 - Researching and monitoring climate change impacts on fisheries
 - Relocating existing development from coastal areas at high risk
 - Prohibiting building in flood-prone areas



Municipal Powers and Functions

Coastal municipalities are responsible for the environmental protection of the coastline, working in partnership with sector departments. Schedules 4B and 5B of the Constitution of South Africa (1996) assign municipalities' the responsibility for municipal planning, beaches and amusement facilities, cleansing, local tourism, local amenities, public places, building regulations as well as pontoons, ferries, jetties and piers – all of which may relate to the coastal management function.

Municipalities with sufficient capacity may take on extended responsibilities related to coastal management.

Key legislation and sector departments

The Integrated Coastal Management Act (Act 24 of 2008) establishes a system for coastal and estuarine management in South Africa.

The National Department of Environmental Affairs and the provincial equivalent department are the main departments regulating and supporting municipalities for this function.

Air Quality Management Plan (AQMP)

- “Local” emissions are those which affect air quality in an area and have local health and visual impacts. They include nitrogen and sulphur oxides, volatile organic compounds and particulate matter.
- The air quality management programme should consider the following:
 - Pursuing use of cleaner transport fuels
 - Exploring possible vehicle inspection & maintenance mechanisms to reduce engine emissions
 - Exploring leverage for promoting low carbon development through exercising authority in emissions licensing

- Developing an emissions data bank for monitoring and evaluation of global and local emissions. This should articulate well with the national GHG emissions registry and follow international GHG emission protocols (yet need not be very complicated).
- Establishing a comprehensive education and communication strategy for air quality management



Municipal Powers and Functions

Schedule 4B of the Constitution of South Africa (1996) assigns the air pollution function to municipalities.

Key legislation and sector departments

The Air Quality Management Act (Act 39 of 2004) lists the minimum emissions standards and provides the overall legal framework for this function.

The National Department of Environmental Affairs and the provincial equivalent department are the main departments regulating and supporting municipalities for this function.

Spatial Development Framework (SDF)

- Studies show that spatial form impacts on GHG per capita levels, with compact urban development showing less emissions per capita than sprawling development. This is because of transport and built environment efficiencies achieved.
- Climate responsive spatial development is critical to avoid loss of life and assets through climate impacts and extreme weather events. Municipalities may even be liable in the future for losses resulting from 'irresponsible' planning decisions that failed to take climate change variables into account.
- The SDF should consider the following:
 - impacts of climate change on these:
 - Zones (hectares) of sensitive, vulnerable, highly dynamic and stressed ecosystems in the municipal area – by ecosystem type (e.g. wetland, dunes etc.)
 - Identification of neighbourhoods that are vulnerable to climate change
 - Desertification, soil loss, soil acidification or salinisation
 - Ecologically sensitive areas: habitats of endangered species, tidal wetland areas
 - Drought vulnerable areas
 - Flood risk areas or low-lying coastal areas
 - Impact of deforestation and the land use changes that may result from climate change
 - Promotion of higher-density and mixed-use forms of development. Cities can encourage the growth of livable, accessible communities. "Smart growth" planning—a strategy that highlights high-density, mixed-use, transit-oriented development—also has other goals, such as maintaining open space, farmlands, and other natural areas and directing city resources toward existing communities rather than diverting them to new development in outlying areas.

Municipal Powers and Functions

As part of the 5-year Integrated Development Plan, all municipalities are required to develop an SDF. Alignment with the provincial SDF is important as these plans form the basis for land-use and physical development.

Key guides and sector departments

The National Spatial Development Perspective (2006) provides key principles guiding spatial development in South Africa.

In 2010, the Department of Rural Development and Land Reform published draft guidelines for developing SDFs.

The National Department of Rural Development and Land Reform, as well as the Department of Cooperative Governance and the provincial equivalent departments are the main departments regulating and supporting municipalities for this function.



Local Economic Development (LED) Framework and/or SMME Sector Development Plan.

- Sectors and jobs which are dependent on natural resources are more sensitive to climate change than those dependent on manufacturing. Agriculture, water and forestry are the most vulnerable to the impacts of climate change, through decreases in rainfall and the increased frequency of extreme weather events such as flooding, drought and heat waves.
- Climate change also threatens major sectors such as health and tourism.
- The increasing use of carbon taxes and carbon trade barriers as countries strive to meet international obligations will result in carbon intensive industries becoming less and less viable. New areas of economic development need to be nurtured to reduce vulnerability.
- While businesses in climate-sensitive sectors have a direct interest in adaptation, climate risks can undermine the infrastructure, energy supply and transport networks needed for all business operations.
- An LED framework and small, micro and medium enterprise (SMME) plan should consider the following:
 - Vulnerable sectors that require resources for adaptation
 - The sensitivity of economic development plans to climate change. Income flows for rural farmers may be unpredictable, leaving them less able to prepare and cope with climate-related disasters. Agro- or timber processing, retail trade, local transport, domestic services, tourism, and equipment repairs are all examples of non-farm livelihood activities that can diversify income, allowing people to protect themselves against adverse shocks and trends.
 - Industrial and commercial energy efficiency or demand side management mechanisms
 - Relocation of buildings located in hazard-prone areas
 - Day-to-day operations that rely on steady water supplies may need to be redesigned as climate change constrains water availability
 - Supply chains reliant on climate-sensitive geographic areas may have to be diversified.
 - Climate risks may translate into less disposable incomes, while associated health risks may affect the productivity of the workforce.

Municipal Powers and Functions

The Constitution of South Africa (1996); the Local Government White Paper (2006); the Municipal Systems Act (2000) and the Municipal Structures Act (1998) assign municipalities a host of responsibilities which broadly relate to creating an environment conducive to social and economic development. In this context municipalities are tasked with creating an enabling environment for local economic development. Through the provision of basic services and infrastructure municipalities promote local growth and development.

Sector departments

A number of national sector departments may play a role in supporting municipalities with respect to LED. These include the Department of Economic Development, the Department of Tourism, the Department of Environmental Affairs, the Department of Cooperative Governance and the Department of Trade and Industry amongst others. Relevant provincial departments also play a key role.

Agricultural Development Plan

- The potential impact of climate change on food production, agricultural livelihood and food security are some of the biggest concerns in the country as the sector is a key component of the national economy.
- The agricultural development plan should consider:
 - More frequent crop failure from more droughts
 - Decreased chill unit accumulation from fewer frost days
 - Less soil moisture due to declining precipitation and greater evaporation rates
 - Increased incidence of pests due to higher mean temperature or reduced production of key crops from pests and disease



- The frequency and intensity of fire is likely to increase due to increase in temperature and dry spells which will impact on agriculture and forestry plantations. A decrease in rainfall would reduce the area which can support plantations, and the growth rate of the trees. These effects have carry-over effects on the rest of Southern Africa in view of shared catchments and hydrological systems and hence on river flows.
- Does the plan consider changes in agricultural management practices?
 - Short-term adaptation strategies in response to a decrease in rainfall could include over-exploitation of groundwater resources, which could actually exacerbate vulnerability over the longer term
 - Innovative approaches, new technologies and monitoring of the effectiveness of strategies in light of changing circumstances is necessary to make sure that coping and adaptation strategies remain appropriate
 - The use of more intensive farming or diversification of crop production as a result of soil erosion (think about increasing irrigation/fertilizers)
 - Changes in crop types or switching to dry land farming

Municipal Powers and Functions

Municipalities mainly engage in agricultural issues as part of their sector plan development, e.g. LED Strategy, Water Services Development Plan and Environmental Management Plan, where relevant and necessary.

Key guides and sector departments

A number of national sector departments may play a role in supporting municipalities with respect to agriculture. These include the Department of Agriculture, Forestry and Fisheries, the Department of Economic Development, the Department of Tourism, the Department of Environmental Affairs, the Department of Cooperative Governance and the Department of Trade and Industry amongst others. Relevant provincial departments also play a key role.

Local Tourism Plan

- The tourism sector is climate-sensitive and has a direct interest in climate risks. For example, beaches and coastal tourism infrastructure may be damaged due to sea level rise and/or increased intensity and frequency of coastal storms. Spread of vector-borne disease may also negatively impact existing tourism destinations.
- The tourism development plan should consider the following:
 - Promotion of biodiversity/nature-based tourism
 - Compliance with energy, waste and water efficiency measures
 - Partnering with relevant organisations such as Worldwide Fund for Nature (WWF) (sectors such as tourism may be focused on as 'lead' sectors)
 - Special events to promote environmental profiles of the municipality, for example incorporating zero waste, green electricity, efficiency, and recycling
 - Implementing visual renewable energy systems at key locations

Municipal Powers and Functions

Schedule 5B of the Constitution of South Africa (1996) assigns municipalities the responsibility for local tourism. Given the cross-cutting nature of the tourism sector a number of other functions assigned to municipalities (for example beaches and amusement facilities, public places, cleansing and local sports facilities and many other aspects of municipal activity influence this sector. In this context municipalities are tasked with creating an environment which promotes tourism, while ensuring the sustainability of natural and other resources.

Sector departments

A number of national sector departments may play a role in supporting municipalities with respect to tourism. These include the Department of Economic Development, the Department of Tourism, the Department of Environmental Affairs, the Department of Co-operative Governance and the Department of Trade and Industry amongst others. Relevant provincial departments also play a key role.



Water Services Development Plan (WSDP)

- Extreme weather and changes in precipitation will require localities to re-examine water supply, storm water management, and the influx of pollutants into water sources.
- The water services development plan should consider:
 - Ensuring that the impacts of climate change are brought into future water resource projections or trends
 - An increase in the number of intense rainfall events requires thinking about increased leakages, insufficient storage capacity and damage to storm water and sewage infrastructure.
 - A reduction in drinking water supplies is exacerbated by unplanned population growth and unplanned settlements. Are additional water sources needed to match future demand? Are there contingency measures in place?
 - Industrial, domestic and agricultural users are highly dependent on a reliable supply of water. A reduction in rainfall amount or variability, or an increase in evaporation would further strain the already limited amount of water resources and water quality
 - More extreme rainfall may change storm water management requirements: for example, clearing storm water drains, designing sustainable drainage systems and improved maintenance of storm water infrastructure?
 - An increase in damaged infrastructure (dams, sewage systems, etc) because of an increase in the frequency and magnitude of storms will result in the need to improve infrastructure capacities
 - Improved monitoring and forecasting systems for floods and storms is likely to be more cost effective than paying for the damage from flooding.
 - Early warning systems to be introduced
 - Introduction of green roofs and permeable pavements or surfaces to increase on-site retention of storm water
 - Design of storm or flood resilient infrastructure and buildings
 - Saltwater intrusion into groundwater and coastal wetlands due to sea level rise
 - Rehabilitation of natural flood barriers, notably wetlands and river courses
 - A water conservation programme in anticipation of changing drought frequencies. Has the municipality considered water restrictions? This requires plans to balance the needs of competing users when water availability is reduced.

Municipal Powers and Functions

Schedule 4B of the Constitution of South Africa (1996) assigns municipalities the responsibility for water and sanitation services. Municipalities that are water services authorities (WSAs) take overall responsibility for the regulation of this service in their area of authority.

Key legislation and sector departments

The Water Act (Act 36 of 1998) provides the overarching legal framework for water services in South Africa.

The Water Services Framework Strategy (2003) provides the strategic direction for the sector.

A number of national sector departments may play a role in supporting municipalities with respect to water and sanitation. These include the Department of Human Settlements, the Department of Water and Environmental Affairs and the Department of Cooperative Governance amongst others. Relevant provincial departments also play a key role.

Energy Master Plan

- The energy master plan should consider the following:
 - A focus on energy efficiency or demand side management for increased energy needs
 - Steadily reducing dependence on fossil fuels
 - The introduction of cleaner fuels such as natural gas into the current fossil fuel mix where feasible
 - Increased use of renewable energy (solar, wind, wave, etc)
 - Economic development based on efficient resource use
 - Social sustainability considerations - all households having access to safe, affordable and reliable energy sources.

Municipal Powers and Functions

Schedule 4B of the Constitution of South Africa (1996) assigns municipalities the responsibility for electricity and gas reticulation. As part of their Environmental Management Plan, municipalities may also specify their plans for reducing their reliance on fossil fuels, increasing renewable energy usage and minimising electricity consumption.

Key legislation and sector departments

The National Energy Act (Act 34 of 2008), which seeks to ensure that South Africa has access to a diverse range of energy resources which are sustainable and affordable, provides the overarching legal framework for the energy sector.

A number of national sector departments may play a role in supporting municipalities with respect to energy. These include the Department of Energy, the Department of Economic Development, the Department of Environmental Affairs, the Department of Cooperative Governance and the Department of Trade and Industry amongst others. Relevant provincial departments also play a key role and the National Energy Regulator of South Africa is also an important player in this sector.

Integrated Waste Management Plan (IWMP)

- The IWMP should consider the following:
 - Reduction, re-use and recycling of waste
 - Demand Side Management (DSM) activities and waste recycling to reduce landfill related methane emissions
 - Correct disposal waste to improve emissions
 - Capture of methane from landfill sites

Municipal Powers and Functions

Schedule 5B of the Constitution of South Africa (1996) assigns municipalities the responsibility for refuse removal, refuse dumps and solid waste disposal as well as cleansing. Local government is primarily responsible for the collection and the disposal of domestic waste. Municipalities also regulate waste management through the drafting and enforcement of by-laws.

Municipalities are legally required to develop Integrated Waste Management Plans (IWMPs), which provide strategic direction for waste management in municipalities and identifies the resources needed to achieve their goals.

Key legislation and sector departments

The National Waste Act (Act 59 of 2008), provides the overarching legal framework for waste management in South Africa.

The National Waste Management Strategy of 2010 presents a long-term plan for the sector and stipulates the goals and objectives of the country with respect to waste management. It also identifies roles and responsibilities for various stakeholders in achieving this vision.

A number of national sector departments may play a role in supporting municipalities with respect to waste management. These include the Department of Environmental Affairs, the Department of Economic Development, the Department of Tourism, the Department of Cooperative Governance and the Department of Trade and Industry amongst others. Relevant provincial departments also play a key role.

Integrated Transport Plan (ITP)

- The ITP should consider the following
 - Establishing an efficient public transport system (a system that is fast, frequent, reliable, safe and accessible) and moving to cleaner alternatives to current transport fuels
 - Discouraging inefficient private vehicle use through congestion charges or other means
 - Encouraging the use of unleaded gasoline and more efficient cars





- Implementing focused behaviour change programmes
- Maximising the use of bicycle and pedestrian transport
- Compact city planning, which reduces the need for multiple and long trips



Municipal Powers and Functions

Schedule 4B of the Constitution of South Africa (1996) assigns municipalities the responsibility for municipal public transport, as well as roads.



Many larger municipalities have developed Integrated Transport Plans in order to ensure the efficient and effective management of urban transport systems. Twelve cities were identified by the Department of Transport to be part of the Integrated Rapid Transport initiative to prepare Integrated Transport Plans.



Key legislation and sector departments

The National Land Transport Act (Act 5 of 2009), provides the overarching legal framework for land transportation in South Africa.



A number of national sector departments may play a role in supporting municipalities with respect to transport. These include the Department of Transport, the Department of Environmental Affairs, the Department of Economic Development, the Department of Tourism, the Department of Cooperative Governance and the Department of Trade and Industry amongst others. Relevant provincial departments further support municipalities, while the South African National Roads Agency Limited (SANRAL) and the National Roads Agency also play a key role.

Sustainable Human Settlement Plan

- The increase in temperature increases the risk of fire which is currently a major threat to informal settlements and has the potential to cause significant damage to livelihoods. Flooding is also a risk as many informal areas form in ecologically sensitive areas that have specifically been excluded from formal development.
- The sustainable human settlement plan should consider the following:
 - Altering any zoning for new housing projects in areas at risk of future sea level rise and coastal flooding to avoid future flood damage
 - Developing early warning systems for communities in flood or fire risk areas
 - Access to safe energy sources to avoid risk of fire from paraffin lamps, candles, etc.
 - Using indicators such as green space per settlement and contaminated land per settlement
 - Promoting the new energy efficient regulations for efficient or passive solar designed housing construction via: raising awareness of builders, architects and developers around the new regulations and best practice

Municipal Powers and Functions

In terms of legislation, housing is largely a provincial and national function; however many municipalities play a role in the delivery of housing. The term Human Settlements is much broader and relates to a number of functions performed by municipalities, such as basic service delivery, municipal public transport and community services and facilities, amongst others.

Key legislation and sector departments

There are a number of key legislative documents governing this sector, including the Housing Act (Act 107 of 1997), the Social Housing Act (Act 16 of 2008), the Rental Housing Act (Act 50 of 1999), as well as the National Housing Code of 2009.

Given the integrated and cross-cutting nature of human settlements, support to municipalities comes from various national departments including the Department of Human Settlements, the Department of Cooperative Governance, the Department of Transport, the Department of Environmental Affairs and Department of Economic Development, amongst others. Relevant provincial departments are also key role players. Various agencies such as the Housing Development Agency also play a role.



Community Services Plan

- A community services plan needs to support community and household initiatives to reduce vulnerability and risk and bring down GHG emissions.
- The plan should consider the following:
 - Making information available on climate change, vulnerability and adaptation. This would include information about hydro-meteorological conditions, growing seasons, agricultural yields, local disease patterns, and pest outbreaks which should be collected and used to inform broader adaptation related policies and programmes.
 - Translating knowledge and decisions on climate change response into action that can be undertaken by individuals, households and other collectivities.
 - Sharing experiences and lessons learned: Communities are an important repository of experiences and lessons learned. These must be drawn upon to inform future actions – and policies that support actions.
 - Encouraging a sense of community - local voluntary commitment for disaster management.

Municipal Powers and Functions

While there is no standard definition of Community Services, Schedules 4 and 5 of the Constitution (1996) makes reference to a host of municipal functions, which could be grouped under Community Services:

- Beaches and amusement facilities
- Local amenities
- Local sports facilities
- Municipal parks and recreation
- Public places
- Cemeteries and crematoria
- Child care facilities
- Libraries

Essentially municipalities are responsible for a combination of direct service provision functions (parks, for example), regulation (child care) and management of partnerships with civil society (sports and recreation facilities, for example), with respect to Community Services.

Key legislation and sector departments

There is no single piece of legislation governing this but the Municipal Structures Act (1998) makes a distinction between the roles of districts and local municipalities with respect to the above.

The national Department of Cooperative Governance as well as provincial departments of local government are the main regulators of community services in municipalities.



Poverty Alleviation Plan

- Poverty is an important determinant of vulnerability to climate change. Lower-income groups are hit hardest by the combination of greater exposure to climate hazards (e.g. those living in makeshift housing on unsafe and/or remote sites), less capacity to cope and adapt (e.g. lack of assets and insurance), less state provision to help them cope and less legal protection.
- There are strong complementarities between reducing poverty and reducing vulnerability – in part because poverty reduction involves better provision of infrastructure and services, and because higher incomes increase the adaptive capacity of households.
- The plan should consider:
 - Declining livelihood opportunities in the agricultural sectors and fisheries (diversification of livelihood strategies)
 - An increase in fires and flooding in informal settlements due to their risk-prone locations (disaster risk reduction measures in informal settlements, including improved infrastructure, planning and management)
 - Weakening of food security, especially in poor communities that depend on subsistence farming
 - Ongoing work in basic services provision

Municipal Powers and Functions

The Constitution of South Africa (1996); the Local Government White Paper (2006); the Municipal Systems Act (2000) and the Municipal Structures Act (1998) assign municipalities a host of responsibilities which broadly relate to poverty alleviation. In this context municipalities are tasked with creating an environment which facilitates economic opportunities, the provision of free basic services to the poor and investment in infrastructure. Grants such as the Municipal Infrastructure Grant specifically support the provision of free basic services.

Key sector departments

A number of national sector departments may play a role in supporting municipalities with respect to poverty alleviation. These include the Department of Economic Development, the Department of Tourism, the Department of Environmental Affairs, the Department of Cooperative Governance and the Department of Trade and Industry amongst others. Relevant provincial departments also play a key role.

Disaster Management Plan

- The Disaster Management Plan should consider:
 - Resources for increasing costs of emergency planning and services resulting from climate change, including the costs of emergency services, road and transport infrastructure for emergency evacuation and the preparation of an evacuation plan.
 - Establish an early warning systems
 - Changes to zoning and building standards to avoid disaster, notably flood-proof buildings in vulnerable locations
 - Construction of physical barriers and drainage channels in areas vulnerable to flash-flooding
 - Increasing rates of rural-urban migration which may result in the expansion of unregulated settlements in hazard-prone areas such as flood plains and municipalities must be responsive to these new risk areas
 - The increase in temperature and stronger winds increase the fire risk which is currently a major threat to informal settlements and has the potential to cause substantial damage to livelihoods. Increase fire fighting capacity and early warning systems. Strong community liaison is needed to work to develop informal areas that are more disaster proof – such as larger distances between houses to facilitate fire-fighting.
 - Landslides can be curtailed through planting of vegetation cover and zoning to avoid development in risk areas; relief operations must be considered and insurance.



Municipal Powers and Functions

As part of the five year Integrated Development Plan, all municipalities are expected to develop a Disaster Management Plan.

Key guides and sector departments

The National Disaster Management Act (Act 57 of 2002) provides the overarching legal framework for disaster management in South Africa.

The Department of Cooperative Governance and the Department of Environmental Affairs as well as the provincial equivalent departments are the main departments regulating and supporting municipalities with respect to this function.

Health Policy

- As temperatures rise, ground-level ozone and smog levels increase and can exacerbate respiratory illnesses, such as asthma and bronchitis. Cities and localities face economic costs from increased air pollution—from such things as additional hospital admissions, absenteeism from work and school days, higher incidence of respiratory and heat-related illnesses and premature deaths.
- There are several important insect-carried diseases of humans and livestock which respond to climatic conditions. For example a small increase in temperature will allow malaria to spread into areas which are currently malaria-free, and will increase its severity in areas where it already occurs.
- Reduced agricultural potential in some areas could lead to reduced yields and subsequently poor nutrition, increasing the burden of diseases such as tuberculosis.
- Physical impacts from heat stress could also increase.
- A health plan and programme should consider:
 - Interventions to reduce air pollution
 - A pollution warning system
 - Improvement of emergency response systems
 - Increase support for health facilities
 - A heat alert system warning of heat stress impacting the young and elderly

Municipal Powers and Functions

Schedule 4B of the Constitution of South Africa (1996) assign municipalities the municipal health services function. Many municipalities also provide primary healthcare services (for example day hospitals and clinics). In this context municipalities are tasked with creating an environment which is healthy and safe.

Key guides and sector departments

The National Health Act (Act 61 of 2003) provides the overarching legal framework for the health sector.

A number of national sector departments may play a role in supporting municipalities with respect to poverty alleviation. These include the Department of Health, the Department of Human Settlements, the Department of Water and Environmental Affairs and the Department of Cooperative Governance. Relevant provincial departments also play a key role.

TOOL 14



Preparation



Analysis



Strategy



Projects



Integration
Implementation



Climate Change Response Action Plan Template

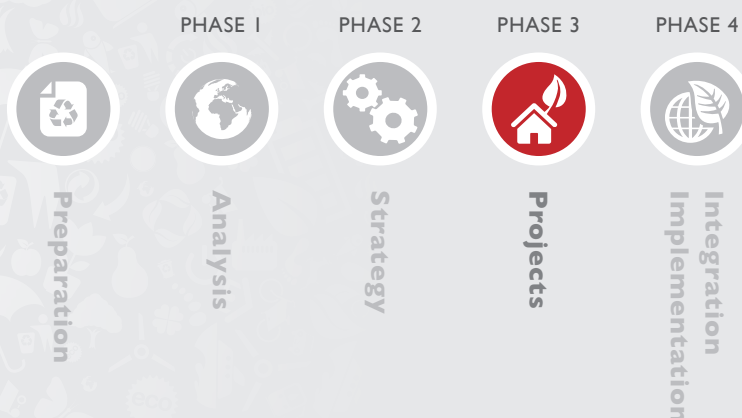
Municipal Climate Change Objectives		
goal		
Obj 1		
Obj 2		
Obj 3		
Obj 4		
Obj 5		

Relevant Sector Plan objectives relating to climate change		
Baseline		Target

Objective 1												
Project Information			Project status			Budget			Departmental target			Directorate scorecard
Action/ Project	sub-task/project	Indicator of success	Dept Resp	Project Manager	Start date	end date	comments	2011-2012	2012-13	2013-14	Date	Number
1.1												
1.2												
1.3												
Objective 2												
Project Information			Project status			Budget			Departmental target			Directorate scorecard
Action/ Project	sub-task/project	Indicator of success	Dept Resp	Project Manager	Start date	end date	comments	2011-2012	2012-13	2013-14	Date	Number
1.1												
1.2												
1.3												
Objective 3												
Project Information			Project status			Budget			Departmental target			Directorate scorecard
Action/ Project	sub-task/project	Indicator of success	Dept Resp	Project Manager	Start date	end date	comments	2011-2012	2012-13	2013-14	Date	Number
1.1												
1.2												
1.3												
Objective 4												
Project Information			Project status			Budget			Departmental target			Directorate scorecard
Action/ Project	sub-task/project	Indicator of success	Dept Resp	Project Manager	Start date	end date	comments	2011-2012	2012-13	2013-14	Date	Number
1.1												
1.2												
1.3												
Objective 5												
Project Information			Project status			Budget			Departmental target			Directorate scorecard
Action/ Project	sub-task/project	Indicator of success	Dept Resp	Project Manager	Start date	end date	comments	2011-2012	2012-13	2013-14	Date	Number
1.1												
1.2												
1.3												
Total budget												



TOOL 15



Project Selection Support Tool

Objective: This tool is designed to assist you in prioritising response actions and selecting response projects.

Introduction: It is important to evaluate response options using a range of criteria and methods so that municipal priorities and factors, such as equity, sustainability or social acceptance are considered, rather than just a single factor, for example, cost. This tool introduces 3 methods for project evaluation:

- **Prioritisation criteria:** A set of criteria and related questions are provided to assist you in identifying the strengths and weaknesses of response options under consideration;
- **Multi-criterion matrix:** an illustrative example of a multi-criteria analysis 'tool' is provided. Using this approach will assist prioritising actions against a set of criteria;
- **Cost-benefit analysis:** the Cost-Benefit analysis (CBA) approach is introduced and guidance to further information on this methodology. CBA is particularly important where different approaches to addressing an issue are under consideration, for example, detailed water conservation programme and water restrictions/allocations plan development, trucking water into an area during peak season in drought conditions, or building a desalination plant.

The level of detail you go into in your prioritisation process will relate to the level of competing priorities, risk and investment proposed.

Prioritisation criteria

Criteria to consider in prioritising options for action

Effectiveness

Vulnerability hot spot: Does the action target identified vulnerability hot spots that require immediate attention?

Priorities: Will the measure contribute to municipal development priorities?

Robustness: How robust is the specific action under a range of possible future climate change scenarios? Is the action capable of dealing with changes in extreme weather events (e.g. increase in frequency and magnitude)? Can the action easily be adjusted to changing climate conditions?

No-regrets measures: Will the action provide benefits in current and future climate conditions even if no climate change occurs? (For example, expanded tree planting not only reduces air pollution and storm water run-off but also improves urban aesthetics and reduces ambient temperatures on hot summer days by providing shade).



Economic Cost of the adaptation action
Cost Benefit Analysis: do the benefits (social, environmental and economic) outweigh the cost of the action for the municipality? Which of the various options presents the greatest net benefit?
<i>Cost-benefit is being increasingly valued as an instrument to assess investment in climate resilience, particularly as it facilitates comparing costs of mitigation and adaptation, costs of inaction with costs of action. This is particularly important for large investment projects. Further information is provided in the box below.</i>
Sustainability and poverty reduction
Does the action create any new vulnerability or limit the adaptive capacity of other communities and future generations and ecosystems?
Does the action support the growth of local jobs?
Does the action support the development of service infrastructure?
What is the carbon impact of the action?
Implementation
Institutional capacities: Does the action fall into the existing powers and functions of the local government sphere? Does the specific action require the cooperation of other government levels (e.g. provincial or national) or the partnership of the private sector? Is the local government capacity to implement adaptation actions adequate in terms of budgetary and personnel constraints? Are the barriers to implementation strong or weak?
Windows of opportunity: Do windows of opportunities for the implementation of the action exist (e.g. updating the highway system)?
Timeframes: visible 'wins' are important, but these will need to be balanced with those interventions that have long lead in times, such as investing in the public transport system.

b. Multi-criteria matrix

A useful method to help prioritise projects is the Multi-criteria analysis. This allows for the comparison of climate response options using monetary and non-monetary values. Its consideration of many factors makes it a useful tool for aiding decision-making.

Illustrative example for climate response measures across some sectors (note that prioritisation will not be the same for all municipalities):

Response action/project	Vulnerability hot spot/key issue?	No regret	Cost	Benefit	Sustainability, environment impact	Jobs, services, livelihoods	Implementation capacity	Time frame	Window of opportunity	Social acceptability	Priority rating: low, medium, high
WATER											
Water restriction/allocation plans	yes	yes	low	high	positive	medium	good	short	no	low	high
Pressure management	Yes	yes	medium	high	positive	medium	medium	medium	no	high	high
Preservation/construction of wetlands for flood risk management	Yes	yes	medium	high	positive	positive	medium	medium	yes	medium	high
Reduction of leaks	Yes	yes	medium	high	positive	positive	low	medium	yes	high	high
Increase storage capacity/widening of dams	yes	no	high	unclear	unclear	medium	low	long	no	medium	Unclear – further research needed
ELECTRICITY AND ENERGY											
Electrification of all households	yes	yes	high	high	positive	positive	medium	medium	yes	high	Medium to high
SWH roll out programmes	yes	yes	Medium (pvt)	high	positive	positive	medium	medium	yes	medium	Medium to high
Landfill gas to electricity	yes	no	High (pvt)	medium	positive	low	medium	longer	no	high	Low to medium



c. Cost-Benefit Analysis: an introduction

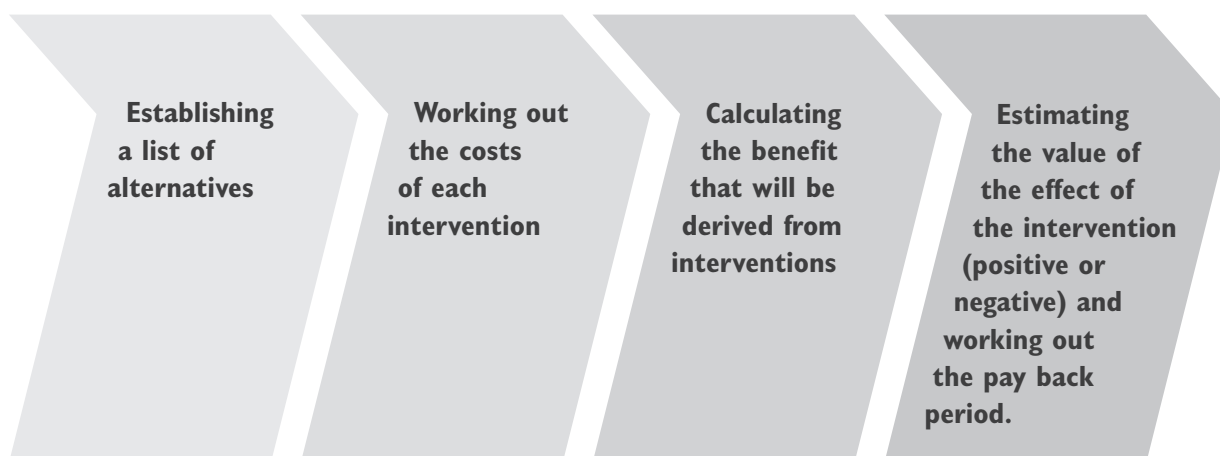
Cost-Benefit analysis, or CBA, refers to a systematic process of comparing benefits and costs to see if an investment is sound, and to evaluate projects against alternatives. It is being explored in the field of climate response as studies are beginning to show that investment in disaster prevention has a 'better return' than meeting the costs of disaster impacts, through the avoided costs of impacts on life, property, the economy and the environment.



There is a strong tendency to rely on post-disaster management: 90% of donor funding is directed to disaster relief and reconstruction and only 10% is allocated for disaster risk management (Mechler, R). As evidence and experience is gathered on the extent of costs and benefits of preventive disaster risk management measures, this is likely to begin to transform. This work lies at the heart of the climate response challenge.



Steps in a Cost-Benefit Analysis



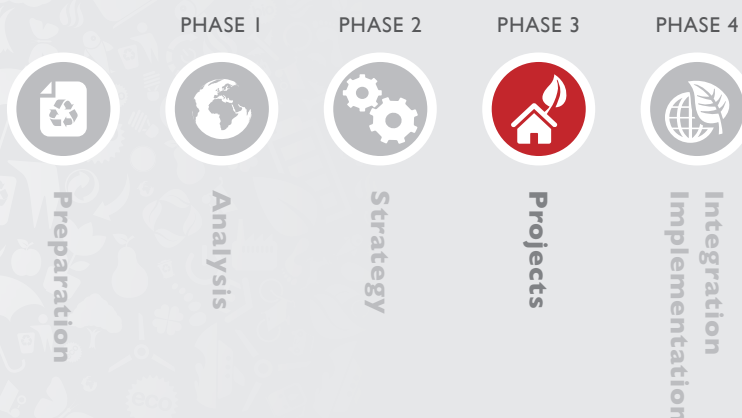
CBA is an important approach to begin to bring into prioritising response options. It is, however, a fairly complex process given that while costs are usually once-off, benefits are realised over time (so that they must be discounted into today's terms) and are experienced differently across different groups. The value of the benefit is often difficult to put into monetary terms. In disaster risk management this is particularly difficult as the benefits are mostly the avoided damages and losses, and include human life and environmental services – all extremely hard to evaluate and put into monetary terms.

Pioneering CBA work on climate resilient interventions in Asian cities, emphasises that hugely detailed CBA studies are not necessary for community projects or public investment decisions, and that the value of a CBA often lies in the process (not the outcome alone). A CBA requires the engagement of a number of stakeholders and diverse perspectives and this process of shared learning is enormously valuable in assessing uncertainties, understanding impacts and integrating the process of climate response.

Detailed CBA methodology direction to assist you can be found in the following sources:

Mechler, R. and The Risk to Resilience Study Team, (2008): The Cost-Benefit Analysis Methodology, From Risk to Resilience Working Paper No. 1, eds. Moench, M., Caspari, E. & A. Pokhrel, ISET, ISET-Nepal and ProVenton, Kathmandu, Nepal, 32 pp. http://www.i-s-e-t.org/images/pdfs/WP_1_lowres.pdf

DEAT (2004) Cost Benefit Analysis, Integrated Environmental Management, Information Series 8, Department of Environmental Affairs and Tourism (DEAT), Pretoria.
<http://www.environment.gov.za/Documents/Publications/2005Jan7/Book3.pdf>



Key Performance Indicator Tool

Objective: When integrating climate change responses into the planning process, it will be necessary to develop key performance indicators (KPIs) which form part of the municipality's performance management system. This allows the municipality to track progress towards meeting its objectives. This tool provides guidance on setting KPIs.

KPIs need to be feasible in the sense that there should be a practical method(s) for data collection. At a broad level, KPIs must:

- **Make sense.** They must make sense and be useful to the municipality responsible for reporting them.
- **Be clear.** KPIs need to be clearly defined so that they are easy to understand. This also facilitates consistent collection between municipalities which allows for comparison which is central to a national indicator set.
- **Be objective.** Indicators developed should not lend themselves to manipulation.
- **Be disaggregated** where appropriate per group, sector or community. While this is important, especially for a local set of indicators, there are limitations to what extent a national set can comply with this characteristic.
- Be easy to convert into unambiguous, measurable and realistic **targets**.

Climate response indicators must be integrated into the strategic scorecard of the municipality, which is linked to the IDP:

Climate change must not be seen as a stand-alone performance area, but rather it is an area of municipal activity which relates directly to all existing performance areas. For example, there are areas of activity related to Technical Services or Infrastructure which are part of the municipality's response to climate change, such as managing water consumption and improving electricity efficiency.

An example of IDP objectives and KPIs related to sustainable urban infrastructure is shown in the table below. These should be used to inform the KPIs which are reported on in the relevant sector plan.


IDP Focus area 4: Sustainable urban infrastructure and services.
4A: Conserve natural resources – water

IDP Objective:	Key Performance Indicator:
Safeguard human health, protect natural aquatic environment & improve & maintain recreational water quality	Percentage compliance with four critical DWA effluent standards (E.coli count, ammonia content, oxygen-demanding substances, total suspended solids)
Sustainable water supply	<ul style="list-style-type: none"> Non-revenue water Percentage drinking water compliance to South African National Standard 241

Indicators should be accompanied by targets and where possible baseline data should be specified. The table below provides a few examples.

Performance Area	Indicator, target and baseline
Electricity efficiency	<ul style="list-style-type: none"> Indicator: Percentage reduction in total electricity consumption Target: Reduce the total electricity consumption by 1 July 2014; to 10% of unconstrained demand Baseline: Electricity use in 2007: 10 278 GWh
Climate change adaptation	<ul style="list-style-type: none"> Indicator: Climate Change Adaptation Plan (CCAP) is developed and approved by Council Target: The CCAP is approved by Council by 1 March 2012 Baseline: A draft CCAP prepared by 30 June 2011
Social housing	<ul style="list-style-type: none"> Indicator: Percentage of pre-2008 social houses retrofitted with insulated ceilings Target: By 2014, 40% of existing pre-2008 social houses will have been retrofitted with insulated ceilings Baseline: 10% of pre-2008 social houses retrofitted with insulated ceilings in 2010 municipal financial year

TOOL 17



Preparation

PHASE 1



Analysis

PHASE 2



Strategy

PHASE 3



Projects

PHASE 4



Integration
Implementation

Local Implementation Case Studies

Objective: This tool provides an overview of some pioneering climate response projects that are underway in South Africa. Case studies can provide useful information for detailed project development planning. These few studies highlight best practice initiatives taking place within municipal key sectors notably water, energy, environment, built environment, infrastructure, transport and livelihoods.

Sector	Case Study
Water management	eThekweni Metro: Rain Water Harvesting Programme City of Cape Town: Water Leakage Reduction in Khayelitsha Emfuleni: Implementation of Pressure Management in Municipal Water Supply Systems
Energy and Electricity	eThekweni Metro: Gas to Electricity Programme Ekurhuleni Metro: Improving Energy Efficiency (EE) in Municipal Buildings
Environment	eThekweni Metro: Buffelsdraai Community Reforestation Project
Livelihoods	City of Joburg: Cosmo City Urban Resilience Project
Transport	Rustenburg Local Municipality: Rapid Transit Initiative
Infrastructure	Thulamela Local Municipality: Stormwater Management Supported by Expanded Public Works Programme
Waste	Overstrand Local Municipality: Recycling at Source Initiative

City of Joburg, Gauteng: Cosmo City - 'climate-proofing' urban communities

What	Cosmo City Urban Resilience Project
Where	City of Joburg, Gauteng Province
Why	The City of Joburg envisioned Cosmo City as an example of a "climate-proofed community" through the piloting of renewable and energy efficiency measures, i.e. improving thermal efficiency, promoting water conservation practices and reducing energy consumption
When	Between 2008 and 2010
Who	770 homes
Funding	R15 million from Danish International Development Assistance (DANIDA)

Cosmo City is one of the few mixed-use, inclusionary low-income housing developments in the country to date. A R350 billion housing development, it emerged out of the need to accommodate informal residents of Zevenfontein and Riverbend. It covers an area of approximately 1100 hectares and about 3400 homes have been occupied to date – the development has a target of 5000 homes. The City of Joburg envisioned Cosmo City as an example of a "climate-proofed community" through the piloting of renewable and energy efficiency measures (i.e. improving thermal efficiency, and in turn improving human health and wellbeing, promoting water conservation practices and reducing energy consumption). Funding was sourced from the Danish International Development Assistance (DANIDA) to pursue this vision. After close consultation with ward councillors and the community in selecting the primary beneficiaries for this project, the oldest standing communities were chosen. The project began with a baseline audit to establish current energy and water usage patterns. Workshops were held to inform community members of the interventions that would be implemented.

Between 2008 and 2010, 770 homes were retrofitted (upgraded) with solar water heaters, compact fluorescent lamps (CFLs), roof guttering, tap flow reducers and insulated ceilings. Fruit and indigenous trees were planted on each stand (740 stands in total) and community vegetable gardening was promoted. Local labour was used throughout the project. Ten residents were given six weeks of formal training on plumbing and solar water heater installation. A comprehensive monitoring and evaluation system tracked the project results and community perceptions. The efficiency interventions reduced water and electricity bills for the community and decreased

Cosmo City's carbon footprint by 2.35 tonnes per house annually. A residential coordinating committee was set up for the project to maintain the technology, monitor problems and communicate with the City of Joburg.

More information is available from:

1. Sustainable Energy Africa's (SEA) Sustainable Energy for Environment and Development (SEED) Programme involvement in the project including **SEED Update Volume 2(6)** which can be downloaded from http://www.cityenergy.org.za/files/resources/seed%20updates/SEED%20Update_Ceilings.pdf
2. City officials from the Environmental Department of the City of Joburg.
3. City of Joburg website: http://www.joburg.org.za/index.php?option=com_content&view=article&id=6231&catid=88&Itemid=266



Ekurhuleni Metropolitan Municipality, Gauteng: Leading by example through energy efficiency improvements in municipal buildings



What	Energy efficiency in public buildings
Where	Ekurhuleni Metropolitan Municipality, Gauteng Province
Why	Municipality wanted to lead by example in its response to climate change through upgrading three of its public buildings with energy efficiency measures
When	Retrofit began in 2005 and took six weeks to complete
Funding	ICLEI helped secure a grant from the United States Agency for International Development (USAID)

Ekurhuleni Metropolitan Municipality, in an effort to lead by example with regard to being climate responsive and building resilience against the impacts of climate change, retrofitted its public buildings with energy efficiency measures in 2005. These actions were guided and encouraged by the municipality's Policy on Energy Efficiency in Council Buildings and on Council Premises; by municipal participation in ICLEI's Cities for Climate Protection (CCP) Campaign and by its draft Energy Efficiency Strategy. ICLEI helped secure a grant from the United States Agency for International Development (USAID) to fund the project. The project was led by the municipality's Environment and Tourism Department and supported by the Municipal Infrastructure Department (Electricity directorate), the Roads Department and the Transport and Civil Works Department (Building Maintenance section).

Three public buildings were selected for the retrofit, the Germiston Civic Centre and the EGSC buildings. A preliminary analysis of the buildings' infrastructure, design and plumbing systems helped determine viable retrofit options. Retrofitting began in 2005 and took six months to complete. Interventions included the replacement of conventional incandescent lights with compact fluorescent light bulbs (CFLs), replacement of cool-beam down lighters with light-emitting diode (LED) lights, replacement of urns and kettles with hydroboils, and the installation of geyser and lighting timers. The average percentage of electricity savings derived from all the interventions was

53%; with savings of 75% as a result of the replacement of incandescent light bulbs with CFLs or LEDs. Total electricity savings achieved was 329,000kWh per year, which paid back the project cost (labour and equipment) within 1.2 years. Carbon reductions equalled 308 tonnes per year.

Since installation, no equipment problems or complaints by staff have been encountered. Key lessons learnt from this initiative, were that an interdepartmental and motivated taskforce within the city is integral to the success of a project; that ample time should be allowed during the project planning phase as municipal processes take time; and that energy efficiency retrofitting is a quick way to save energy and money.

More information is available from:

1. 'How to Implement Renewable Energy and Energy Efficiency Options', a publication by Sustainable Energy Africa's (SEA) City Energy Support Unit Programme which can be downloaded from <http://www.cityenergy.org.za/files/resources/implementation/05Lighting.pdf>
2. An ICLEI publication: 'Case Study 92 - Improving energy efficiency in Ekurhuleni' available for download from http://www.iclei.org/fileadmin/user_upload/documents/Global/case_studies/ICLEI_Case_Study_Ekurhuleni_92.pdf



eThekwini Metropolitan Municipality, Kwa-Zulu Natal: Buffelsdraai Community Reforestation Project

What	Community Reforestation Project
Where	eThekwini Municipality, KwaZulu-Natal Province
Why	To create a natural carbon sink, improve catchment management, protect water resources, and uplift the local community.
Who	Nine local communities members were permanently employed to oversee the holding nursery and to plant the seedlings
Funding	The project was funded by Danish International Development Assistance (DANIDA)

The Buffelsdraai Community Reforestation Project planted 62 500 indigenous trees in the buffer zone of the Buffelsdraai regional landfill site to create a natural carbon sink. The project was a joint venture between eThekwini's Environmental Management Department, its Solid Waste Department and the Wild Lands Conservation Trust. Funding was obtained from DANIDA through the Urban Environmental Programme (UEMP). The project aimed to offset carbon emissions from the 2010 FIFA Soccer World Cup, restore biodiversity, improve catchment management, protect water resources, and uplift the local community.

The collection of seeds and propagation of seedlings was conducted by local community members, who were trained as 'treepreneurs'. The seedlings were traded at local 'tree-stores' for goods (groceries, school fees, bicycles, etc). Nine local community members were employed permanently to oversee the holding nursery and to plant the seedlings.

More information is available from:

eThekwini Municipality's website:
http://www.durban.gov.za/City_Services/development_planning_management/environmental_planning_climate_protection/Projects/Pages/Buffelsdraai-Community-Reforestation-Project.aspx



eThekwini Metropolitan Municipality, Kwa-Zulu Natal: Innovative Rainwater Harvesting Initiatives



What	Rainwater harvesting pilot project in selected low-income areas
Where	eThekwini Municipality, KwaZulu-Natal province
Why	The municipality recognised that the free basic water provided to low-income households was not ample for large families
Who	500 rain water tanks were installed in homes and schools
Funding	Prize money from the Vuna awards was used to finance the project

eThekwini recognised that the daily free water quota provided to low-income households was not adequate for large families. In response, the municipality piloted rainwater harvesting in the Inanda, Ntuzuma and KwaMashu areas. Prize money from the Vuna Awards was used to install 500 rainwater tanks, along with gutters and pipes, at houses and schools. The cost was R6 000 per unit. Water collects from the roofs of buildings via gutters and down pipes to store in the tank. A standpipe installed at the bottom of the tank provides access to the water. Water cleanliness can be improved with a 'first flush device' that diverts the initial water flow, containing roof debris, away from the storage tank. A 5000-litre tank requires a roof of 50m² or more.

The project provided training to local contractors, plasterers, builders and community facilitators. Rainwater harvesting reduced demand for potable water by providing households with 3 500 free litres a month. It also reduced the flow of stormwater, relieving pressure on stormwater drains.

More information available from:

1. Delivery Magazine (a periodical for Local Government) features an article: **Harvesting the rain – a water saving initiative at eThekwini municipality in Durban demonstrates how small innovations can benefit the municipality, residents and the environment.** Article can be downloaded from: http://www.sadelivery.co.za/files/back_issues/delivery/Edition10/what%20works%20rain0802.pdf
2. A publication by the eThekwini municipality - **Durban: a climate for change – transforming Africa's future.** Publication can be downloaded from: http://www.durban.gov.za/City_Services/development_planning_management/environmental_planning_climate_protection/Publications/Documents/Durban_A_Climate_For_Change.pdf



eThekwini Metropolitan Municipality, Kwa-Zulu Natal: A pioneering Landfill Gas to Electricity Project

What	Landfill Gas to Electricity Project
Where	eThekwini Municipality, KwaZulu-Natal province
Why	To extract methane from 3 council-owned landfill sites (Mariannhill, La Mercy and Bisasar Road) for electricity generation and sale and in turn substantially reduce greenhouse gas emissions emitted from the landfill sites
When	2007

eThekwini launched Africa's first landfill gas to electricity project in 2007. The project involved the extraction of methane from three council-owned landfill sites (Mariannhill, La Mercy and Bisasar Road) for electricity generation. Methane is a greenhouse gas 25 times more potent than carbon dioxide (CO₂). Landfill site emissions were reduced through flaring, where methane is burnt to produce relatively less damaging CO₂, and through methane-powered electricity generators, which reduces electricity use from coal-fired power stations. The project was registered with the Clean Development Mechanism (CDM) and generates income from 1) the sale of Certified Emissions Reductions (CERs) to the World Bank, and 2) the sale of electricity generated. The project demonstrated the importance of having a guaranteed CER buyer in place. Project drivers included the city's Electricity Department and, importantly, a champion in the city's Cleansing and Solid Waste Department. Good internal communication and buy-in at the highest level (the mayor was directly involved) was a key factor in getting the project implemented.

Electricity generation capacity of 0.5MW, 1MW and 6.5MW was installed at La Mercy, Mariannhill and Bisasar

respectively. La Mercy was later abandoned because the gas generated was not adequate despite initial pumping trial indications. Bisasar, the busiest landfill in Africa, exceeded all expectations. Overall, the project had an estimated payback period of 4 years. It became clear that small landfills (less than 1,000 tonnes of waste per day) are not viable for electricity generation, unless a Renewable Energy Feed-In Tariff is introduced. Landfills that accept more than 3 000 tonnes per day can have a payback period of six years or less, but only if the sale of CERs is included.

More information available from:

1. A publication by the eThekwini municipality - **Durban: a climate for change – transforming Africa's future**. Publication can be downloaded from: http://www.durban.gov.za/City_Services/development_planning_management/environmental_planning_climate_protection/Publications/Documents/Durban_A_Climate_For_Change.pdf
2. City officials from the Electricity Department of eThekwini Municipality



Overstrand Local Municipality, Western Cape: An award-winning recycling programme



What	Waste Management
Where	Overstrand Local Municipality, Western Cape Province

Overstrand Local Municipality, winner of several provincial and national Cleanest Town awards, has a comprehensive waste management programme in place including a host of recycling initiatives. The municipality has established buy-back centres, it facilitates controlled recycling and provides recycling igloos as well bottle banks. It also implements recycling at schools and awareness campaigns. In addition the municipality offers an innovative recycling at the source service for households in selected suburbs. This service was piloted in 2002 in the town of Hermanus and has since expanded to a number of other towns within the municipality. According to the municipality's waste management website, the system works in the following manner: exiting staff were trained to undertake this programme; existing equipment used to deliver municipal waste collection service was modified and adapted so that a two bag collection service could be utilised; each participating house receives a clear plastic bag (made from recycled plastic) free of charge in exchange for a full bag of mixed recyclables which they place on the curb for collection by the municipality on 'recycling day'. Publicity and information brochures distributed at the commencement of the project included a fridge magnet, handed out with the first free recycling bag to each residence in the participating areas. The municipality carries the cost of the clear recycling bags. The mixed

recyclables are taken to Walker Bay Recycling for sorting, which also serves as a job-creating opportunity. Additional recycling bags can be obtained free of charge from the municipal offices (Overstrand Local Municipality website, 2011).

In its Integrated Waste Management Plan (IWMP) (2009), the municipality estimates that 33% of the available recoverable waste materials can be realistically recovered through separation at source recycling, accounting for 14% of the total waste stream. This is in the context of public awareness raising and education programmes which it suggests needs to be comprehensive in order to be effective.

More information is available from:

1. Overstrand Local Municipality (2009). Integrated Waste Management Plan. Western Cape, South Africa. Publication can be downloaded from: http://www.overstrand.gov.za/index.php?option=com_docman&task=doc_details&gid=200&Itemid=159
2. Overstrand Local Municipality waste management website: http://waste.overstrand.gov.za/index.php?option=com_content&task=view&id=23&Itemid=71



Landmark Water Pressure Management Interventions in Khayelitsha, Cape Town and Emfuleni, Gauteng

What	Water Pressure Management Projects
Where	Khayelitsha, Western Cape Province and Emfuleni, Gauteng Province
Why	To manage substantial water wastage from major leakages in water reticulation system. Installation of pressure control system is the cheapest way to reduce water leakage
When	The Khayelitsha water pressure management project was commissioned in 2001, followed by another project in Mitchell's Plain in 2008. The Emfuleni project was commissioned in 2008.

Aside from in peak water demand periods, South Africa's water supply system tends to operate at pressures significantly higher than required. Water pressure demand management, through installation of a pressure control system, is the cheapest way to reduce leakage. It also extends the lifespan of the water reticulation system and defers the building of new water supply systems. Some of the largest water pressure demand projects in the world were implemented in low-income areas in South Africa. Leakage in these areas was mainly attributed to plumbing fittings damaged by relatively high water pressure.

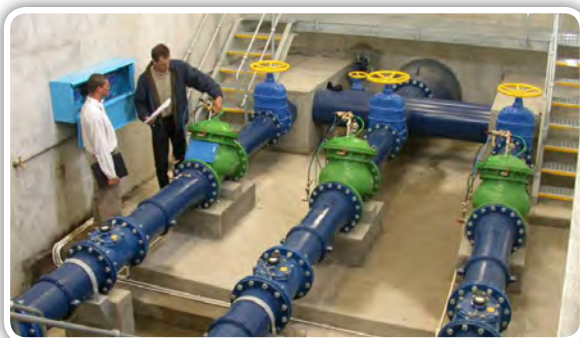
Leakage in Khayelitsha was estimated at almost three-quarters of the water supplied to the area. The result was high levels of non-payment. The Khayelitsha Pressure Management Project, commissioned in 2001, was the largest installation of its type in the world at the time. Local labour was used throughout the project and community support was a key factor in successful implementation. The average daily flow rate was reduced by 40%. Financial savings were estimated at R54 million/year. In 2008, the City of Cape Town implemented another large pressure demand project in Mitchell's Plain. Savings were in the order of 2.4 million m³ per year, with a value of R14 million. Payback for the project was less than six months.

In 2005, Emfuleni Local Municipality's water demand project broke the record for the largest installation of its type in the world, and still holds it. It was estimated that

wastage was in the order of 80% of water supplied. After project implementation, water demand levels were reduced to what it was in 2001, exceeding expectations of the municipality and contractor. A shared-savings performance contract, based on a risk-reward Public Private Partnership, meant that the contractor had to source project funding, as well as implement the new system. Payment was made to the company from savings in municipal water purchases. 80% of the savings accrued to the municipality and the remaining 20% was used as remuneration to the contractor over a period of five years.

More information is available from:

- 1) Mackenzie RS et al (2004). **Leakage reduction through pressure management in Khayelitsha: Two years down the line.** Water SA Vol. 30 (5). Available for download from <http://www.wrc.org.za>
- 2) Mckenzie RS & Wegelin W (2009). Implementation of pressure management in municipal Water supply systems. IWA Water Loss Conference (03/09). Available for download from http://www.miya-water.com/user_files/Data_and_Research/miyas_experts_articles/3_DMAs_Pressure_management/03_Implementation%20of%20pressure%20management%20in%20municipal%20water%20supply%20systems.pdf



Khayelitsha Project (Cape Town)



Emfuleni Project (Gauteng)

Thulamela Local Municipality, Limpopo Province: Storm water management supported by the Expanded Public Works Programme



What	Storm water management
Where	Thulamela Local Municipality, Limpopo Province
Why	To reduce the severity of damage of roads, infrastructure and homes, arising from frequent and extreme flooding events. Illegal dumping and misuse of catch-pits around town and residential areas has resulted in frequent blockages of the town's storm water drainage systems, hampering the function of the drainage system to draining away water during intense flooding events.
When	55 drainage systems were cleaned in August 2011
Funding	The project was funded through the Public Works Programme

Thulamela Local Municipality, situated in the Vhembe District of Limpopo Province, experienced heavy storms and floods in the summers of 2000, 2001 and 2002. The floods resulted in landslides and damage to roads and infrastructure. Without road infrastructure people couldn't cross streams and were unable in instances to get medication and death certificates in order to be able to bury their dead.

Illegal dumping and misuse of catch-pits around the town centre and its residential areas contributed to the damage as storm water networks were unable to function at 100%. Thulamela responded by embarking on a project to clean up the storm drainage system. A comprehensive storm water management study was first undertaken to assess the problem. Findings showed that the storm water system layout design did not take into account the cumulative impact of development on the system as a whole; instead it focused only on the area being developed. Illegal dumping close to storm water outlets caused major maintenance

challenges and in some cases permanent outlet closures. Disposal of cooking waste by hawkers into catch-pits reduced pipe diameters and carrying capacity, significantly hampering optimal functioning of the drainage systems.

The project was funded through the Expanded Public Works Programme (EPWP) and emphasised the employment of people living alongside bridges and culverts. In August 2011, 55 drainage systems were cleaned. The community has also become more aware of the value and importance of maintaining the health of these systems. This in turn strengthens the municipality's adaptive capacity during floods and heavy rains.

More information can be obtained from:

Mr. Simon Madi

Community Services Manager

Thulamela Municipality

Email: madims@thulamela.gov.za



Rustenburg Local Municipality, North West Province: Rapid Transit Initiative

What	Integrated Rapid Public Transport Network including Bus Rapid Transit (BRT) direct and feeder routes. A 40 km BRT route with two main trunk corridors between Phoekeeng and central Rustenburg, and Kanana and central Rustenburg, 37 stations proposed, with more than 500 other stops along direct and feeder routes.
Where	Rustenburg Local Municipality, North West Province
Why	This was triggered by two main factors: the first being the more obvious need to contribute to ensuring South Africa achieves its stated emissions reduction target by 2020 and to ease congestion on Rustenburg roads.
When	Planning and design 2011-2012, construction 2012-2014, system operational in 2015
Who	For an estimated 200 000 residents
Funding	Estimated at R3 billion

Rustenburg is one of the fastest-growing towns in South Africa. It is situated in the middle of North West Province; an hour-and-a-half's drive from Johannesburg. As Rustenburg is home to two of the world's largest platinum mines, the mining industry provides employment to more than half of the town's 500,000 residents. The town also has a rich agricultural area, with many surrounding farms and a vibrant village life.

Commuting to and from work, schools, clinics and visiting family and friends is not easy for residents. They rely primarily on the 21 taxi associations and 2 bus operators for mobility. The town experiences high pedestrian traffic and there is strong support for bicycle use, especially among scholars.

The 2010 FIFA World Cup paved the way for Rustenburg to improve its road infrastructure and public transport systems. Rustenburg was one of the 12 cities chosen as part of national government's Public Transport Strategy and Action Plan of 2007. Over the last 2 years, the municipality has worked closely with the local taxi and bus industries to conduct feasibility studies for a new and improved integrated rapid public transport system for residents. When feasibility planning began in 2010 on the Rustenburg Integrated Rapid Public Transport Network, the technical team considered the environment as a fundamental building block for the type of public transport system to be created. This was triggered by the need to contribute to South Africa's stated emissions reduction target.

The result of this feasibility planning is an implementation plan for a new integrated system to meet the local mobility needs of all the town's residents by 2015. The project, known as the Rustenburg Rapid Transit (RRT) project, was launched in July 2011. The aim is to provide access for up to 200 000 of the town residents to an efficient, safe and affordable transport network within easy walking distance (500m) of homes and places of work by 2015. Public transport trunk routes will ensure that health and education facilities, as well as mining operations, are easily accessible. Smaller feeder services will ensure that public transport reaches into communities and villages throughout the municipality.

This RRT system aims to achieve considerable carbon emissions reduction by replacing an aging taxi fleet with a modern fleet of buses, which comply not only with emissions standards, but also considers the use of alternative fuel sources. In addition, the RRT project will develop a Transport and Climate Change Action Plan for Rustenburg. The RRT project intends to investigate alternative funding mechanisms, such as through Nationally Appropriate Mitigation Actions (NAMAs).

Lessons learnt from the Johannesburg and Cape Town public transport projects helped to create and direct how the project is managed and communicated. The RRT project has a strong focus on communication, stakeholder engagement and skills transfer. The project team consists of a complement of technical specialists with municipal



Executive Mayor alongside Councillor Shimane Seriteng and Boikagong Principal show their support to the Rustenburg Rapid Transport Project. They are joined by the project manager, Pauline Froschauer.

support. Experienced suppliers working on the project are doing so in partnership with local firms to ensure skills transfer. In addition, transport engineering graduates are being groomed to manage the RRT in the future.

The RRT will be the first completely integrated public transport system in the country and the first of its kind in demonstrating the case for integrated rapid public transport networks in smaller cities.

Above information obtained from:

1. Gail Jennings, 2011, **UNDP-GEF Guide to Low-Carbon Transport: Transportation, climate change and the UN Framework Convention on Climate Change**, South African National Department of Transport. Available online: <http://issuu.com/rideloco2/docs/guidetolowcarbontransportcop17>
2. Lewis, J of RRT (2011).

TOOL 18



Is your IDP climate response ‘credible’?

Objective: This tool provides a guide to check that your municipality has achieved a ‘credible’ IDP from a climate response perspective.

The tool is based on the format developed by the Department of Cooperative Governance’s IDP Evaluation Framework, which aims to support effective IDP comment and engagement by Provincial Government MEC’s for Local Government during assessment sessions. Integrating climate response into this framework is under development.

ASSESSMENT CRITERIA	YES/NO COMMENT
1. Spatial Development Analysis and Rationale	
Does the municipality exhibit a good understanding of areas vulnerable to the impacts of climate change and extreme weather events?	
Do the strategies for spatial reconstruction (land release, social and economic infrastructure and commercial developments) show they have factored climate change impacts (extreme weather events, changes, but also changes in economic comparative advantage arising from political agreements around carbon emissions)?	
Does the spatial rationale show consideration of the need for more resource efficient development and decreasing dependence on energy intensive mobility modes?	
2. Service Delivery and Infrastructure Planning	
Water and Sanitation service delivery	
Does the IDP’s vision/mission cover future related water resources and water services issues and does this include consideration of future climate impacts projections?	
Are projected climate impacts on the sector visible within the WSDP and future plans and implementation strategies?	
Do projects in the IDP projects list address the climate challenges identified and water loss/leakage reduction strategies?	



ASSESSMENT CRITERIA	YES/NO COMMENT
Energy and electricity	
Is there a budget and plan to ensure universal access to electricity?	
Are alternative and renewable energy options considered?	
Do projects in the IDP projects list include energy efficiency initiatives, including efficient water heating?	
Roads and Transport	
Is there a budget and plan for an integrated road and transport system (including non-motorised transport), with an emphasis on improving the quality of the public and non-motorised transport available?	
Is there a budget and plan for new roads and operation and maintenance of old roads? Do these plans show a consideration of climate impacts?	
Storm Water Drainage	
Is there a budget and plan that factor in likely climate change impacts, to manage storm water drainage and maintain related infrastructure?	
Waste management	
Does the Integrated Waste Management Plan show plan and budget to reduce waste and associated gas emissions, through waste reduction approaches, gas flaring or waste to energy projects?	
General Infrastructure Planning	
Does the integrated infrastructure investment plan show consideration of the potential impacts of projected climate change and adequate responses?	
3. Local Economic Development	
Does the LED strategy take into account projected future climate change impacts and show consideration of diversification/adaptation of livelihoods where there is a large dependency on climate sensitive livelihoods (such as agriculture, forestry, fishing, carbon intensive industry)?	
Does the LED strategy show consideration of potential 'green' economic opportunities, such as in energy efficiency, solar water heating, seedling nurseries, new crops viable under changing climate conditions, etc?	
Do economic development strategies show adequate consideration of the spatial impacts of climate change (on land values, productive capacities of land)?	
Is the area's competitive and comparative advantage understood? Does this show an understanding of changing climatic conditions (and political climate regime conditions)? Is this exploited when looking at 'green' economic opportunities?	
4. Good Governance	
Has the IDP planning process included steps to integrate climate change response?	
Has the municipality demonstrated leadership on climate change issues, for e.g. energy and water efficient retrofitting of public buildings?	



ASSESSMENT CRITERIA	YES/NO COMMENT
Special groups	
Does the IDP recognise groups particularly vulnerable to the impacts of a changing climate? E.g those dependent on natural systems for livelihood; those living in climate impact vulnerable locations.	
Does the IDP detail what kind of support initiatives will be provided to such groups?	
5. Financial Viability	
Does the financial strategy show consideration of the anticipated costs of climate impacts and risks and the need to invest in climate mitigation and adaptation measures? (this for the longer term – will take some time to develop this)	
6. Institutional Arrangements	
Does the municipality show evidence that it has made an assessment of capacity and skills requirements in order to be able to address climate change? (again, likely longer term)	
Is there evidence that the municipality is boosting climate change related skills levels through training?	
Is there evidence of some form of cooperative alignment across sectors for climate change response management? E.g. committee, standing item on Strategic Management Team agenda (SMT).	

NOTES

Handwriting practice lines consisting of 28 horizontal dotted lines.

NOTES

