GENERAL NOTICE

DEPARTMENT OF ENVIRONMENTAL AFFAIRS

NOTICE_____OF 2010

NATIONAL CLIMATE CHANGE RESPONSE GREEN PAPER 2010

I, Bomo Edith Edna Molewa, Minister of Water and Environmental Affairs, hereby invite members of the public to submit written comments on the National Climate Change Response Green Paper 2010 in the Schedule hereto.

Hard copies are available at Department of Water and Environmental Affairs, Fedsure Building, 315 Pretorius Street, Pretoria, 0001

The electronic copy of the draft green paper can be downloaded at the following website: www.environment.gov.za

Members of the public must submit written comment by no later than 16h00 on 11 February 2011. Comments should be titled as:

National Climate Change Response Green Paper 2010
Ms Joanne Yawitch, Deputy Director-General: Climate Change

Comments may be:

- Hand delivered to the Department of Environmental Affairs at the above address
- Posted to: The Director-General: Department of Environmental Affairs
  Attention: Ms. Joanne Yawitch
  Deputy Director-General: Climate Change
  Private Bag X447
  Pretoria, 0001
- Faxed to: (012) 322 2602; and
- E-mailed to jyawitch@environment.gov.za or dngobeni@environment.gov.za

Any telephonic enquiries in connection with the Second National Communication can be directed to Ms. Joanne Yawitch at (012) 310-3666 or Mr. Peter Lukey at (012) 310 3710.

Comments received after the closing date may not be considered.

MS BOMO EDITH EDNA MOLEWA
MINISTER OF WATER AND ENVIRONMENTAL AFFAIRS

SCHEDULE

THE GOVERNMENT OF THE REPUBLIC OF SOUTH AFRICA

NATIONAL CLIMATE CHANGE RESPONSE GREEN PAPER

TABLE OF CONTENTS

1 INTRODUCTION

South Africa is a mega-diverse country of immense natural beauty that is blessed with an abundance of natural mineral, fossil and renewable resources. South Africa's physical assets are matched only by its people - a truly Rainbow Nation.

However, South Africa is also a water-stressed developing country - still dealing with the legacy of apartheid, the challenge of poverty, and unemployment as well as the gap between rich and poor, low levels of education and the endeavour to deliver basic services to all its people.

South Africa is both a contributor to, and potential victim of, global climate change given that it has an energy-intensive, fossil-fuel powered economy and is also highly vulnerable to the impacts of climate variability and change,

Against this national context, Government accepts the conclusions of the Intergovernmental Panel on Climate Change in its 4th Assessment Report that warming of the climate system is unequivocal and that it is very likely that the increase in anthropogenic greenhouse gas concentrations is responsible for much of this warming trend since the mid twentieth century.

With this, Government regards climate change as one of the greatest threats to sustainable development. Government also believes that climate change, if un-mitigated, also has the potential to undo or undermine many of the positive advances made in meeting South Africa's own development goals and the Millennium Development Goals.

Government also acknowledges that –

- The stabilisation of greenhouse gas concentrations in the atmosphere at a level that prevents dangerous anthropogenic interference with the climate system will require the efficient international implementation of an effective and binding global agreement on, among others, greenhouse gas emission reductions;
- That, together with all the other countries responsible for significant greenhouse gas emissions and considering its developing country status, South Africa, as a responsible global citizen, is committed to reducing its own greenhouse gas emissions in order to successfully facilitate the agreement and implementation of an effective and binding global agreement on, among others, greenhouse gas emission reductions;
- That notwithstanding the impact of any global agreement, South Africa will have to adapt to the unavoidable impacts of climate change through the management of risk and the reduction of vulnerability; and
- That although there will be costs associated with South Africa's greenhouse gas emission reduction efforts, there will also be significant short and long-term social and economic benefits, including improved international competitiveness that will result from a transition to a low carbon economy. Furthermore, that these costs will be far less than the costs of delay and inaction.

With this, Government will continue to engage actively and meaningfully in international climate change negotiations, specifically the United Nations Framework Convention on Climate Change (UNFCCC) negotiations, in order to secure a binding, multi-lateral international agreement that: will effectively limit the average global temperature increase to at least below 2°C above pre-industrial levels; and that is inclusive, fair and effective; has a balance between adaptation and mitigation responses; has an appropriate development - climate response balance; and is based on the recognition that solving the climate problem will only be possible if it is undertaken within the context of developing countries' priority of achieving poverty eradication and promoting development.

Notwithstanding our international efforts, and given the cross-cutting nature of climate change impacts and responses, Government further believes that an effective response to climate change requires national policy in order to ensure a coordinated, coherent, efficient and effective response to the global challenge of climate change.

The policy outlined in this Green Paper serves as the embodiment of the South African Government's commitment to a fair contribution to the stabilisation of global greenhouse gas concentrations in the atmosphere and the protection of the country and its people from the impacts of unavoidable climate change. It presents the Government's vision for an effective climate change response and the long-term transition to a climate resilient and low-carbon economy and society – a vision premised on Government's commitment to sustainable development and a better life for all.

Should multi-lateral international action not effectively limit the average global temperature increase to below at least 2°C above pre-industrial levels, the potential impacts on South Africa in the medium- to long-term are significant and potentially catastrophic. Even under emission scenarios that are more conservative than current international emission trends, it has been predicted that by mid-century the South African coast will warm by around 1-2°C, and the interior by around 2-3°C. After 2050, warming is projected to reach around 3-4°C along the coast, and 6-7°C in the interior. With these kinds of temperature increases, life as we know it will change completely – parts of the country will be much drier; increased evaporation will ensure an overall decrease in water availability significantly affecting human health, agriculture and the environment in general; the increased occurrence and severity of veld and forest fires and especially extreme weather events such as floods and droughts will also have significant impacts; sea-level rise will negatively impact the coast and coastal infrastructure; mass extinctions of endemic plant and animal species will greatly reduce South Africa's biodiversity.

In addition to the increased atmospheric CO_2 concentrations measured at the Global Atmosphere Watch station at Cape Point, some climate change impacts are already being observed to a lesser or greater degree. For example, the sea-level around the South African west coast is already rising by 1.87 mm per year, the south coast by 1.47 mm per year, and the east coast by 2.74 mm per year. It is also well established that observed surface air temperatures over land as well as the number of frost days have changed with statistical significance since 1950 across South Africa and that these changes are consistent with, and have sometimes exceeded, the rate of mean global temperature rise. Increased fire frequency has been observed in the winter rainfall biomes of the fynbos and succulent karoo and significant increases in precipitation since the 1950s' have been observed in the south-west of the country and significant decreases in the northeast, especially in dry years.

Given the significance of these impacts, it is clear that urgent and decisive international and local action is required to achieve a real reduction of greenhouse gases in the atmosphere and in so doing limit the impacts of climate change into the future.

2 THE SOUTH AFRICAN CLIMATE CHANGE RESPONSE OBJECTIVE

South Africa, taking into account equity and the common but differentiated responsibilities and respective capabilities of all nations as well as the inter-generational commitment of the Environmental Right contained in Section 24 the country's Constitution, has the climate change response objective of –

- making a fair contribution to the global effort to achieve the stabilisation of greenhouse gas concentrations in the atmosphere at a level that prevents dangerous anthropogenic interference with the climate system; and
- effectively adapt to and manage unavoidable and potential damaging climate change impacts through interventions that build and sustain South Africa's social, economic and environmental resilience and emergency response capacity.

3 PRINCIPLES

The achievement of South Africa's climate change response objective is guided by the following principles, among the others entrenched in the Constitution, national legislation and a number of relevant international agreements –

- ***The principle of Common but Differentiated Responsibility and Respective Capabilities*** – the implementation of measures aimed at reducing the country's contribution to global climate change

while being mindful of our own unique state of development and vulnerability and our capability to act.

- ***The Precautionary Principle*** – a risk-averse and cautious approach which takes into account the limits of current knowledge about the consequences of decisions and actions.
- ***The Polluter Pays Principle*** – the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment.
- ***A people-centred approach*** – the prioritisation of climate change mitigation and adaptation actions that ensure human dignity, especially considering the special vulnerabilities of the poor and in particular of women, youth and the aged. In this regard the requirement of social equity and economic sustainability while enhancing environmental stewardship are recognised.
- ***Informed participation*** – the enhancement of the understanding of the science of climate change, information streams and technology to ensure citizen participation and action at all levels. The participation of all interested and affected parties must be promoted, and all people must have the opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation. Participation by vulnerable and disadvantaged persons must be ensured.
- ***Inter-generational rights*** – meeting the fundamental human needs of the people by, in part, managing our limited ecological resources responsibly for current and future generations

4 THE SOUTH AFRICAN CLIMATE CHANGE RESPONSE STRATEGY

South Africa will implement the following strategies in order to achieve its climate change response objective –

- Taking a balanced approach to both climate change mitigation and adaptation responses in terms of prioritisation, focus, action and resource allocation.
- Prioritising the development and maintenance of the science-policy interface and knowledge management and dissemination systems to ensure that climate change response decisions are informed by the best available information.
- The short-term prioritisation of adaptation interventions that address immediate threats to the health and well-being of South Africans including interventions in the water, agriculture and health sectors.
- The prioritisation of mitigation interventions that significantly contribute to a peak, plateau and decline emission trajectory where greenhouse gas emissions peak in 2020 to 2025 at 34% and 42% respectively below a business as usual baseline, plateau to 2035 and begin declining in absolute terms from 2036 onwards, in particular, interventions within the energy, transport and industrial sectors.
- The prioritisation of mitigation interventions that have potential positive job creation, poverty alleviation and/or general economic impacts. In particular, interventions that stimulate new industrial activities and those that improve the efficiency and competitive advantage of existing business and industry .In order to accurately identify these sectors and the job creation, industrial development potential of these,work will be done in order that the White Paper provides a clear understanding and prioritisation of these and their potential.
- Prioritising the development of knowledge generation and information management systems that increase our ability to measure and predict climate change and, especially extreme weather events, floods, droughts and forest and veld fires, and their impacts on people and the environment.
- The mainstreaming of climate change response into all national, provincial and local planning regimes.

- The use of incentives and disincentives, including through regulation and the use of economic and fiscal measures to promote behaviour change that would support the transition to a low carbon society and economy.
- Acknowledging that, with the energy intensive nature of the South African economy, the mitigation of greenhouse gases is generally not going to be easy or cheap and that Government must support and facilitate the mitigation plans of, in particular, the energy, transport and industrial sectors.
- The recognition that sustainable development is also climate friendly development and that that; the more sustainable our development path is, the easier it will be to build resilience to climate change impacts.
- Recognise that measures taken by developed countries in their efforts to respond to climate change may have detrimental effects on high carbon and energy intensive economies such as South Africa. These response measures may include trade measures including border tax adjustments, and could be reflected in a reluctance to trade in goods with a high carbon footprint. South Africa's climate change strategy must recognise and address this and also create mechanisms that will give high carbon sectors the support and time to move to lower carbon forms of production.
- Recognise that South Africa's response to climate change will have major implications for both the Southern African region and for Africa as a whole and ensure that national responses are aligned to, support and operate as part of a broader regional response.

5 POLICY APPROACHES AND ACTIONS

The achievement of South Africa's climate change response objective will be brought about by employing the strategies outlined above and, specifically, through the implementation of various policy approaches and actions for key climate change impacted and/or affected sectors as described below.

The first sectors to be described include those that, in the short- to medium-term, are broadly regarded as the key sectors required to implement, primarily, climate change adaptation responses including –

- ***Water*** – water is arguably the primary medium through which climate change impacts will be felt by people, ecosystems and economies;
- ***Agriculture*** – after water, the prognosis for domestic food security and the agricultural industry more broadly, is a major cause for concern; and
- ***Human Health*** – further threats to an already challenging national health profile is also of concern

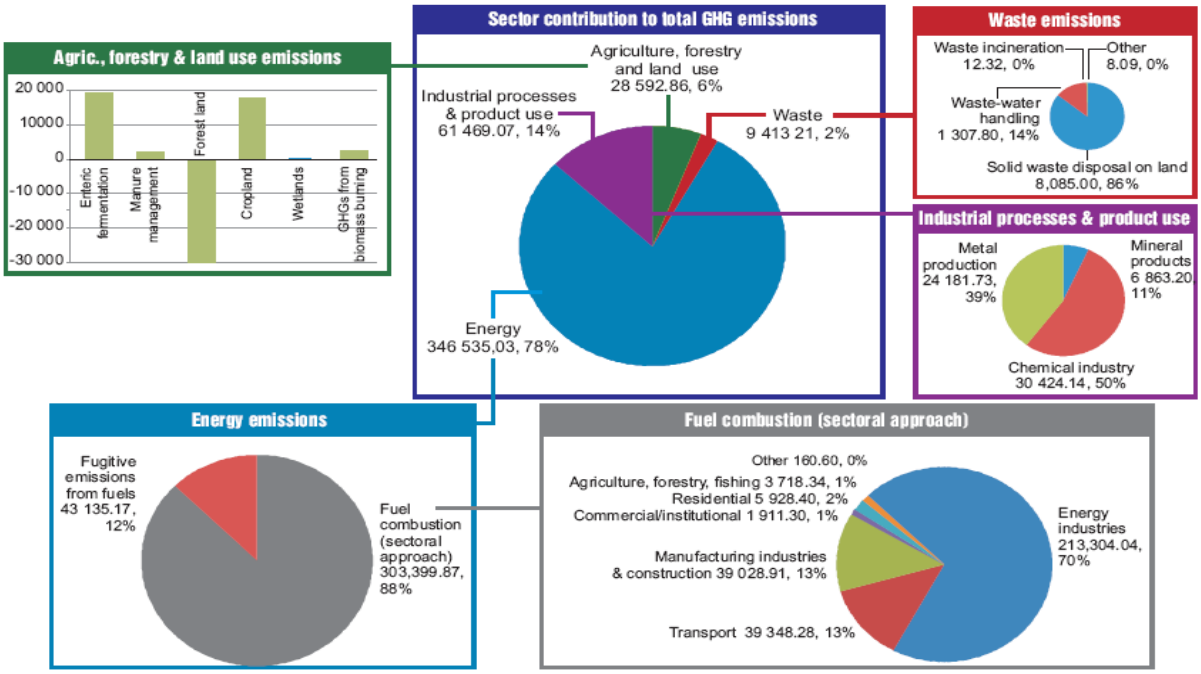

Figure 1: The 2000 South African Greenhouse Gas Emission Profile.

The second set of sectors include those that, informed by South Africa's greenhouse gas emissions profile (see Figure 1) and the mitigation potential of the sectors that are responsible for over 80% of South Africa's greenhouse gas emissions and that are thus the key sectors required to make a significant contribution to South Africa's mitigation efforts including –

- ***Energy*** –This section focuses in particular on the impact that energy efficiency, renewable energy technologies and a nuclear roll out could have on South Africa's greenhouse gas profile;
- ***Industry*** – responsible for a significant contribution to South Africa's total greenhouse gas emissions; and
- ***Transport*** – responsible for over 8% of South Africa's total emissions.

The remaining sectors are also regarded as significant and include –

- ***Disaster Risk Management*** – an urgent short- to medium-term response area and one where proactive long term responses are critical
- ***The Natural resources sectors*** – sectors that require a predominantly adaptation response, including Terrestrial Biodiversity, Marine Biodiversity, Commercial Forestry and Fisheries
- ***Human Society, Livelihoods and Services*** – extremely important sectors in terms of both adaptation and mitigation responses, including: Human Settlements, Infrastructure and the Built Environment; Education; The Banking Sector and Insurance Industry; Rural livelihoods and Waste

For clarity, the following sectoral policy approaches and actions are structured in the following way: (i) firstly, a very brief description of the sector in a climate change context; (ii) bullet points on selected climate change impacts and/or implications for the sector; and (iii) numbered policy approaches and actions for each sector.

5.1 Key Adaptation Sector - Water

Present population growth trends and water use behaviour indicates that South Africa, as a water scarce country, will exceed the limits of its economically usable, land-based water resources by 2050. South Africa has low rainfall and among the lowest rates of run-off in the world. South Africa's water sector faces two major challenges: limited water resources; and the need to ensure that the benefits of those resources are distributed equitably. The adverse impacts of climate change will worsen the existing problem of systemic water shortages and will bring

forward the limits to water resources. Increasingly, South Africa's water security will depend on the extent to which it is able to refine and re-orientate its institutional arrangements to make the most responsible, equitable and effective use of its water, while strengthening environmental management of the natural resource base. Challenges to this from the likely impacts of climate change include:

- Increased variability of storm-flow and dry spells - By ~2050 the frequency of storm-flow events and dry spells is projected to increase over much of the country, especially in the east (over much of the Eastern Cape and KwaZulu-Natal, including some of the most crucial source regions of stream-flows in southern Africa such as the Lesotho highlands), but much less so in the west (much of the Western and Northern Cape). Median annual stream-flow is projected to increase in the east and decrease in the west over the same time period.
- Increased cost - The cost of providing water will rise. It is estimated that just a 10% decline in run-off could double the cost of new water schemes, raising the cost to the fiscus and users of new infrastructure developments. Already the cost of water from South Africa's new big dams may quadruple and result in even higher prices than users are accustomed to paying. In addition, Inter-basin transfer schemes, high levels of assurance of supply to key sectors of the economy and extensive local reticulation networks require extensive pumping, with rising energy costs.
- Rising temperatures - Climate change will bring higher average temperatures. This is projected to lead to more erratic weather, more flooding and greater rainfall variability. Higher temperatures will increase evaporation from dams and rivers, and will reduce run-off on the ground, so that less of the water that falls reaches our rivers and dams.

To address these impacts of climate change on water resources, South Africa will:

5.1.1 Continue to develop and maintain good water management systems and institutions, from village through to national level, to ensure we achieve our equity objectives, and can sustain affordable provision of water to all.

5.1.2 Accelerate the development and/or capacity of effective and accountable catchment management agencies that will: promote equitable and sustainable use of available water resources at local and regional level; strengthen water resources regulation at local and regional level; monitor developments and emerging stresses, and propose effective ways of addressing them. As groundwater grows in strategic importance as a result of increased surface water evaporation, they will have to manage the recharge of aquifers as an integral part of local water management where this is feasible.

5.1.3 Invest in monitoring capabilities across a range of disciplines in order to spot trends and understand them as well as track the efficacy of adaptive strategies.

5.1.4 Accelerate the finalisation and implementation of cost reflective water and water-use pricing including effluent charges.

5.1.5 Optimise the re-use of wastewater. For example, although most coastal towns discharge their effluent to sea after limited treatment through marine outfalls, cities like Cape Town and Durban are now acknowledging that it is significantly more cost-effective to treat and recycle this water for re-use, rather than building new dams.

5.1.6 Increase investments wastewater treatment capacity to meet stipulated norms and standards for waste discharge – to safeguard public health, river health and ecological services and to minimize environmental disasters and treatment costs.

5.1.7 Increase investments in maintenance and renewals to minimize system losses in infrastructure networks. Maintenance deferred is infinitely more expensive, and the country needs the most efficient networks possible to optimize currently available resources.

5.1.8 Develop and implement an household rainwater harvesting incentive programme.

5.1.9 Implement integrated water resource management including protecting and restoring natural systems, increasing conjunctive use of surface and ground water, and learning through adaptive management experiments. Given South Africa inter-basin and trans-boundary transfer schemes integrated water

resource management provides an important governing framework for anticipating and achieving successful adaptation measures across socioeconomic, environmental, and administrative systems. It needs to facilitate effective actions for specific outcomes based on linkages among monitoring, research and management as climate varies and changes. It explicitly addresses information across the nodes of action viz. States, agencies, communities and the private sector.

5.1.10 Explore desalination opportunities, especially those that may be powered by renewable energy resources.

5.1.11 Vigorously enforce compliance with water quality standards to ensure that our water remains fit for use, and that clean water is available for blending to dilute pollutants. Contamination by salts, excessive nutrients, heavy metals and other pollutants must be restricted.

5.1.12 Develop and rollout more effective support mechanisms to ensure that safe drinking water is available to all, with a priority of ensuring that affordable access for all is safeguarded

5.1.13 Measurably improve the management and maintenance of existing systems and strengthen the foundation of professionalism that already exists.

5.1.14 Invest in maintenance and renewals to minimize system losses in infrastructure networks. Maintenance deferred is infinitely more expensive, and the country needs the most efficient networks possible to optimize currently available resources and protect future ones..

5.2 Key Adaptation Sector - Agriculture

The agricultural sector is a key component of the South African national economy. While the direct contributions to GDP and employment are less than 5% and approximately 13% respectively, its full contribution, with multipliers, comprises up to 12% of GDP and 30% of national employment. Potential adverse impacts of climate change on food production, agricultural and subsistence livelihoods, rural nutrition and food security in South Africa are significant policy concerns. Furthermore, agriculture is a relatively significant source of greenhouse gas emissions with enteric fermentation and manure management accounting for over 20 million tons of $CO_{2\text{-eq}}$ emissions in 2000 (approximately 4.6% of total net emissions), with cropland accounting for over 17 million tons of $CO_{2\text{-eq}}$ emissions (approximately 3.7% of total net emissions).

Climate change impacts on the agriculture sector include, among others –

- Agriculture is the largest consumer of water (for irrigation) and is vulnerable to changes in water availability, increased water pollution (particularly from toxic algal or bacterial blooms) and soil erosion linked to more intense rainfall events. Intensively irrigated agriculture uses more than 50% of South Africa's water, and is thus at risk due to both increased evapo-transpiration and competition from urban and other water uses.
- There is sufficient evidence to confidently predict that yields for certain crops will increase in some areas and decrease in others, while certain previously climatically unsuitable areas for specific crops will become suitable and vice-versa. Current maize production areas in the west of the country could become unsuitable for maize production due to increased rainfall variability. Marginal land will become prone to reduced yields and crop failure because of diminished soil productivity and land degradation. Evidence also suggests that small-scale and urban homestead dry-land farmers are most vulnerable, and large-scale irrigated production is least vulnerable to projected climate change, given sufficient water supply for irrigation.
- Secondary and indirect impacts of climate change, such as increases in pest and disease infestations (e.g. changes in the distribution and abundance of vectors and ectoparasites) or enhanced soil erosion, may in specific circumstances become more important than direct or primary impacts, as may tertiary impacts such as losing (or gaining) a competitive edge against other countries for agricultural export commodities, trade protection and barriers.
- Overgrazing, desertification, natural climate variability, and bush encroachment are among the most serious problems facing rangelands. External stressors such as climate change, economic change, shifts in agricultural production and land use may further negatively impact the productivity of these

regions and deepen pre-existing vulnerability. It is also shown that Intensive livestock production systems are vulnerable to increasing demands and costs associated with thermal stress reduction, water use and pressure to contain greenhouse gas emissions.

- Climate change (including increased atmospheric carbon) may complicate the existing problems of bush encroachment and invasive alien species in rangelands and rising atmospheric CO_2 levels may be increasing the cover of shrubs and trees in grassland and savanna with consequent disruption of existing productive activities such as cattle farming.
- International climate change measures have started affecting South Africa's agricultural export products, through shifts in the preferences of consumers, particularly in the EU, away from purchasing of carbon intensive products. The term "food miles" is used to refer to the distance food is transported from the point of production to the point of consumption, and is increasingly being used as a carbon emission label for food products.

In response to these challenges to the agricultural sector, South Africa will –

5.2.1 Assess and investigate appropriate and country specific adaptation options in relation to their costs and associated environmental risk and support the agricultural industry's proactive efforts to exploit new agricultural potential and opportunities (new areas, new crops, etc.) and reduce the impacts on existing potential (crop switches, etc.).

5.2.2 Invest and improve on its research capabilities in relation to investigating and implementing water and nutrient conservation technologies, developing climate resistant crop varieties (crop diversification) and creating a suitable database on greenhouse gases emissions that is specific to the agricultural sector and in line with the National Atmospheric Emission Inventory (see 9.2.3).

5.2.3 Investigate short, medium and long term adaptation scenarios for the agriculture sector. Strategies and policies supporting this sector could usefully be informed by such considerations. Further supporting conservation agriculture, promoting the practise of conservation tillage, and initiating country wide organic farming pilot projects.

5.2.4 Use early warning systems to assist with timely early warnings of adverse weather and the possibility of related pest and disease occurrence whilst also providing up to date information and decision support tools to assess the vulnerability of farmers and inform on-farm management decisions.

5.2.5 Invest in education and awareness programmes in rural areas and link these to agricultural extension activities to enable both subsistence and commercial producers to understand, respond and adapt to the challenges of climate change.

5.3 Key Adaptation Sector - Human Health

Climate change aside, a significant proportion of South Africans and in particular the poor, already have serious and complex health challenges which are compounded by poor living conditions. This constitutes a unique disease complex comprised of the highest global prevalence of Human Immunodeficiency Virus (HIV) and Tuberculosis (TB), complicated by waterborne and chronic respiratory disease, with children being particularly prone. Life expectancy has declined to about 48 in 2005 from about 61 in 1990 and infant mortality has increased from 45 to 55 per 1000 live births in the same period. Underpinning these conditions are the common denominators of malnutrition, poor indoor air quality and the lack of social amenities. Acquired Immune Deficiency Syndrome (AIDS) caused by HIV and TB now account for about 75% of premature-deaths in South Africa. In particular sections of the country the threat of expanding vector-borne diseases like Malaria, Rift Valley Fever and Schistosomiasis are already an ever-present reality, requiring concerted public health initiatives. Any new compounding factor such as unpredictable weather patterns and climate aberrations will have significant impacts on this vulnerable sector of society, further aggravating the depth of poverty, food insecurity and demographic imbalances.

Notwithstanding these challenges, significant climate change is injurious to humans either directly (e.g. through heat stress) or indirectly (by affecting floods, fires, and ecosystem services), leading to changes in the epidemiology or emergence of infectious diseases and famines, and ultimately to displacement and conflict. Impacts in this regard are likely to include –

- The immediate human and ecosystem health impacts from extreme weather and climate variability and associated loss of livelihoods are well researched and recorded but those from climate change are gradual and widespread, their manifestations indirect; and they are not easily quantified, less known and very difficult to respond to.
- Climate change impacts on human health will not be felt in isolation but will increase in magnitude and severity with corresponding impacts on biophysical, economic and social structures. This would exacerbate the difficulty and expense of effective responses, especially for poor and rural communities.
- Water scarcity and its consequences of reduced water quality is another significant threat to human health. Diarrhoeal disease is already the third largest cause of disease in children under the age of 5, 3 million people still have no access to water and over 14 million do not have adequate sanitation. Flooding and droughts, which are common seasonal occurrences, exacerbate this problem, by reducing access to potable water.
- From direct observation, surveillance and models, increases in temperature and change in rainfall patterns in southern Africa are already favouring the range expansion of some vector-borne diseases such as Malaria and altering the range of tick-borne diseases. Increases in sea-surface temperature have been linked to increases in Vibrio cholereae the causative agent of cholera as a result of an increased abundance of phytoplankton and zooplanktons.
- The immediate health impacts of extreme climatic events are well established and documented, but the impacts of gradual changes in temperature and precipitation are less tangibly measurable.
- The immediate health impacts of extreme climatic events with longer term social impacts and loss of livelihoods are well established and documented especially in settlement populations that are directly exposed to the elements and where infrastructure is particularly prone to such events. Such populations are also most vulnerable to the disease complexes.

In response to these challenges, South Africa will –

5.3.1 Reduce the incidence of respiratory diseases by improving air quality through reducing ambient particulate matter (PM) and sulphur dioxide (SO_2) concentrations by legislative and other measures to ensure full compliance with National Ambient Air Quality Standards by 2020. Progress in this regard will be published on the South African Air Quality Information System (www.saaqis.org.za).

5.3.2 Ensure that sound nutritional policies, health care infrastructure and education lie at the heart of all the health adaptation strategies by acknowledging that if a population's nutritional status is robust, individuals will have greater resilience.

5.3.3 Develop and rollout public awareness campaigns on the health risks of high temperatures and appropriate responses including, improved ventilation and avoidance behaviour.

5.3.4 Design and implement "Heat-Health" action plans including plans in respect of emergency medical services, improved climate-sensitive disease surveillance and control, safe water and improved sanitation.

5.3.5 Strengthen information and knowledge of diseases-climate linkage.

5.3.6 Develop a health data capturing system that records data both at spatial and temporal scales and that ensures that information collected can be imported into multiple-risk systems such as the South African Risk and Vulnerability Atlas electronic spatial database system.

5.3.7 Improve the bio safety of the current malaria control strategy.

5.3.8 Strengthen the awareness programme on Malaria and Cholera outbreaks.

5.4 Key Mitigation Sector - Energy

South Africa's economy is heavily dependent on coal. According to the World Energy Council, South African coal resources were estimated to be approximately 34 billion tons, accounting for 95% of African coal reserves and

4% of world reserves. Coal provided an estimated 72% share of the country's total primary energy supply in 2007 and accounts for approximately 85% of electricity generation capacity. Coal is also a major feedstock for the country's synthetic fuel industry. Energy supply is therefore heavily carbon-intensive.

The energy sector is the largest contributor to greenhouse gas emissions, generating over 80% of South Africa's emissions. In 2009, the International Energy Agency listed South Africa as the thirteenth highest emitter of carbon dioxide in the world.

Within South Africa's energy sector, the largest source of emissions is the combustion of fossil fuels. Emission products of fossil fuel combustion processes include CO_2, nitrous oxide (N_2O) and methane (CH_4). The South African economy depends to a large extent on energy production and use, with energy-intensive sectors such as mining, minerals processing, a coal-based electricity and liquid fuel supply sector and energy-intensive beneficiation. Energy industries comprise emissions from fuels combusted by the fuel extraction or energy-producing industries. The main energy industries include electricity and heat production, petroleum refineries and manufacture of solid or liquid fuels. Electricity generation and refineries are the most significant energy industries in South Africa, with electricity production from the national utility company accounting for more than 90% of total electricity generated in the country. The main fuel of power generation is coal, which is abundantly available, accounting for more than 92% of fuel used in electricity generation.

Given the above picture, it is clear that successful climate change mitigation in South Africa must focus on the energy sector. In this regard, energy efficiency measures, the roll out of renewable forms of energy and also a nuclear energy roll out would result in the largest emission reductions. There are however major challenges that must be overcome to realise this, including issues of cost, lead times, and the speed with which low carbon options can be established at a scale that can guarantee the country's base-load needs. A further key concern is the impact of this on job creation and destruction and the resultant effects on incomes. A clearer understanding of the opportunities and constraints of the low carbon transition,, including its costs and benefits over time is essential and further work to assess this must be prioritised and undertaken with a view to incorporating its conclusions in the Climate Change Response White Paper. This work will ensure the alignment of the Climate Policy with inter alia the New Growth Path and also the Industrial Policy Action Plan and will ensure that the key national goal of employment and job creation is central to the climate mitigation strategy.

The historically low cost of electricity in South Africa that resulted from the externalisation of many energy-related costs, such as atmospheric emissions and their associated impacts, means that carbon intensive electricity is cheaper than any other source of power. This has made it difficult for renewable energy and energy efficiency options to compete with coal based power. With the recent announcement of the renewable energy feed-in tariff, as well as the recent implementation of the electricity generation levy on non-renewable electricity, energy from wind, solar, hydro and biomass are becoming increasingly more attractive. There has been a significant amount of activity in the wind and solar industries with tremendous potential for local manufacturing and job creation. Over the longer-term Concentrated Solar Power (CSP) options, with their potential to provide base load, have the potential to be a much larger component of the energy supply mix. CSP alternatives are in their early stages of piloting and improvements in technology as well as expected cost reduction coming from increased market size are expected to improve its competitiveness dramatically over the next five years. Demand side management and energy efficient technologies are also gaining momentum with very strong support from government and industry. The industrial sector promises great opportunities for improving energy efficiency. In this sector improvements in energy efficiency are likely through improved lighting efficiency, compressed air efficiency, motor efficiency, thermal efficiency, steam system efficiency and HVAC efficiency.

Certain renewable energy technologies such as solar water heaters and photovoltaic cells are well developed internationally and are generally readily available in South Africa. The challenge for the country is to identify those technologies that are most suitable for widespread roll-out in the country. South Africa has a high level of renewable energy potential and presently has in place targets of 10,000 GWh of renewable energy by 2013. To contribute towards this target and towards socio-economic and environmentally sustainable growth, and to kick start and stimulate the renewable energy industry in South Africa, there is a need for the rapid implementation of the renewable energy support mechanisms including the Renewable Energy Feed-in Tariff, Clean Development Mechanism projects, Renewable Energy Certificates, Solar Water Heating subsidies and other financial support mechanisms to support the rapid implementation of renewable energy options in South Africa .

In the context of climate change, and especially the international climate change negotiations, this means that, among others –

- South Africa is a significant contributor to greenhouse gas emissions and is one of the largest developing country emitters.
- Historically our abundant and cheap coal as the main feed stock to power our economy has been a key source of our competitiveness as a nation. Into the future however, continued reliance on this may jeopardise our international competitiveness in a future, carbon-constrained, global economy. In addition, trade barriers on coal and carbon intensity that are being proposed by some developed countries would have serious consequences for our exports.
- Facing the realities of a carbon constrained world and the likelihood of sustained pressure on large developing country emitters to address their emissions, South Africa's disproportionate greenhouse gas emission profile is becoming a source of vulnerability.
- South Africa is committed to contributing its fair share to the global greenhouse gas mitigation effort and has committed to its emissions peaking between 2020 and 2025, remaining stable for a decade and declining in absolute terms from around 2035. In December 2009 and in the context of this trajectory, South Africa committed at Copenhagen to reduce its greenhouse gas emissions by 34% by 2020 and 42% by 2025 below business as usual, on condition that it receives the necessary finance, technology and support from the international community that will allow it to achieve this. A mitigation plan for the energy sector is key to achieving these objectives.
- Fortunately South Africa has a, largely untapped, abundance of renewable energy sources, most notably solar energy. This presents new economic opportunities and potential competitive advantage.
- Limited availability of international finance for large scale fossil fuel infrastructure in developing countries is emerging as a potential risk for South Africa's future plans for development of new coal fired power stations.

In response, South Africa will –

5.4.1 Integrate a climate constraint into its energy planning tools including the Integrated Energy Plan (IEP) and the Integrated Resource Plan for Electricity Generation (IRP).

5.4.2 Ensure that the Integrated Resource Plan for Electricity Generation (IRP) and its future iterations are modelled so as to take account of the peak plateau and decline trajectory described above through the diversification of our energy mix, the implementation of far reaching energy efficiency measures, investments in the development of new and cleaner technologies and industries and the initiation of the transition to a low-carbon economy.

5.4.3 Use market-based policy measures such as an escalating carbon tax to price carbon and internalise the external costs of climate change. The use of such market-based policy measures should be aimed at using the market to motivate or drive the diversification of our energy mix, the implementation of far reaching energy efficiency measures and investments in the development of new and cleaner technologies and industries. Furthermore, some form of partial on-budget funding for specific environmental or social programmes may be considered to promote the long-term benefits of the carbon tax policy and help to minimise potential adverse impacts on low income households and trade exposed sectors.

5.4.4 Establish a business environment that facilitates the development of a local renewable energy technology manufacturing, implementation and export industry and that maximises its job creation potential. This is located within the context of the New Growth Path and the country's Industrial Policy Action Plan and in particular the national goal of job and employment creation.

5.4.5 Design and roll out ambitious research, development and demonstration programmes that result in new, novel and innovative approaches to the diversification of our energy mix, development of alternative energy sources, energy efficiency, cleaner technologies and industries, carbon capture and storage and the transition to a low-carbon economy.

5.4.6 Identify and resolve the financial, regulatory and institutional barriers that may impede the implementation of the renewable energy feed-in tariff at a level adequate to incentivise large-scale investment.

5.4.7 Review and scale up the 10,000 GWh 2013 Renewable Energy target in order that it can sustain long term growth in order to promote competitiveness for renewable energy with conventional energies in the medium and long term. Consideration should be given to the feasibility of "fleet" procurement of particular renewable technologies.

5.4.8 Scale-up and accelerate the implementation of the "Working for Energy" programme which seeks to develop human capacity and labour intensive opportunities through renewable energy and energy efficiency technologies as well as energy management type projects which will provide poverty alleviation opportunities for SMMEs, local cooperatives and sustainable local economic development. Activities in this regard include labour intensive projects in respect of : biomass from invasive alien plants and bush encroachment; biogas for rural energy access; biogas generation from farm waste and municipal solid waste and wastewater; bio fuels development and implementation in rural applications; solar thermal energy like solar geyser fabrication, small scale co-generation; mini-grid hybrid systems and mini-hydro systems for both on and off grid applications.

5.4.9 Explore and further develop the potential for nuclear energy in terms of the national Nuclear Energy Policy, as a means to both ensure energy security as well as meeting the country's climate change mitigation undertakings. To this end, a new nuclear fuel cycle strategy should be implemented that provides for skills development and industrialisation and localisation opportunities with a view to developing a nuclear power station fleet with a potential of up to 10 GWe by 2035 with the first reactors being commissioned from 2022.

5.4.10 Develop renewable energy policy, legal and regulatory frameworks that allow for differentiated but specific targets, parameters and tariffs for all renewable energy technology options (wind, hydro, solar PV, CSP, landfill gas, biomass and biofuels).

5.4.11 Introduce innovative approaches for the establishment of sustainable structures and financing mechanisms for delivering renewable energy including securing funding international climate funding institution and other development finance institutions that fund the renewable energy projects.

5.4.12 Invest in new and clean coal technologies and efficient technologies where coal power is still built and reinforce this through introducing more stringent thermal efficiency and emissions standards for coal fired power stations.

5.4.13 Set ambitious and mandatory targets for energy efficiency and in other sub-national sectors. Current energy efficiency and electricity demand-side management initiatives and interventions should be scaled-up, made mandatory through available regulatory instruments and other appropriate mechanisms.

5.4.14 Improve energy efficiency knowledge and understanding in the various sectors via awareness campaigns, demonstration programmes, audits and education, and publicise corporate commitment programmes, and public building sector energy efficiency implementation.

5.4.15 Develop and implement mandatory appliance labelling for household appliances.

5.4.16 Introduce Minimum Energy Performance Standards (MEPS) for appliances and equipment, as well as proposals for mandatory energy rating labelling.

5.4.17 Legislate requirements for the installation of energy-management systems in large-scale office buildings.

5.4.18 Replace older demand technologies or reduce their energy consumption. These technologies include energy efficient HVAC systems, heat pumps, variable speed drives, efficient motors and efficient boilers. The standards, retrofits and other management actions implemented to improve the energy efficiency of the commercial sector impact on either the useful energy intensity of demand or the energy efficiency of the technology meeting the demand. Thermal design of buildings and design measures that reduce lighting demand will have an impact on energy intensity and will reduce the useful energy demand to be met by HVAC systems, heating systems and lighting.

5.4.19 Develop, implement and maintain a greenhouse gas emissions information management system in respect of the energy sector that provides accurate, up to date and complete information to the South African Air Quality Information System's National Greenhouse Gas Inventory hosted by the South African Weather Service.

5.4.20 Ensure that the greenhouse gas emissions information management system provides measurable, reportable and verifiable information on all significant interventions (i.e. interventions that reduce greenhouse gases by greater than 0.1% of emissions from the sector).

5.4.21 Develop an initiative to roll-out an Energy Management training and awareness programme to be implemented within the industry and mining sectors.

5.4.22 Promote the development and implementation of appropriate standards and guidelines and codes of practice for the appropriate use of renewable energy, energy efficient and low carbon technologies.

5.4.23 Develop a legislative policy and regulatory framework to support carbon capture and storage.

5.4.24 Extend research, development and demonstration efforts on new construction materials, housing design, and energy efficient buildings.

5.5 Key Mitigation Sector - Industry

Commerce and Manufacturing

Although the economic contribution (measured as the percentage of total value added) of the primary economic sectors of mining, quarrying, agriculture, forestry and fishing has been steadily reducing from 14.3% in 1980 to 8.5% in 2007 as have the secondary economic sectors of manufacturing and construction (20.3 to 17.7% and 4.2 to 3.8% respectively), there has been some growth in the electricity, gas and water sectors (1.9 to 2.3%) and strong growth in most of the tertiary economic sectors, including: financial services, real estate and business services (14.5 to 22.2%); wholesale/retail trade, catering and accommodation (12.7 to 15.4%); and transport, storage and communication (7.2 to 10.7%).

With respect to the secondary and tertiary economic sectors, climate change holds various threats and opportunities, including:

- The commercial and manufacturing sector is responsible for around 16% of total greenhouse gas emissions. However, as 45% of electricity consumed is used by the manufacturing sector and 10% by the commercial sector, greenhouse gas emissions that can be attributed to this sector then rise to approximately 45% of total emissions – a very significant contribution.
- Notwithstanding the fact that our energy intensity, measured as primary energy supply divided by GDP, dropped by 9% from 5.20 MJ/R in 1993 to 4.73 MJ/R in 2006, South Africa's commercial and manufacturing sector is still considered to be highly energy-intensive and relatively energy-inefficient.
- Although industrial and commercial energy efficiency is regarded as being a significant and cost-effective means of mitigating greenhouse gases, electricity savings at the point of consumption does not necessarily translate into equivalent greenhouse mitigation at the point of generation.

Some greenhouse gas emissions are not specifically energy-related, such as the process emissions associated with the coal to liquid conversion process and in the manufacturing of cement. Hence, although these emissions may be marginally mitigated through process and general efficiency improvements, significant reductions will only be achieved through the use of technology that is still under development and potentially very expensive such as carbon capture and storage. As a significant global greenhouse gas emitter, South Africa is vulnerable to measures taken both internationally and nationally, to reduce GHG emissions. The sectors that are particularly vulnerable are those that are emissions intensive, and trade exposed, and may include iron and steel, non ferrous metals, chemicals and petrochemicals, mining and quarrying, machinery and manufacturing, some agricultural exports, as well as transport services and tourism. Potential economic risks emerge from, among others, the impacts of climate change regulation, the application of trade barriers, a shift in consumer preferences, and a shift in

investor priorities. International climate change measures, such as the EU directive on aviation and moves to bring maritime emissions into an international emissions reduction regime, could significantly impact on a variety of South Africa's manufactured export products through increasing the costs of air freight and shipping. Products likely to be affected include mineral products, base and precious metals, pulp and paper products, prepared foodstuffs, and chemicals. There is also the potential for border tax adjustments being considered by the EU and the USA that could affect South Africa's cement, iron and steel industries.There are, however, also economic opportunities that arise from new or expanded markets, enhanced efficiencies and improved competitiveness, development of low carbon infrastructure with strong socio-economic benefits, and development of a national environmental goods and services sector.To address these challenges, South Africa will –

5.5.1 By 2012, compile and publish a climate change response action plan for the commercial and manufacturing sector that details short-, medium- and long-term response actions and provides measurable, reportable and verifiable outcomes for the actions with details on related responsible implementing agents, inputs and international support requirements, if any.

5.5.2 Ensure that climate change considerations are fully incorporated into the Industrial Policy Action Plan and . Importantly, these policies, strategies and plans should aim to effectively manage and reduce economic risks, and build on and optimize the potential opportunities, to ensure a smooth and just transition to a lower carbon economy. In the short-term, there will be a need to focus particularly on the development of mitigation plans for vulnerable emission intensive sectors as well as identifying and incentivizing potential areas of competitive advantage that are less emission intensive or vulnerable. In the medium term industrial policy will be introduced that favours sectors using less energy per unit of economic output and supports the building of domestic industries in these emerging sectors.

Begin the work necessary to have a clear understanding of the costs to the economy in the short medium and long term of the approach to climate change mitigation. This work should begin and be aligned with other similar studies, including that of the economic impact of the IRP and should be reflected in the final Climate Change White Paper.

5.5.3 Use Section 29(1) of the Air Quality Act, to manage GHG emissions from all significant industrial sources (i.e. sources responsible for >0.1% of total emissions for the sector) in line with approved mitigation plans prepared by identified industries and/or sectors.

5.5.4 Continue to develop and implement an escalating CO2 tax on all energy related CO2 emissions, including process emissions from the coal to liquid fuel process.

5.5.5 Improve industrial and commercial energy efficiency as described in 5.4 through, among others, improved boiler efficiency, HVAC, refrigeration, water heating, building energy management systems, lighting and air compressors, motors, compressed air management, building shell design, optimising process control, energy management systems and the introduction of variable speed drives.

5.5.6 Support accelerated research, development and implementation of carbon capture and storage applications for CO2 rich industrial process emissions, especially those related to the coal to liquid process.

5.5.7 Engage vigorously in the multilateral climate change negotiations, to ensure a fair and effective outcome that is in accordance with the principles of equity and common but differentiated responsibility, and that provides developing countries with sufficient time and development space for economic transition.

Mining and Mineral Resources

South Africa produces about 59 different minerals from 1115 mines and quarries and, although the sector's contribution to GDP has fallen gradually from 20% in the 1960s to 6.8% from 2000 to 2008, mining remains an important source of employment in South Africa employing directly ~2.7% of the economically active population and much more when the backward and forward linkages of the sector are considered. Apart from being both a direct and indirect contributor to climate change, climate change itself, and particularly the impacts of climate change response measures, has important implications for this sector, including, among others –

- Fugitive emissions of methane (CH_4), an important potential fuel, especially from coal mines are a significant source of greenhouse gas (GHG) emissions and account for ~9% of South Africa's emissions. The burning of coal as a fuel accounts for the bulk of South Africa's GHG emission, i.e. over 60% of total emissions.
- Certain mining operations, especially large-scale open-caste mines, reduce natural carbon-sequestration capacity and may also result in increased water stress due to water use and/or pollution.
- The Mining and Quarrying sector has been identified as being at considerable risk from the secondary impacts of climate change, especially risks relating to regulation that targets energy intensive mining companies and, with this, potential disparity in relation to key competitor countries such as Canada, the USA, Russia and Australia.
- A local and global transition to low carbon societies and economies will negatively impact on local coal sales and exports, although the export impacts are only likely to become significant in the medium- to long-term.
- Climate change responses may create industry opportunities in platinum (e.g. catalytic converters), uranium (e.g. nuclear energy) and copper (e.g. energy efficiency).

To address these challenges, South Africa will –

5.5.8 By 2015, compile and initiate the implementation of a strategy and action plan to reduce fugitive emissions of methane (CH_4) by 42% from the business as usual by 2025.

5.5.9 By 2015, compile and initiate the implementation of an action plan for the national roll out of appropriate coal-bed gasification projects.

5.5.10 By 2012, ensure that the industrial policy action plan (IPAP) has fully explored how local and global climate change responses may be fully exploited by the platinum, uranium and copper mining industries.

5.5.11 Work with the mining industry to increase its energy efficiency across its production processes.

Tourism

Tourism is one of the largest industries in the world, contributing almost 10% of the global GDP (9.6% in 2008) and accounting for more than 225 million jobs around the world. The global tourism industry has shown significant growth in the last 3 decades, and total international arrivals increased by an average of 4,4% per annum from about 278 million in 1980 to 922 million in 2008. In South Africa there has also been strong growth in the tourism sector since 1994, with an average growth of 6% over the past five years and a contribution of about R79 billion, or 8.2% of national GDP. Tourism is also a job creation sector, and South African tourism jobs increased by 10% in 2008. Tourists rate the country's natural scenic beauty highest in tourist satisfaction and this is seen as an economic driver.

However, tourism is not just a potential victim of climate change, it also contributes to the causes of climate change.

Tourism in South Africa is closely linked to the environment and climate itself with the country's biodiversity, fauna and flora, beaches and weather being major tourist attractions. Tourism is therefore considered to be a highly climate-sensitive economic sector similar to agriculture, insurance, energy, and transportation. Impacts in the tourism sector are likely to manifest through:

- Environmental resources and conditions such as wildlife, the beach, heritage sites, scenic beauty and properly functioning ecosystems are critical for tourism growth and development in South Africa.
- Climate-induced environmental changes will have profound effects on the tourism sector at the local and regional destination level.
- Changes in water availability, biodiversity loss, reduced landscape aesthetic, altered agricultural production (e.g., food and wine tourism), increased natural hazards, coastal erosion and inundation, damage to infrastructure and the increasing incidence of vector-borne diseases will all negatively impact tourism to varying degrees.

- National or international climate change mitigation policies may have impacts for biodiversity tourism in South Africa, because they may lead to changes in tourist mobility and flows. International measures, such as the EU Directive on Aviation, and efforts to promote low carbon tourism destinations pose a significant risk to South Africa's tourism industry. South Africa is a carbon intensive destination, and relies extensively on long haul flights from key international tourism markets.
- The hospitality industry is a large consumer of energy and other resources. It has a large potential contribution to energy efficiency and other efficient resource usage initiatives.

In response to the above challenges, South Africa will:-

5.5.12 Mainstream climate change in tourism planning, policy and development.

5.5.13 Build climate resilience and adaptive capacity of tourist attractions/destinations and encourage green tourism infrastructure investment.

5.5.14 Promote domestic tourism in order to counteract a decline/shift in international travel that may follow the implementation of transport mitigation policies in other countries.

5.5.15 Encourage both domestic and international visitors to participate in the protection and conservation of South Africa's natural environment and to enjoy a responsible travel experience.

5.5.16 Promote research, capacity building and awareness in the tourism sector.

5.5.17 Support the establishment of energy efficiency programmes and the introduction of renewable energy into the tourism sector.

5.5.18 Establish programmes that will allow tourists to offset the emissions generated through their travel to and in South Africa.

5.6 Key Mitigation Sector - Transport

Transport systems form the backbone of South Africa's socio-economic activities through enabling the movement of people and products. Apartheid planning has left a legacy of transport networks that are poorly integrated and where the majority of citizens live far from places of work. Many people still do not have access to an existing and extensive formal railway and road infrastructure, and live in areas where there is no reliable transport.

In the context of climate change –

- The transport sector is the most rapidly growing source of greenhouse gas emissions in South Africa, and is the second most significant source of greenhouse gas emissions therefore significant mitigation benefits can be found in the transport sector.
- According to the GHG inventory 2000, transport emissions contributed 12% of the 2000 energy emissions, a decrease of 9.4% between 1994 and 2000. However, reports show that diesel and gasoline fuel consumption had increased from 1994 to 2000 respectively by 22.4 and 7.9% respectively. It was therefore concluded that the decrease in the emissions was an emission location issue rather than an actual decrease in overall transport emissions.
- Transport was responsible for 25.7% of energy demand in 2004. Road transport represented 84% of transport energy use.
- Through transport mitigation there are co-benefits that can be realised such as reduction in accidents, improved urban air quality, increased productivity through reduction of time between trips, etc.
- The EU directive on Aviation is an example of an international measure that is likely to have an impact on South Africa's aviation industry. It will implement the first emission caps in 2012, and will affect operators such as South African Airways. This could potentially reduce the relative importance of SA as a flight hub in relation to other hubs in Africa or the Middle East. It could also result in other impacts such as raising direct costs to comply with targets, raising operational costs in monitoring and reporting and increasing fuel costs.

- The current international discussions on options to reduce shipping related emissions could impact shipping transport and industry.
- Climate change impacts could result in the destruction of transportation infrastructure. Floods and storm surges have in the past destroyed roads, bridges and railway lines and sea level rise poses threats to coastal transport infrastructure, including harbours.

In response to these challenges, South Africa will –

5.6.1 Continue to put in place transport policies and developments that result in a modal shift in passenger transport to public and low carbon forms of transport including plans to move freight from road to rail over time.

5.6.2 Encourage the integration of land use and transportation planning in cities in a manner that encourages public transport, non-motorised transport (walking and cycling) and promotes alternative communication methods such as tele-commuting, in order to reduce long term transport fuel use patterns.

5.6.3 Improve the efficiency of our vehicle fleet across the board through a range of measures including the use of fuel standards.

5.6.4 Invest in the further development and deployment of cleaner technologies for the transport sector such as electric vehicles and hybrids.

5.6.5 Build capacity to deal with transport mitigation in the areas of planning, engineering, and relevant technical skills.

5.6.6 Support the production and use of cleaner fuel technologies and alternative fuels away from current fossil fuels.

5.6.7 Implement the flat rate specific excise tax based on passenger vehicle carbon emissions which applies to each gram CO_2 vehicle emissions above a target range and investigate expanding the emissions tax to include other categories of motor vehicles.

5.6.8 Consider further incentives in the form of lower fuel taxes to encourage cleaner fuels, e.g. cleaner diesel fuel

5.6.9 Integrate climate change information into transport planning, in order to minimise the potential risk to infrastructure from extreme weather events.

5.7 Disaster Risk Management

Although the building and maintenance of resilience to possible disasters and disaster risk reduction efforts must be prioritised in respect of potential climate change-related extreme events (e.g. heat waves, floods, droughts, storm surges, extreme whether events, etc.), South Africa has legislation governing Disaster Management that sets out a comprehensive approach to disaster management and that identifies the roles and responsibilities of key institutions and disaster management agencies. In addition, the Act establishes a National Disaster Management Centre (NDMC) whose role is to address disaster prevention, coordinate the activities of disaster management agencies and capacity across government and ensure that critical information is disseminated speedily.

Climate change impacts on the disaster management sector include, among others –

- An increase in the frequency and intensity of extreme weather events such as flooding and wild fire, with heightened requirements for effective disaster management. In recent years fires, storm surges and floods have caused large scale destruction with high costs to the fiscus and to private citizens. In many cases, badly located developments and poor management have contributed to loss of property and of lives (e.g. housing that has been built below flood lines or too close to the sea, absence of firebreaks leading to fires spreading faster and further than they may have otherwise, etc.). Estimates of the cost of selected climate-related disaster types in South Africa for the period 2000 to 2008 include: R1.1 billion in respect of drought damage; R1.7 billion for fires; R4.7 billion for floods; and just under R400 million for storms.

- Climate Change has been identified as a key strategic threat facing the insurance industry. This industry sees climate risk as a factor that increases uncertainty and therefore risk and that must be determined and included in their cost structures. This, in time could mean significant costs to particularly vulnerable sectors as well as to private householders and enterprises.
- Government budgets stand to be increasingly strained into the future due to climate related disasters. In a country with high levels of poverty, high vulnerability and a lack of resilience to disasters, it is government who must declare 'disaster areas' and provide the funds necessary to support both management of the immediate crisis as well as long term recovery.

In response to these challenges, South Africa will –

5.7.1 Continue to develop and improve its early warning systems in respect of weather and climate (especially severe weather events), droughts, floods and pest infestation warnings and ensure that these warnings reach potentially affected populations timeously.

5.7.2 Facilitate increased uptake of seasonal climate forecasts among key stakeholders such as those in the water and agricultural sectors.

5.7.3 Maintain and update the South African Risk and Vulnerability Atlas (SARVA) as a tool to be used by provinces and municipalities to facilitate their climate change adaptation planning.

5.7.4 Investigate and implement plans to use the mass media and information and communication technology including the use of radio, TV and SMS cellular phone text warning messages to alert threatened populations timeously.

5.7.5 Promote Research and Development initiatives in order to explore processes and products that might facilitate increased uptake of seasonal climate forecasts amongst stakeholders.

5.7.6 Collaborate with social networks such as community organizations NGOs, farmers' organisations, South African Adaptation networks, etc. in order to assist in raising awareness and achieving technology transfer and capacity building. In this regard make use of the existing network of community development workers to spread knowledge of climate change and its associated risks.

5.7.7 Strengthen both formal and informal education in respect of climate change, Disaster Risk Reduction and climate change adaptation.

5.8 Natural Resources Sectors

Terrestrial Biodiversity

South Africa is one of the world's top 3 mega-biodiverse nations, along with Brazil and Indonesia, and is thus one of the richest countries in terms of diversity of plants and animals (marine and terrestrial) and levels of endemism. Of the 34 internationally recognised biodiversity "hotspots", 3 are in South Africa: the Cape Floristic kingdom; the Western Cape / Succulent Karoo region; and the Maputoland-Pondoland region. Although the immense contribution of our biodiversity to our economic, social and spiritual well-being is difficult to measure, it is generally accepted that this contribution is significant and essential. Despite this, it has been reported that 44% of river ecosystems, 23% of estuarine ecosystems, 12% of marine ecosystems and 5% of terrestrial ecosystems in South Africa are already critically endangered. South Africa's indigenous forests have been reduced by 46%, mangrove swamps by 90% and grasslands by 60-80% over the past two centuries. South Africa is also substantially affected by invasive alien species in the terrestrial, freshwater and marine realms, and their considerable biodiversity and socioeconomic consequences are well established. In addition to these current threats, there is much evidence that South Africa's unique and rich biodiversity is at further risk from projected anthropogenic climate change by 2050.

Climate Change impacts on terrestrial biodiversity include, among others –

- Several studies indicate that a majority of endemic species may show contractions of geographic range and that up to 30% of endemic species may be at an increasingly high risk of extinction by the latter half of this century if climate change is unmitigated.

- The most adverse effects of projected climate change on endemic species associated with unmitigated greenhouse gas emissions trends are projected in the winter rainfall biomes, the Fynbos and Succulent Karoo, with between 20 and 40% of the areas supporting these biomes exposed to new climate conditions by 2050, and with some impacts on species already observable, including an observed increase in wildfire frequency.
- Summer- and all-year rainfall biomes (Savanna, Nama-karoo, Grassland and Forest) may be susceptible to changes in tree/grass and shrub/grass balance and changes in fire regime, with likely substantive but poorly quantified implications for biodiversity and ecosystem processes and services.
- Rising atmospheric CO_2 levels may be increasing the cover of shrubs and trees in grassland and Savanna biomes at least, with mixed effects on biodiversity, and possible positive implications for carbon sequestration.
- Additional stresses to biodiversity that will interact with climate change include fire frequency (which appears already to show climate change-related increases in the Fynbos biome) and invasive alien species. The combined effects of these and stresses relating to land use and fragmentation of habitats will further increase the vulnerability of biodiversity to climate change.
- With respect to invasive species, if climate change projections are borne out, even more serious invasions are expected with tropical species becoming a more significant component of the invasive biota, the distributions of many species currently limited by water availability expanding into previously drier areas and CO_2 fertilization effects possibly increasing the impact of invasive woody plants. Furthermore, the future efficacy of biological control agents (one of the key interventions to control invasive alien species) under altered climates is an uncertainty that poses a major risk for future management and control.

To address these challenges, South Africa will –

5.8.1 Prioritise support for monitoring efforts and experimental studies at national and sub-national scale aimed at evaluating future risks to biodiversity, improving model projections of impacts, and informing the design and assessment of adaptation responses.

5.8.2 Encourage and facilitate the building of partnerships to enable effective management of areas not under formal protection and investment in the expansion of key protected areas (which were not originally designed with climate change trends in mind) in line with the most robust knowledge of climate change impacts.

5.8.3 Ensure that protected area planning and expansion strategies benefit from an eco-system approach and focus to ensure that threatened biomes, landscapes and species are given special protection and that conditions are established that will minimise the risks of species extinction.

5.8.4 Ensure that a comprehensive biodiversity monitoring system is established that can provide timely information on specific risks.

5.8.5 Expand existing programmes to combat the spread of alien and invasive species and the destruction of sensitive ecosystems including Working for Water, Working for Wetlands and Working on Fire.

5.8.6 Promote efforts to conserve, rehabilitate and/or restore natural systems that reduce and/or improve resilience to climate change impacts, e.g. mangrove forests and their positive impact on storm surges.

5.8.7 In the medium-term, create and maintain a gene-bank of critically endangered species.

Marine Biodiversity

For a region of its size, the coastal and marine environment around South Africa is regarded as one of the most varied in the world, largely due to the dynamic presence of two major currents. The Agulhas Current flows strongly to the south west along the eastern and southern coasts, bringing warm water and diverse tropical species from the Indian Ocean. The Benguela Current flows northward along the west coast, with wind-driven upwelling close inshore permitting cold nutrient-rich water to rise to the surface, and giving rise to productive coastal ecosystems and fisheries.

The contrasting characteristics of the east and west coasts has resulted in South Africa having a rich marine biodiversity, with 12 000 identified species, of which approximately 31% are endemic. A number, c. 65%, of South Africa's marine and coastal bio-zones are, however, considered threatened. Critically endangered habitats occur primarily on the west coast, where both mining and commercial fishing have had the greatest negative impact. Coral reefs on the east coast represent one of the natural ecosystems most threatened by climate change. Apart from its economic contribution via the fisheries sector, coastal resources also contribute roughly 30% to GDP.

Although there is a conceptual understanding of the possible impacts of climate change on many of South Africa's key marine habitats, a quantitative and spatially integrated evaluation of future climate change scenarios must still be undertaken in almost all marine and coastal systems. The effects of climate change on the marine environment are predicted to be complex and cascading, with changes in sea temperature, sea level, acidity and storm events, either individually or in combination, influencing marine and coastal biodiversity.

Impacts of climate change on marine and coastal biodiversity include –

- Climatic changes will almost certainly disturb marine ecosystems, making them more susceptible to invasive species from lower latitudes, so that warmer water species are likely to become more abundant with an overall decline in cold water indigenous species.
- Changes in wind fields are expected to influence large-scale oceanographic processes, particularly to the upwelling associated with the Benguela region.
- Changes in precipitation patterns across the country will influence annual runoff in complex ways, significantly affecting the marine and estuarine environment. Reduced water flow will increase the salinity levels of estuaries, affecting the breeding grounds and nursery areas of many marine species. Additionally, coastal estuaries are particularly vulnerable to the wave and flood water energy which are channelled here.
- Changes in acidity (pH), from enhanced carbon dioxide levels in the ocean, could disrupt chemical processes (especially those involving calcium). This would be acute in coastal coral systems and inter-tidal systems (corals, molluscs and crustaceans), but could also impact on up-welling systems of the west coast, and hence on our fisheries.
- Change in South Africa's marine and coastal environment is already being observed, but the understanding of the nature of this change is still poor. Examples include: reported decadal sea temperature changes for both the inshore and offshore marine environments around South Africa; several species of tropical estuarine fishes have extended their ranges southwards; several strong trends in respect of the Benguela system and associated fisheries include a warming at the northern and southern boundaries, with potential increased hypoxia in inshore waters; and an eastward (perhaps cyclic) shift in sardine and anchovy from the west coast onto the south coast.

In response to these challenges, South Africa will –

5.8.8 Prioritise the development of accurate regional climate models, which adequately consider ocean, atmospheric and terrestrial influences, and produce reliable regional scenarios for marine biodiversity impacts.

5.8.9 Prioritise the ocean, marine and coastal management sector for climate change research and monitoring in order that the potential impacts, and in particular the causes and the effects of these impacts, are better understood. On the basis of these, adaptation plans will be developed and implemented.

5.8.10 Protect natural coastal protective systems, such as mangrove swamps, reefs and coastal dunes.

Commercial Forestry

South Africa's plantation forests are based on alien trees, and cover 1.4% of cultivated land. In 1996/7 the total turnover for forestry was around R13.1 billion and the industry employed more than 150 000 people. The exports are mainly converted, value-added products, with raw material exports only making up 1.8% of the total. The main products exported are pulp and paper (73% of the total export), sawn lumber, wood chips and wattle extract. The private sector currently owns 70% of the total plantation area, as well as virtually all the processing plants. Forests are greenhouse gas sinks (they absorb rather than emit carbon) and, thus have an important mitigation

role. Indeed, South Africa's forests are estimated to have absorbed just under 30 million tons of CO2-eq in 2000 (around 6.3% of South Africa's nett emissions). However, the mitigation potential of commercial forestry is likely to be relatively small since two thirds of the land area regarded as suitable for commercial forestry is already in use. In addition, South Africa's natural forests are endangered due to marginal fragmentation. South Africa's forests are likely to remain constant in area and increase slightly in productivity. However changes in precipitation and temperature are likely to have a marked impact on the size and location of the land area suitable for growth of certain forest genotypes.

The potential climate change impacts and implications for commercial forestry include, among others –

- In areas where there is likely to be less rainfall, the forest estate and its productivity will decrease markedly while stress and pest or disease attacks are likely to increase.
- Climate Change and rising temperatures will exacerbate declines in river runoff due to water use by commercial plantations, agriculture, woody invasive alien species, and urban industrial land-use.
- Fires are likely to increase in frequency and intensity due to an increase in dry spells and temperature posing a significant threat.
- Commercial forest productivity is sensitive to potential changes in rainfall. If a 2°C increase in temperature is accompanied by a 10% increase in mean rainfall (which appears more likely in key regions with the current understanding), modest increases in the afforestation area and growth rates can be expected. However, if there is a 10% decrease in mean rainfall significant losses in productivity and suitable growing areas will result.

In order to address these challenges, South Africa will:

5.8.11 Ensure that forest planning tools take into account carbon sequestration in a way that could provide necessary planning information, so as to aid in obtaining incentives from carbon trading.

5.8.12 Undertake a full Life Cycle Analysis to develop a benchmarking system to analyze and optimise CO_2 emissions from forest operations in South Africa, and include an improved fire management regime.

5.8.13 Introduce targeted education programmes that focus on the relationship between the commercial forestry sector and conservation sector to ensure biological diversity is not compromised and that resilience to climate risks is increased..

5.8.14 Promote the downscaling of climate models to provide information that allows for long term decision making, species and site matching in relation to future predicted site conditions.

5.8.15 Encourage agro-forestry and indigenous tree production as a potential socio-economic co-benefit of environmentally integral planting regimes, and tree breeding as an adaptive response to changing landscape conditions.

Fisheries

Although the fishing industry is a relatively small economic sector, contributing about 1% of GDP and employing about 16 854 people, it contributes significantly to the economic welfare of many towns and cities along the South African coastline and is an important source of both nutrition and income for poor communities. Indeed, the significance of subsistence fishing / marine harvesting, although small and localized, cannot be under-estimated in supporting survival strategies. However, South Africa has experienced significant declines in catches and loss of species as a result of over-fishing, poaching and illegal fishing and due to fish population migrations related with climatic and other changes. As a result, various controls are already applied to the fishing sector.

Possible climate change impacts on this sector include, among others –

- Increased ocean acidity, as a result of the absorption of increased atmospheric carbon dioxide, will disrupt chemical processes (especially those involving calcium carbonate) and this could disrupt or displace entire ecosystems up to fisheries level. This would be acute in coastal coral systems and inter-tidal systems (corals, molluscs and crustaceans), but could also impact on up welling systems of the west coast and southern oceans.

- Exports of fish products face the risk of being impacted by international food miles labelling schemes and shifts in consumer preferences in South Africa's key export markets away from carbon intensive products.
- Many coastal systems, already under severe human induced stress, will further deteriorate due to sea level rise, temperature changes, extreme weather events, storm surges and coastal erosion and inundation and this in turn will impact on species distribution patterns, reproductive success and production rates.
- Changes in the character of water masses around South Africa can affect both the abundance of living marine resources and their availability to the offshore fishing industry. An eastward shift in the distribution of inshore resources such as rock lobsters and in the pelagic stocks of sardines and anchovy on the continental shelf has already been noted in the past decade.
- The effects of climate change on ocean circulation will drive impacts on climate at a regional scale. The impacts of these effects are not fully understood, but could include long‐term effects on the productive Benguela system on the west coast, with impacts on industrial fisheries.

To address these impacts of climate change on fisheries, South Africa will:

5.8.16 Prioritise research and information management and monitoring systems that provide information on, among others, the state of fisheries in South Africa and commercial marine species movements in response to changes resulting from the impacts of climate change.

5.8.17 Take a risk-averse approach to fish and marine resource harvesting quotas to ensure that over-exploitation is not responsible for local extinctions and population crashes in climate stressed areas.

5.8.18 Investigate how the climate related risks and uncertainties associated with wild fisheries may be reduced through new and/or up-scaled fish-farming interventions - mariculture and aquaculture.

5.8.19 Ensure coordination and cooperation between the fisheries and marine biodiversity sectors to ensure that the climate change responses of the sectors provide win-win outcomes.

5.9 Human Society, Livelihoods and Services

Human Settlements, Infrastructure and the Built Environment - Urban areas

Although urban areas only cover 1.5% of South Africa's surface area, approximately 61% of the approximately 49 million South Africans live in urban areas. The average growth rate for urban areas (more so for metropolitan areas) has been consistently higher than the population growth rate during the period 1998 to 2008. Larger towns and cities generally grew at the expense of rural areas, with metropolitan areas experiencing the highest influx rates, followed by secondary cities. Although urban areas can offer advantages that can make sustainability more likely, e.g. a greater concentration of people limits the need for land and makes the provision of basic services more viable, urban areas also consume more water, food, energy and durable goods and have an impact far beyond the urban boundaries. Urban sprawl is furthermore linked to the loss of biodiversity and the pollution of land, water and air. The rapid influx of people into already overcrowded urban areas with large service delivery backlogs has led to the formation of informal settlements in vulnerable locations, on the banks of streams, on steep hillsides or marshy areas, such as the on the Cape Flats. It is estimated that up to half of all informal dwellings in South Africa can be classified as vulnerable to environmental factors. The absence of basic services in overcrowded areas is associated with negative health outcomes and accelerated environmental degradation, mostly as a consequence of the collection of local resources for energy, and localised pollution.

In addition to these existing challenges, urban human settlements, infrastructure and the built environment also face the following climate change challenges –

- Climate change may exacerbate the problems caused by unsustainable development in urban areas. For example, poor storm water drainage systems and urban induced soil erosion result in flash flooding. Under circumstances of increased storm intensity, these pre-existing problems could become more severe.

- Cities are particularly vulnerable to climate change because they are slow to adapt to changes in the environment, they rely on an ever-increasing hinterland, and they have entrenched dependencies on specific delivery mechanisms for critical services. There is increasing recognition that the sustainability of urban social-ecological systems is a function of their functional integrity and resilience. The application of the concept of resilience to urban social-ecological systems is as yet undeveloped. Although vulnerability in urban areas to climate variability is highly varied spatially, racially, and along gender and age lines, it is generally accepted that it is the poor who are most vulnerable. In this regard, climate change is likely to affect resources relevant to the poor in urban settings such as water infrastructure through storm damage and heat stress, services such as sewage and refuse, health, through air pollution and diseases such as malaria and cholera and disasters such as fires and flood recovery
- South Africa's cities still reflect an apartheid geography and are low density in nature with the poorest communities tending to live far away from services and employment. This contributes to increased transport emissions.
- Water demand by the urban centres is growing rapidly, stressing water supply systems, and the treatment of waste water has not tracked growth in demand and use.
- Current vulnerabilities to floods and fires in informal settlements are exacerbated by location in flood- and ponding-prone areas, the use of inferior building materials, structures built on sand dunes, and inadequate road access for emergency vehicles
- Cities and dense urban settlements consume large amounts of energy. Both in South Africa and internationally much work has been done to identify the large potential for energy efficiency within the urban fabric.

In order to address these challenges for urban human settlements, infrastructure and the built environment, South Africa will –

5.9.1 Encourage and support research that focuses on, among others: the factors that determine urban resilience; how a city's physical form and infrastructure affects its resilience ; appropriate monitoring and assessment tools with which to evaluate a city's ongoing resilience; and the implications of climate change risks and declining ecosystem services for decision making and policy development regarding resource allocation, settlement planning and design, development and growth and management of major city-regions.

5.9.2 Encourage and develop water-sensitive urban design as a means of capturing water within the urban landscape and minimising pollution, erosion and disturbance by ensuring that storm water is treated as a valuable water resource and not simply discharged to rivers or the sea.

5.9.3 Ensure that climate models are appropriately downscaled to provincial and where possible metropolitan and district levels in order to provide climate information at a scale that can be integrated into medium and long term spatial and development plans. Such downscaling must express critical uncertainties that can inform allocation of resources. This information can be used to ensure that long term settlement and infrastructure plans can adequately incorporate climate risk.

5.9.4 Support the development of energy efficiency and renewable energy plans for cities and towns and support their implementation.

5.9.5 Initiate research to identify the factors that would determine urban resilience.

5.9.6 Conduct research to determine appropriate monitoring and assessment tools with which to evaluate a city's ongoing resilience.

5.9.7 Regulate commercial building standards with a view to enforcing green building construction practices.

5.9.8 Mandate the National Home Builders Registration Council (NHBRC) to ensure that building construction conforms to green building requirements, including measures such as use of controlled ventilation, recycled material, solar power,.

5.9.9 Broaden the mandate of the Construction Industry Development Board (CIDB) to include green building and construction practices as a specific requirement to be met by contractors who wish to participate in the public tendering system to build schools, clinics, roads, bridges, dams, stadiums and other public infrastructure.

5.9.10 Strengthen and enhance decision support tools and systems such as the Toolkit for Integrated Planning.

Human Settlements, Infrastructure and the Built Environment – Rural Areas

Over 19 million or 39% of South Africans live in rural areas. 80% of rural areas are commercial farming areas with low population densities, and 20% are a legacy of the apartheid systems "homelands" where the agricultural sector was undermined, 'populations are dense, people are poor and are largely reliant on urban remittances and social welfare for their livelihoods. Small-scale and homestead food production are practiced in rural areas on both high potential and marginal agricultural land, with roughly 1.3 million small-scale farm units. 70% of the country's poorest households live in these areas and few of them are food self-reliant throughout the year. Although access to basic water services has been provided to an additional 9 million people since 1994, this has been concentrated in the urban areas and, by 2006, 3.3 million people still lacked access to adequate, clean water supplies, with another 15.3 million being without access to sanitation services. Groundwater is used extensively in rural and more arid parts of South Africa and is a significant resource to many irrigation farmers and especially small towns in more arid parts of the country and where surface water resources are already fully committed. Rural communities in many parts of the country are largely or wholly dependent on groundwater. In many rural areas, lack of managed services means that people rely on unmanaged local resources such as springs and rivers. These are vulnerable to pollution and drought. Poor communities who are dependent on natural water resources do not control the quality of their water or bulk storage for water supplies.

In addition to these existing challenges, rural human settlements, infrastructure and the built environment also face the following climate change challenges –

- Small-scale and homestead food production is particularly vulnerable to climate variability, relying mostly on dryland food production, with limited capital to invest in soil fertilization, seed, and weed, pest and disease control.
- Employment in rural areas is likely to be negatively affected by climate change and in particular by changes in production systems and climate related damage and crop failures.
- Rural communities with the highest dependence on natural water sources are in KwaZulu-Natal, the Eastern Cape and Limpopo. The former two are expected to be exposed to more flooding and water contamination, whilst Limpopo may be exposed to flooding, water contamination and drought. These are also areas with some of the poorest communities and under resourced municipalities with limited capacity and skills to adapt to changing conditions.
- Rural areas are under-represented in the climate monitoring network despite the fact that they are likely to be earliest and most significantly affected by climate change.

To address these challenges, South Africa will –

5.9.11 Scale up programmes to reduce rural vulnerability and enhance local food security by educating subsistence and small holder farmers on the potential risks of climate change and support them in developing adaptation strategies, including conservation agriculture practices and water harvesting by means of participatory, on-farm demonstration and experimentation. In this indigenous knowledge and local adaptive responses will be prioritised and the ownership of adaptation programmes by local communities and their empowerment in the process of implementation will be a key objective.

5.9.12 Expand existing resource conservation and job creation programmes in rural areas including Working for Water, Working for Wetlands and Working on Fire.

5.9.13 Design and implement macro-economic diversification and livelihood diversification programmes in rural areas

5.9.14 Within the country's research and development system, prioritise technologies for climate change adaptation within rural areas. These could include for example, low water use irrigation systems; new and drought resistant seed varieties, etc,

5.9.15 Target adaptation programmes so as to build resilience among the most vulnerable sections of the rural population, including through enhancing knowledge to ensure sustainable environmental conditions and optimising the ecosystem services that this provides.

Human Settlements, Infrastructure and the Built Environment – Coastal Areas

Coastal areas provide habitation, work, and recreation to approximately 40% of the South African people. A significant proportion of South Africa's metropolitan areas including numerous towns and smaller settlements are coastal, particularly on the east coast. These areas also host high numbers of local and international tourists annually. A network of infrastructural installations and communication links along the coast, built by public and industrial/commercial enterprises, is used to service the needs of the inhabitants, tourists and other entities in the coastal zone, i.e. municipal, harbours/ports and industrial/commercial. The attraction of life and opportunities on the coast are leading to significant migration to the coast, with a need for additional settlements and services in areas which may be vulnerable to the impacts of climate change.

On the west coast, generally cold subsiding dry air results in low rainfall, semi-arid and desert conditions. The southwest coast has a Mediterranean climate, with winter rainfall. The south coast receives both summer and winter rainfall. The east coast is the wettest and warmest region, with resulting high humidity. Coastal zones are influenced by the ocean and their prevailing currents, which have a moderating impact on coastal air temperatures.

The 3,650 km South African coastline is generally exposed to moderate to strong wave action and provides little natural shelter to storms from the sea. With climate change expected to increase both the frequency and intensity of storms, the South African coast will become increasingly vulnerable to sea level rise, extreme weather events, storm surges and coastal erosion. A continual assessment of coastal defences, particularly at harbours, estuaries and lagoons, and along low-lying coastal land, will be needed to reduce the threat of loss from damage in high risk areas.

In addition to the impacts listed for urban and rural areas above, further impacts for coastal areas include –

- Flooding and coastal erosion which will result in the loss of coastal infrastructure (including breakwaters, roads, public coastal amenities), habitat and ecosystem goods and services. Predicted rises in sea level may further exacerbate these impacts.
- Sea level rise could result in low-lying coastal areas, i.e. coastal flood plains, becoming inundated, with a resultant impact on coastal settlements.
- Vulnerability along the coast is set to increase with increased frequency and intensity of coastal storms, which includes seasonal cyclone activity on the east coast. Estuaries are particularly vulnerable. These impacts will be exacerbated by increased coastal development, and inappropriate land and catchment management.

In order to address these challenges, South Africa will –

5.9.16 Ensure that long-term planning for coastal areas incorporates relevant climate information and that a risk-averse approach to planning is taken so as to cope with the expected migration of communities into the high risk coastal areas.

5.9.17 Consider the potential impact of sea level rise and intense weather events, such as storm surges, on infrastructure development and investment in coastal areas.

5.9.18 Protect and rehabilitate natural systems which act as important coastal defences, such as mangrove swamps, offshore reefs and coastal dunes.

5.9.19 Develop Disaster Risk Management plans taking into account the potential consequences associated with climate change impacts along the coast.

Waste

Although waste-related greenhouse gas emissions account for less than 2% of South Africa's total emissions, the amount of waste generated is rapidly increasing. Furthermore, some substances currently regarded as waste could be used in climate change responses, e.g. gypsum resulting from flue gas desulphurisation. With this, current climate change challenges for the waste sector include, amongst others –

- Methane, an important potential fuel, is the predominant greenhouse gas associated with waste.
- Many of our landfill sites are not designed or operated in a way that allows for the optimal extraction of methane for use as a fuel.
- Co-generation and use of waste and by-products as fuels has a significant potential to contribute to energy supply and electricity supply in particular.
- Gypsum is an example of a waste stream that could be utilized in the manufacture of ceilings for low-income homes thereby increasing the energy efficiency of these homes substantially.
- Cattle feed-lotting results in manure concentration and, hence, relatively concentrated methane emissions – i.e. emissions of a powerful greenhouse gas that could be used as a fuel.

To address these challenges in the waste sector, South Africa will –

5.9.20 Encourage and support industries that produce significant quantities of gypsum from flue-gas desulphurization to enter into appropriate public-private and/or other partnerships to ensure that affordable gypsum products are readily available to meet the demand for ceilings and dry-walling in low-income homes by 2012.

5.9.21 Ensure that the Minimum Requirements for Landfills are revised and amended to reflect greenhouse gas mitigation considerations by 2012, including, among others: the use of bio-cover at landfills not suitable for gas extraction; energy recovery from landfill gas at landfills suitable for gas extraction through active support to municipalities in the development of energy recovery projects and the negotiation of appropriate carbon-offset funding; and, in the transition to effective energy production from landfill gas at landfills suitable for gas extraction, ensure that all such landfills are required to, at least, extract and flare this gas by 2020.

5.9.22 Compile and implement by 2014 a national composting strategy aimed at reducing the amount of organic waste land-filled by 50% of the 2000 baseline by 2020.

5.9.23 In line with the Waste Incineration Policy, facilitate energy recovery from appropriate waste streams through active support to municipalities in the development of energy recovery projects and the negotiation of appropriate carbon-offset funding.

6 ROLES AND RESPONSIBILITIES

Although climate change and our response to climate change will directly alter the environment in which we live and work (e.g. increasing or decreasing rain, increasing temperatures, more floods, more drought, etc.) and will change how we live and work (e.g. more efficient energy use, greater use of public transport, etc.), it does not change what work is done or needs to be done and neither does it change who should be doing it.

For example, if a national department is responsible for the development of national energy policy, within a changing climate and our response to it, that department will remain responsible for the development of national energy policy. The only difference being is that climate change and our agreed responses to climate change must now be considered in the development of the policy and integrated into it. Thus, although climate change provides a changing context and new challenges to the way, for example, government does its work, the basic work remains the same and, hence, government's roles and responsibilities remain the same.

This notwithstanding, we must recognise that most of our climate adaptation and much of the mitigation efforts will take place at provincial and municipal levels and will be integrated into provincial development and spatial plans and into IDPs at municipal level. It is imperative that we recognise the centrality of all three spheres of government in addressing climate change and that necessary support is provided for this. In particular we should

recognise the valuable work that has already been done by many municipalities and provinces in relation to addressing climate change and we should ensure that means are found so that best practice and innovative methodologies are disseminated and replicated.

6.1 Government

As discussed above, although climate change provides a changing context and new challenges to the way government does its work, the basic work remains the same and, hence, government's roles and responsibilities remain the same.

However, in order to ensure that climate change considerations and the climate change responses outlined in this policy are fully mainstreamed into the work of government, all three spheres of government, all government departments and all state owned enterprises must –

6.1.1 By 2012, conduct a review of all policies, strategies, legislation, regulations and plans falling within its jurisdiction or sphere of influence to ensure full alignment with the National Climate Change Response Policy.

6.1.2 By 2014, ensure that all policies, strategies, legislation, regulations and plans falling within its jurisdiction or sphere of influence are fully aligned with the National Climate Change Response Policy.

6.2 Social Partners (Industry and Business; Organized Labour and Civil Society)

Climate change is a challenge that has consequences for all South Africans and unmitigated is likely to have serious consequences for our patterns of production and consumption, our livelihoods and the allocation of national resources.

Given this, we must see climate change as all of our business. As such, the role of all citizens and specifically organised groupings within civil society are important to the success of a broad national effort. Government therefore sees its climate change strategy as being one that is implemented in partnership with the South African people and in a way that seeks to empower people and give them understanding, choice and control over the climate related decisions that impact their daily lives and work.

In this context there are key constituencies who have clear roles to play.

The business and industrial sectors have an important contribution to make in increasing their levels of energy efficiency, developing and implementing climate adaptation and mitigation plans and working in partnership with government to achieve the overall policy objectives.

Business will also continue with initiatives to engage international counterparts in the climate change debate to ensure that the interests of business in the developing world are well understood and to encourage its members to increase participation in voluntary climate change response reporting initiatives like the carbon disclosure project.

Civil society, labour and the faith communities have an important role to play in continuing to raise public awareness and motivate individuals, institutions and authorities to take actions to reduce greenhouse gas emissions and adapt to the adverse impacts of climate change as well as to critically evaluate, comment on and respond to the initiatives of government and the private sector. Civil society organisations that work directly with community based organisations and particularly with the poor and with women are an important conduit for ensuring that climate information is timeously communicated and that the issues of vulnerable groupings that are related to climate change are fed back into the governmental and scientific and research sectors.

The climate change science community shall work together to improve projections of climate variability, climate change and their impacts, key vulnerabilities in affected sectors and communities, and exploration of appropriate mitigation and adaptation responses and their implementation, including in the area of technology research and development, and its implementation. They shall continue to enhance their role in building South Africa's capacity in climate change science and the broader engagement of its citizens in the related socio-economic challenges and opportunities.

7 INSTITUTIONAL FRAMEWORK FOR COORDINATION

The following institutional arrangements are considered necessary for the implementation of this policy:

- Executive national coordination.
- A capacity for Research, Development and Innovation coordination that should be aligned to the institutional arrangements of the national science and technology system championed by the Department of Science and Technology.
- A capacity for coordinating adaptation and mitigation actions.
- A system and capacity for measuring, reporting and verifying climate change responses. This capacity would need to be aligned to the international system that is currently being negotiated and would in all likelihood require that carbon emissions and their reductions be measured, as well as the financing, technology and capacity building initiatives that underpin this, as well as support our adaptation programmes.
- A capacity for facilitating and promoting the use of carbon trading and off-set schemes.
- A means of monitoring and evaluating Government policies, strategies and legislation to ensure alignment

However, with the implementation of this policy, and as the transition to a climate resilient and low-carbon economy and society evolves, it may be appropriate to adjust these institutional arrangements accordingly.

In ensuring proper coordination on climate change issues, the following cooperative structures and mechanisms will be utilized:

7.1 The Inter-Ministerial Committee on Climate Change

The strategic, multi-faceted and cross-cutting nature of climate change response activities necessitate the formation of a coordination committee at Executive (Cabinet) level, which will ensure coordination of actions and alignment of all actions with national policies and legislation.

To this end, an Inter-Ministerial Committee on Climate Change shall exercise oversight over all aspects of the implementation of this policy…

7.2 FOSAD Clusters and Outcomes Based Monitoring

The national climate change response actions shall be guided by the relevant FOSAD clusters based on the different elements of their mandate. The Economic Sectors and Employment Cluster shall continue to provide strategic leadership on all climate change issues that have a strong bearing of economic growth and employment creation, the Infrastructure cluster shall continue to provide strategic leadership on all infrastructure related aspects of this policy and the International Cooperation Cluster shall continue to provide strategic leadership on international engagements as they relate to climate change. Monitoring and Evaluation of the Country's climate change programme shall be undertaken through the outcomes based system that has been established by the Presidency and shall be reported through the delivery forums for: Outcome 1: Improved quality of basic education; Outcome 2: A long and healthy life for all South Africans; Outcome 3: All People in South Africa are and feel safe; Outcome 4: Decent employment through inclusive growth; Outcome 5: A skilled and capable workforce to support an inclusive growth path; Outcome 6: An efficient, competitive and responsive economic infrastructure network; Outcome 7: Vibrant, equitable and sustainable rural communities and food security for all; Outcome 8: Sustainable human settlements and an improved quality of household life; Outcome 9: Responsive, accountable, effective and efficient local government system; Outcome 10: Environmental assets and natural resources that are well protected and continually enhanced; Outcome 11: Creating A better South Africa and Contributing to a Better (and Safer) Africa and a better World; and Outcome 12: An efficient, effective and development oriented public service and an empowered, fair and inclusive citizenship.

7.3 Intergovernmental Committee on Climate Change (IGCCC)

Chapter 3 of the Constitution enjoins government agencies to operate in accordance with the principles of cooperative government and intergovernmental relations that it sets out. These include that: "*All spheres of government and all organs of state within each sphere must co-operate with one another in mutual trust and good faith by: (i) fostering friendly relations; (ii) assisting and supporting one another; (iii) informing one another of, and consulting one another on, matters of common interest; (iv) co-ordinating their actions and legislation with one another; (v) adhering to agreed procedures; and (vi) avoiding legal proceedings against one another.* Thus, the exchange of information, consultation, agreement, assistance and support are key features of cooperative government.

In order to operationalise cooperative governance in the area of climate change, the Intergovernmental Committee on Climate Change (IGCCC) has been established to foster the exchange of information, consultation, agreement, assistance and support among the spheres of government with respect to climate change and government's response to climate change.

7.4 Provincial and Local Government cooperation

Climate Change impacts on all levels of Government, and a vertical cooperation mechanism is required to ensure enhanced government coordination and policy alignment. The Ministerial political (MINMEC) and technical (MINTECH) structures as set up through the Intergovernmental Relations Act (IGR) facilitate a high level of policy and strategy coherence between the three spheres of government, and should be used to guide Climate Change work across the 3 spheres. Several technical working groups meet regularly to discuss and advise on issues of biodiversity and heritage, impact management, pollution and waste management, and planning and reporting and a working group that deals with cross-cutting issues (i.e. Working Group 3) would coordinate climate change response. These working groups feed into the MINTECH and ultimately to MINMEC.

South African Local Government Association (SALGA) as a body mandated to support, represent and advise local government action will continue to actively participate in the inter-governmental system and ensure the integration of climate adaptation and mitigation actions into Integrated Development Plans as well as massively up-scaled public education, awareness, media and information on climate change.

7.5 Partnering with Stakeholders

Climate change is an issue for all South Africans and Government is cognisant of the fact that the objectives set out in this policy can only be fully realised with the full participation of all key stakeholders and civil society organisations. The National Committee on Climate Change (NCCC) has been set up to ensure consultation with stakeholders from key sectors impacted by and/or impacting on climate change. The Committee advises on matters relating to national responsibilities with respect to climate change, and in particular in relation to the United Nations Framework Convention on Climate Change and the Kyoto protocol and the implementation of climate change related activities. The National Economic Development and Labour Council (NEDLAC) should have climate change as a key component of its agenda, NEDLAC is considered as the forum where government comes together with organised business, organised labour and organised community groupings on a national level, and this platform will ensure that climate change policy implementation is balanced and meets the needs of all sectors of the economy. In addition, the specific sector capacities identified above will work in close cooperation with stakeholders in the implementation of their work.

8 INPUTS AND RESOURCES MOBILISATION

8.1 Financial Resources

The substance of this policy document has demonstrated that a successful national response to climate change will require South Africa to invest heavily in both the development of a low carbon growth path, as well as in a forward looking and proactive approach to identifying and managing the inevitable impacts of climate change.

This imposes an additional set of costs on society. These costs are recognised in the UNFCCC Convention and in particular, the obligation of the developed world who has primary responsibility for the emissions currently in the atmosphere, to provide resources for the adaptation and mitigation efforts of developing countries. It is in this

context that the conditionality on South Africa's mitigation announcement in Copenhagen, namely that our efforts are conditional on the provision of finance, technology and capacity building, can be understood.

Furthermore, substantial work that has been undertaken internationally has demonstrated clearly that the costs of the investments that are necessary to address the threats posed by climate change, are much less if early action is taken. Delayed action in relation to both mitigation and adaptation will impose much greater burdens on the world economy overall.

South Africa accepts the need for early and decisive action and in that context is committed to mobilising the resources that are necessary to address both mitigation and adaptation. It is accepted that this financing must come from a range of sources and that our own domestic efforts to create, allocate and mobilise finance for the necessary investments, must be met by substantial resources flowing from the international community.

In line with the requirements of the UNFCCC Convention it is important that a significant element of these resources are from international public sources and are additional to existing Overseas Development Assistance. It is also clear that the element of the resources that comes from private sector sources is likely to be largely made up of concessional loan financing.

The mobilisation of the scale of resources necessary to address the climate challenge is currently a subject of negotiation internationally. South Africa has an opportunity at the present time to develop a coherent approach to climate financing and to do the preparatory work necessary to be able to mobilise the appropriate scale of resources at an early stage. At the same time, South Africa also recognises that as a middle income developing country and given the current global economic downturn, the quantum of resources there is likely to be a limited degree of funding that is likely to be able to be mobilised from the international community and that much of this is likely to be either concessional loan financing or financing flows channelled through the private sector. It is also likely that there is likely to be a weighting towards mitigation finance in this scenario. The mobilisation of national sources of financing and the integration of climate plans into the work of government and their resourcing as such is therefore of utmost importance. I

South Africa also recognises that our existing financial institutions in both the public and private sector are increasingly aware of climate change issues and are considering how to engage in providing finance for climate related activities. This should be actively supported and encouraged.

Furthermore, South Africa recognises that economic and fiscal incentives and disincentives can both support climate change policy objectives and also can be structured so as to generate a revenue stream that can allow fiscal decisions to be made over time to support climate change policy objectives.

Specifically –

8.1.1 Government will undertake work to determine the economic and fiscal costs and benefits of the proposed Climate Change Response Strategy. This work will specifically address the costs and opportunities resulting from a low carbon growth strategy, including on jobs and livelihoods and specific economic sectors. The work will also address the impacts of climate change through an assessment of the costs of action versus those of inaction and will address the costs of priority actions for specific sectors. This work to, to the extent possible will be incorporated into the National Climate Change Response Strategy White Paper.

8.1.2 Government will consider establishing a National Climate Change Fund that will mobilize resources from national and international sources for investment in both climate change mitigation and adaptation actions. A feasilbility in this regard will be undertaken and its conclusions incorporated in the National Climate Change Response Strategy White Paper.

8.1.3 Government will establish a Climate Finance Tracking Facility that will have the responsibility to track the flows of climate finance in both the private and public sector and that will also be responsible for reporting on the mitigation actions that have been implemented with international support.

8.1.4 Work closely with South Africa's Development Financing Institutions to ensure that climate change information and climate change risk is factored into their planning and that their lending portfolios support the country's climate change objectives.

8.1.5 Collaborate with the private banking and insurance sector to ensure that it has adequate information to make informed decisions on risk management measures and lending decisions that may be affected by the impacts of climate change

8.1.6 Work with and support the banking sector in mobilizing and making available finance for climate mitigation initiatives.

8.1.7 Provide information that would support the banking sector to consider carbon implications in financing and investment decisions.

8.1.8 Carbon trading schemes will be investigated as a medium- to long-term policy response to climate change and will focus on the scope and administrative feasibility of trading schemes for South Africa.

8.2 Human Resources

An efficient and effective response to climate change will require all of us to change our behaviour, especially when it comes to the use of fossil fuels and energy usage in general. We will need to do things differently, we will need to use different technologies and we will need to be far more sensitive to, and vigilant of, the changes happening around us. This, in turn, implies the need for new areas of education, the need for new levels of awareness, the need to build new skills, knowledge and expertise. Also implied is the need to provide re-skilling for people whose livelihoods will be completely changed.

To meet this challenge, South Africa will –

8.2.1 Ensure that climate change, and specifically the required response to climate change, is included in all relevant aspects of our formal education curricula in order to ensure that future generations are fully prepared for a rapidly changing planet and the transition to a low-carbon society and economy.

8.2.2 Include Climate Change elements in the review of the National Skills Development Strategy and ensure that all Sector Education and Training Authorities (SETAs) integrate climate change in priority skills development programmes, in the formal, informal and non-formal sectors of the South African education system.

8.2.3 Ensure that all government sectoral climate change response strategies and actions plans include sections on education, awareness and outreach and human resource development.

8.2.4 Ensure that the building of knowledge and expertise in new and/or emerging economic sectors is considered in all tertiary education curricula and relevant formal and informal training.

8.2.5 By 2012, design, develop and roll-out a climate change awareness campaign that raises the awareness of all South Africans to the challenge of climate change and the need for appropriate responses and choices at the level of the individual.

8.2.6 By 2013, compile and publish a review of the jobs most threatened by climate change and climate change responses and provide a strategy on how these people may be shielded against potential job losses including, but not limited to, re-training and re-skilling programmes for redeployment in new and/or emerging sectors.

8.2.7 Encourage tertiary institutions of learning to conduct climate change research and facilitate the development of a national monitoring, reporting and verification guidelines for land use practices and land use change.

8.3 Technological Resources

As with the other inputs described in this section, an efficient and effective climate change response will require many changes in the technologies we use today. South Africa's 2007 Climate Change Technology Needs Assessment indicated what South Africa's priorities are in terms of technologies to address climate change. It was hoped that this initial submission to the United Nations Framework Convention on Climate Change would facilitate the next, critical step, which is the development of specific implementation plans for the prioritised technologies. It was envisaged that this process would open up access to funds, create an enabling environment for the transfer and uptake of technologies, and highlight opportunities for research and development cooperation in this area.

The next step is the development of technology implementation plans. However, the plans for mitigation and adaptation may vary significantly. Whereas mitigation technologies mostly concern hard technologies that are more easily transferred once the major stumbling block of funding has been resolved, it is much more difficult to draw implementation plans for the soft technologies required for adaptation. This stems from the fact that mitigation technologies are usually related to the services sector, which is relatively well regulated. Moreover, very often the end users of adaptation technologies are the general public and the poorest communities, who possess lower and less reliable repayment capacities, which are strong deterrents to financiers. The organisations most likely to be to be involved in the acquisition, development and implementation of adaptation technologies would be local government agencies and community-based organisations, which would also pose a risk to financiers in terms of repayment. Additionally, recipients of adaptation technologies frequently have limited absorption capacity. Due consideration will have to be given to this issue when dealing with implementation plans for adaptation.

As there is no single recipe for transferring different technologies, it is important to draw up implementation plans that will accommodate all technologies prioritised while paying due attention to the specific nature of the various options. Such an action will lead to the identification of more precise steps, barriers and capacity-building needs, as well as other activities that may be required, such as awareness raising and information communication. Research and development partnerships are likely to be a key vehicle by which technologies will be transferred.

With this, South Africa will –

8.3.1 By 2012, translate the results of the Climate Change Technology Needs Assessment into well defined implementation plans for the successful transfer of the technology (hard or soft). In so doing, an effective stakeholder engagement process will be employed, the availability of financial and human resources for acquiring the technology will be assessed, and an environment conducive to the smooth flow of technology to the final recipients and users will be described. While elaborating the different steps of the implementation plan for the transfer of a technology, it will be important to identify capacity building needs and other barriers that will have to be overcome. The eventual outcome of this being the preparation of project documents for funding purposes for technologies requiring significant investments.

8.4 Information

Another key element of an effective response to climate change is information to support decision making at all levels. Given the nature and implications of climate change and the magnitude of the economic and social implications of effective climate change responses, decisions must be based on accurate, current and complete information in order to reduce risk and ensure the efficacy of interventions. To this end, the following information inputs are regarded as the minimum to ensure informed decision-making –

The National Greenhouse Gas Inventory

In order to make informed decisions around greenhouse gas emission mitigation and monitor the efficacy of interventions in this regard, accurate, current and complete information on South Africa's greenhouse gas emission profile, including all significant sources, sinks and quantities of emissions, as well as information on historical and current emission trends must be available. To this end, South Africa will –

8.4.1 By 2012, develop, test and commission a web-based greenhouse gas emission monitoring and reporting system as part of the National Atmospheric Emission Inventory component of the South African Air Quality Information System.

8.4.2 By 2013, require the mandatory submission of greenhouse gas emission data to the National Atmospheric Emission Inventory by all significant emitters and compilers of greenhouse gas emission related data and/or proxy data by 2013.

8.4.3 From 2014 onwards, publish an annual report containing accurate, current and complete information on South Africa's greenhouse gas emission profile, including all significant sources, sinks and quantities of emissions, as well as information on historical and current emission trends.

Observed climate change

In order to monitor the accuracy of climate change predictions, especially those used to inform response decisions, accurate, current and complete information on observed climate changes must be available. Furthermore, this information is also fundamental for early warning systems and modelling calibration and amendment. To this end, South Africa will –

8.4.4 By 2012, compile a national climate change observation strategy that, among others, identifies key climate change indicators (e.g. temperature changes, rainfall change, sea-level rise, changes in the frequency and severity of extreme weather events, ocean acidity, etc.), identifies all the key role players involved in monitoring and measuring these indicators and describes how these role players will share and report information on observed climate change.

8.4.5 By 2014 onwards, publish an annual report on all significant observed climate changes and which highlights, among others, new areas of concern, areas where observations are not aligned with modelled predictions, etc.

Medium- and long-term modelling and down-scaled risk assessments

In order to make informed proactive decisions in respect of interventions aimed at reducing predicted climate change risks, reliable medium- and long-term impact predictions must be available to, among others, establish the scale of the projected change and associated impact and establish the potential costs of the impact and the potential benefits of a response intervention. Furthermore, as much of the on-the-ground responses will be planned and implemented by local authorities, it is imperative that these predictions are down-scaled to levels where they are of use in informing these plans. To this end, South Africa will –

8.4.6 By 2012, finalise, publish and initiate implementation of the 10-year Global Change Research Plan for South Africa, especially those elements of the plan aimed at increasing South Africa's modelling capacity.

8.4.7 By 2012, compile and publish a strategy for the continuous update and maintenance of the South African Risk and Vulnerability Atlas using reliable medium- and long-term modelling results and down-scaled risk assessments.

8.4.8 By 2012 develop and pilot a methodology for the appropriate downscaling of climate information and the application of comprehensive impact assessments to specific geographical areas, including provinces and municipalities, in order to facilitate the provision of useful information for spatial and resource planning purposes to government. Roll out the downscaling work from 2012 onwards.

8.4.9 Ensure that all National Communications submitted in terms of South Africa's United national Framework Convention On Climate Change commitments contain the most up to date medium- and long-term modelling results and appropriately down-scaled risk and impact assessments.

Response Monitoring

In order to measure the efficacy of response interventions, especially with respect to cost effectiveness and impact, as well as to facilitate the replication of successful interventions, accurate, current and complete information on these interventions, their cost, outcome and impact is required. To this end, South Africa will –

8.4.10 By 2012, design and publish a draft Climate Change Response Monitoring, Reporting and Verification (MRV) System that meets South Africa's requirements for response monitoring whilst aligning with evolving international MRV requirements.

Early Warning Information

Although disaster management in South Africa has developed significantly since the promulgation of the Disaster Management Act 57 of 2002 and considering that there are numerous overlaps between disaster management and adaptation to climate change due to both focus areas addressing vulnerability to climatic extremes, there is a need to minimise the burden on existing limited institutional capacity by exploiting the disaster management - adaptation synergy and ensuring that the use and usefulness of existing information systems is maximised. To this end, South Africa will –

8.4.11 By 2012, compile, publish and initiate the implementation of a plan to extend the existing Early Warning System to include environmental diseases, pest outbreaks, heat stress and drought (to support agriculture) and heat stress (impact on vulnerable population).

8.4.12 Support the development of risk and vulnerability service centres at universities supporting resource constrained municipalities.

Information and Communication technology

One of the key information challenges is to get required information to interested and affected people as quickly as possible and to ensure that the information is provided in a format that is accessible and useful to the target audience. This is especially important in respect of early warning systems where people need to take specific actions to reduce risks to themselves, their families and property. In order to meet this challenge, South Africa will-

8.4.13 Ensure that all information systems referred to above implement effective communication strategies that ensure that information reaches the target audience efficiently and effectively.

8.4.14 Explore and develop new and novel ways of communicating information, especially the communication of information to people who have no access to telephonic or other forms of electronic communication. In this regard, the use of radio and also of community networks, such as messages disseminated through schools, hospitals, churches etc should also be explored.

9 MONITORING, EVALUATION AND REVIEW

The implementation of this policy will be monitored through the cooperative governance mechanisms reflected in section 6 above and the Department of Environmental Affairs as a leading government department will define review mechanisms as well as process towards a further elaboration of this policy into regulatory and legislative instruments.

9.1 Monitoring, verifying and Reporting Climate Changes

In order to, among others, maintain and improve South Africa's early warning systems, inform appropriate adaptation responses and monitor the impacts of climate change and the success, or otherwise, of international mitigation efforts, South Africa will –

9.1.1 Ensure that research and observation bodies initiate and/or maintain nation-wide climate change monitoring systems, especially in respect of, among others, soil and ambient air temperature, soil moisture and air humidity, extreme weather events, floods and droughts, rainfall and sea-level.

9.1.2 Ensure that appropriate research and observation bodies initiate and/or maintain nation-wide climate change impact monitoring systems, especially in respect of, among others, disease zone changes, vegetation changes, river and stream-flow changes, alien plant invasions and crop failures due to abnormal weather conditions.

9.1.3 Compile and publish an annual summary climate change impact update from 2012 onwards.

9.1.4 Implement and comply with the monitoring, reporting and verification (MRV) system for developing countries that is finally negotiated internationally.

9.2 Monitoring, verifying and Reporting Overall Mitigation Efforts

In line with government's local and international undertakings and South Africa's climate change response objective, South Africa's climate change mitigation interventions are informed by, and will be monitored and measured against the following peak, plateau and decline emission trajectory, where:

9.2.1 South Africa's greenhouse gas emissions peak in 2020 to 2025 at 34% and 42% respectively below a business as usual baseline.

9.2.2 South Africa's greenhouse gas emissions plateau from peak in 2020 to 2035 South Africa's greenhouse gas emissions begin declining in absolute terms from plateau levels from 2036 onwards.

With the context of South Africa's climate change response objective, the emission trajectory described above is considered to be a fair contribution to the stabilisation of greenhouse gas concentrations in the atmosphere at a level that prevents dangerous anthropogenic interference with the climate system. It should be noted that the above trajectory is an ambitious one for a country that is as energy intensive and coal dependent as South Africa. In this context, the need for international finance, technology and capacity building support is a critical factor in the achievement of the trajectory. A key element of an international climate deal is likely to include an international monitoring, reporting and verification system (MRV) which will monitor and report on mitigation actions in developing countries. South Africa would want to make use of the National Communication system for this.

In order to monitor, verify and report mitigation progress and the efficacy of South Africa's mitigation interventions, South Africa will –

9.2.3 Develop, test and commission a web-based greenhouse gas emission reporting system as part of the National Atmospheric Emission Inventory component of the South African Air Quality Information System by 2012.

9.2.4 Require the mandatory submission of greenhouse gas emission data to the National Atmospheric Emission Inventory by all significant emitters and compilers of greenhouse gas emission related data and/or proxy data by 2013.

9.2.5 Publish an annual report comparing actual greenhouse gas emission data against the emission trajectory described above by 2014.

9.2.6 Keep a register of climate actions that result in the mitigation of greenhouse gases and also use this to measure progress against the overall GHG emission trajectory and national reduction targets.

-----oOo-----