
GENERAL NOTICE

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DEPARTMENT OF ENVIRONMENTAL AFFAIRS

WHITE PAPER ON THE NATIONAL CLIMATE CHANGE RESPONSE

I, Bomo Edith Edna Molewa, Minister of Water and Environmental Affairs hereby publish the White Paper on the National Climate Change Response for general information.

The electronic copy of the White Paper can be downloaded at the following website:
www.environment.gov.za.



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MINISTER OF WATER AND ENVIRONMENTAL AFFAIRS



THE GOVERNMENT OF THE REPUBLIC OF SOUTH AFRICA

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NATIONAL CLIMATE CHANGE RESPONSE WHITE PAPER

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LIST OF ABBREVIATIONS

CDM	Clean Development Mechanism
DBSA	Development Bank of Southern Africa
DoE	Department of Energy
DEA	Department of Environmental Affairs
DST	Department of Science and Technology
DTI	Department of Trade and Industry
GDP	Gross Domestic Product
GHG	Greenhouse gas
GHGs	Greenhouse gases
IGCCC	Intergovernmental Committee on Climate Change
IMCCC	Inter-Ministerial Committee on Climate Change
IPCC	Intergovernmental Panel on Climate Change
IRP 2010	Integrated Resource Plan for Electricity Generation 2010
MDGs	Millennium Development Goals
MRV	Measure, report and verify
NCCC	National Committee on Climate Change
NEDLAC	National Economic Development and Labour Council
NEMA	National Environmental Management Act
NEVA	National Employment Vulnerability Assessments
NEVB	National Employment Vulnerability Baseline
NGO	Non-Governmental Organisation
NGP	New Growth Path
NRF	National Research Foundation
SAAQIS	South African Air Quality Information System
SARVA	South African Risk and Vulnerability Atlas
SETA	Sector Education and Training Authority
SJRPs	Sector Jobs Resilience Plans
UNFCCC	United Nations Framework Convention on Climate Change

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EXECUTIVE SUMMARY

Climate change is already a measurable reality and along with other developing countries, South Africa is especially vulnerable to its impacts. This White Paper presents the South African Government's vision for an effective climate change response and the long-term, just transition to a climate-resilient and lower-carbon economy and society. South Africa's response to climate change has two objectives:

- Effectively manage inevitable climate change impacts through interventions that build and sustain South Africa's social, economic and environmental resilience and emergency response capacity.
- Make a fair contribution to the global effort to stabilise greenhouse gas (GHG) concentrations in the atmosphere at a level that avoids dangerous anthropogenic interference with the climate system within a timeframe that enables economic, social and environmental development to proceed in a sustainable manner.

This response is guided by principles set out in the Constitution, the Bill of Rights, the National Environmental Management Act, the Millennium Declaration and the United Nations Framework Convention on Climate Change. These principles are detailed in section 3.

The overall strategic approach for South Africa's climate change response is needs driven and customised; developmental; transformational, empowering and participatory; dynamic and evidence-based; balanced and cost effective; and integrated and aligned.

In terms of strategic priorities, the White Paper sets out South Africa's climate change response strategy to achieve the National Climate Change Response Objective in a manner consistent with the outlined principles and approach and which is structured around the following strategic priorities: risk reduction and management; mitigation actions with significant outcomes; sectoral responses; policy and regulatory alignment; informed decision making and planning; integrated planning; technology research, development and innovation; facilitated behaviour change; behaviour change through choice; and resource mobilisation.

See section 4 for details of the elements of the response policy.

In terms of adaptation, the National Climate Change Response includes a risk-based process to identify and prioritise short- and medium-term adaptation interventions to be addressed in sector plans. The process will also identify the adaptation responses that require coordination between sectors and departments and it will be reviewed every five years. For the immediate future, sectors that need particular attention are water, agriculture and forestry, health, biodiversity and human settlements. Resilience to climate variability and climate change-related extreme weather events will be the basis for South Africa's future approach to disaster management and we will use region-wide approaches where appropriate.

Section 5 expands on the adaptation part of the response policy.

South Africa's approach to mitigation, which is addressed by section 6 of the response policy, balances the country's contribution as a responsible global citizen to the international effort to curb global emissions with the economic and social opportunities presented by the transition to a lower-carbon economy as well as with the requirement that the country successfully tackles the development challenges facing it.

The key elements in the overall approach to mitigation will be:

- Using a National GHG Emissions Trajectory Range, against which the collective outcome of all mitigation actions will be measured;
- Defining desired emission reduction outcomes for each significant sector and sub-sector of the economy based on an in-depth assessment of the mitigation potential, best available mitigation options, science, evidence and a full assessment of the costs and benefits;

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- Adopting a carbon budget approach to provide for flexibility and least-cost mechanisms for companies in relevant sectors and/or sub-sectors and, where appropriate, translating carbon budgets into company level desired emission reduction outcomes.
- Requiring companies and economic sectors or sub-sectors for which desired emission reduction outcomes have been established to prepare and submit mitigation plans that set out how they intend to achieve the desired emission reduction outcomes.
- Developing and implementing a wide range and mix of different types of mitigation approaches, policies, measures and actions that optimise the mitigation outcomes as well as job creation and other sustainable developmental benefits. This optimal mix of mitigation actions will be developed to achieve the defined desired emission reduction outcomes for each sector and sub-sector of the economy by ensuring that actions are specifically tailored to the potential, best available solutions and other relevant conditions related to the specific sector, sub-sector or organisation concerned;
- The deployment of a range of economic instruments to support the system of desired emissions reduction outcomes, including the appropriate pricing of carbon and economic incentives, as well as the possible use of emissions offset or emission reduction trading mechanisms for those relevant sectors, sub-sectors, companies or entities where a carbon budget approach has been selected.
- A national system of data collection to provide detailed, complete, accurate and up-to-date emissions data in the form of a Greenhouse Gas Inventory and a Monitoring and Evaluation System to support the analysis of the impact of mitigation measures.

In addition to the direct physical impacts of climate change, there are also secondary economic impacts where South Africa may be economically vulnerable to response measures - measures taken both internationally and nationally, to reduce GHG emissions. As discussed in section 7, Government will take a multi-pronged approach to addressing and managing response measures, especially in respect of those that may have negative economic impacts.

A suite of Near-term Priority Flagship Programmes consisting of both new initiatives and the scaling up of existing initiatives will be implemented while the first sectoral desired emission reduction outcomes and carbon budgets are being developed and initial adaptation interventions prioritised. This component is addressed in section 8.

For job creation, as described in section 9, the National Climate Change Response aims to limit jobs contraction to those areas of the economy where excessive carbon intensity is unsustainable, whilst promoting and expanding the green economy sectors. The National Climate Change Response also aims to promote investment in human and productive resources that will grow the green economy. To do this, Government will assess the vulnerability of the different economic sectors to climate change and develop Sector Job Resilience Plans.

To mainstream climate-resilient development, section 10 notes that all Government departments and state-owned enterprises will need to review the policies, strategies, legislation, regulations and plans falling within their jurisdictions to ensure full alignment with the National Climate Change Response within two years of the publication of this policy. On the basis of the outcome of these reviews, government will determine what adjustments need to be made to achieve alignment with the goals and objectives of the National Climate Change Response, and will identify any additional legislative or regulatory measures that are needed. The National Climate Change Response itself will be reviewed every five years from the publication of this policy.

All sectors of the South African society will take part in the effort to mainstream climate-resilient development. Existing institutional arrangements, such as the Cabinet Clusters, the National Planning Commission, the Forum of South African Directors-General, the Parliamentary Portfolio Committee on Water and Environment Affairs, the Inter-Ministerial Committee on Climate Change, the Intergovernmental Committee on Climate Change and the multi-stakeholder National Committee on Climate Change will be used to drive this new policy direction.

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Government departments will start communicating with citizens about climate change to inform and educate them and to influence their behavioural choices. This includes setting up and maintaining early warning systems so that people can take specific actions to reduce risks to themselves, their households and property.

South Africa needs to mobilise financial, human and knowledge resources to effectively address climate change. To this end, Government will use existing financial institutions and instruments and it will help to develop new ones. This includes international financial assistance specifically for climate change response actions. During the initial period of transition to a climate-resilient and lower-carbon economy and society, Government will establish an interim climate finance coordination mechanism to secure the necessary resources for priority programmes.

See section 11 for further details on resource mobilisation.

To formulate effective responses to climate change, South Africa needs a country-wide monitoring system to measure climate variables at scales appropriate to the institutions that must implement climate change responses.

To monitor the success of responses to climate change, and to replicate the ones that have worked well, we need to measure their cost, outcome and impact. To this end, South Africa will, within two years of the publication of this policy, design and publish a draft Climate Change Response Monitoring and Evaluation System. Although the Climate Change Response Monitoring and Evaluation System will be based on South African scientific measurement standards and will be undertaken through the Presidency's Outcomes-Based System, it is expected that the system will evolve with international Measuring, Reporting and Verification requirements.

Section 12 details the systems needed to monitor and evaluate climate change and our responses to it.

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1. INTRODUCTION

The phenomenon known as "climate change", the focus of this policy, refers to an ongoing trend of changes in the earth's general weather conditions as a result of an average rise in the temperature of the earth's surface often referred to as global warming. This rise in the average global temperature is due, primarily, to the increased concentration of gases known as greenhouse gases (GHGs) in the atmosphere that are emitted by human activities. These gases intensify a natural phenomenon called the "greenhouse effect" by forming an insulating layer in the atmosphere that reduces the amount of the sun's heat that radiates back into space and therefore has the effect of making the earth warmer.

While weather changes on a daily basis, climate represents the statistical distribution of weather patterns over time, and on a global scale has changed only very slowly in the past – usually over periods of tens of thousands of years or even millions of years which allows time for the earth's bio-physical systems to adapt naturally to the changing climatic conditions. Currently, the global climate is changing much more rapidly as a result of global warming, leading to, among others, the melting of polar and glacier ice, sea-level rise, ocean acidification, changes in rainfall and snowfall patterns, more frequent floods and droughts and increased frequency and intensity of extreme weather events, such as tornadoes, hurricanes and cyclones. The rapid rate of this climate change does not allow the earth's bio-physical systems to adapt to these changes naturally.

Evidence of rapid climate change, including more frequent and intense weather systems and greater climate variability, has already been observed and includes:

- increases in the average global temperature; with the past decade being the hottest on record;
- rises in the average global sea level;
- changes in average rainfall patterns, with some regions experiencing higher rainfall (e.g. Northern Europe) and other areas experiencing drying (e.g. the Sahel and southern Africa);
- increased frequency of heavy rainfall and extreme weather events over most land areas; and
- more intense and longer droughts, particularly in the tropics and subtropics.

GHGs are emitted from, and are reabsorbed by, a variety of natural sources, but the rate at which human economies and societies are emitting these gases far exceeds the capacity of natural ecosystems to reabsorb them. Increased industrial activity since the mid-18th century has led to a rapid increase in the atmospheric concentration of GHGs such as carbon dioxide, methane and nitrous oxide, in large part due to the burning of fossil fuels derived from oil, coal and natural gas. We also know that land-based human activities, such as forest clearing and unsustainable agricultural practices, are not only increasing GHG emissions from these sources, but are also reducing the earth's natural ability to absorb GHGs. The evidence that current global warming is due to human activities associated with industrialisation and modern agriculture is overwhelming.

The rate of change to the earth's climate exceeds the ability of all types of ecosystems (marine, coastal, freshwater, and terrestrial) to adapt as well as compromising their ability to function effectively. Ecosystems provide important services to society, such as the formation of soil; the provision of food, fresh water, wood, fibre and fuel; the regulation of climate, floods and the spread of disease; protection from storm surges and floods; and a range of cultural, spiritual, educational and recreational services. The protection of biodiversity, habitats and ecosystems is essential to the maintenance of these services, which is a key pillar for sustainable development.

It is acknowledged that Africa, as a whole, has contributed least to GHG concentrations in the atmosphere, but also faces some of the worst consequences and generally has the least capacity to cope with climate change impacts. However, it is also recognised that South Africa is a relatively significant contributor to global climate change with significant GHG emission levels from its energy-intensive, fossil-fuel powered economy. On the

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other hand, South Africa is extremely vulnerable and exposed to the impacts of climate change due to our socio-economic and environmental context. Climate variability, including the increased frequency and intensity of extreme weather events, will disproportionately affect the poor. South Africa is already a water-stressed country and we face future drying trends and weather variability with cycles of droughts and sudden excessive rains. We have to urgently strengthen the resilience of our society and economy to such climate change impacts and to develop and implement policies, measures, mechanisms and infrastructure that protect the most vulnerable.

The science is clear that action to address the causes and impacts of climate change by a single country or small group of countries will not be successful. This is a global problem requiring a global solution through the concerted and cooperative efforts of all countries. Should multi-lateral international action not effectively limit the average global temperature increase to below 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 to 2°C and the interior by around 2 to 3°C. By 2100, warming is projected to reach around 3 to 4°C along the coast, and 6 to 7°C in the interior. With such temperature increases, life as we know it will change completely: parts of the country will be much drier and increased evaporation will ensure an overall decrease in water availability. This will significantly affect human health, agriculture, other water-intensive economic sectors such as the mining and electricity-generation sectors as well as the environment in general. Increased occurrence and severity of veld and forest fires; extreme weather events; and 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 with consequent impacts on eco-system services.

Against this national context, the South African Government:

- Accepts the conclusions of the Intergovernmental Panel on Climate Change (IPCC) in its Fourth Assessment Report, that warming of the climate system is unequivocal and that the increase in GHG concentrations as a result of human activity is primarily responsible for this warming trend.
- Regards climate change as one of the greatest threats to sustainable development and believes that climate change, if unmitigated, 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 (MDGs).
- Having ratified both the United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol, will continue to meaningfully engage in the current multilateral negotiations to further strengthen and enhance the international response to the climate change crisis. The Government specifically aims to continue its efforts to strengthen and ensure the full implementation of the UNFCCC and its Kyoto Protocol through additional multi-lateral rules-based and legally-binding international agreements that will come into force after 2012. These should effectively limit the average global temperature increase to below a maximum of 2°C above pre-industrial levels. In so doing, South Africa will strive to ensure that such agreements are inclusive, fair and effective; reflect a balance between adaptation and mitigation responses; and recognise that solving the climate problem will only be possible if developing countries' priorities of eradicating poverty and promoting sustainable development are taken into consideration.
- Notwithstanding these ongoing international negotiations, reaffirms that, in terms of the provisions of Articles 4, 5, 6 and 12 of the UNFCCC as well as Article 10 of the Kyoto Protocol, South Africa already has existing international legally binding obligations to:
 - Formulate, implement, publish and regularly update policies, measures and programmes to mitigate its emission of GHGs and adapt to the adverse effects of inevitable climate change;
 - Monitor and periodically report to the international community the country's GHG inventory; steps taken and envisaged to implement the UNFCCC; and any other information relevant to the

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- achievement of the objective of the UNFCCC, including information relevant for the calculation of global emission trends;
- Sustainably manage, conserve and enhance GHG sinks and reservoirs, including terrestrial, coastal and marine ecosystems, biomass, forests and oceans;
 - Develop climate change response plans to address integrated coastal zone, water resources, agriculture, and land protection and rehabilitation;
 - Mainstream climate change considerations into social, economic and environmental policy;
 - Promote and cooperate in the development, application, diffusion and transfer of GHG emission mitigation technologies, practices and processes;
 - Further develop and support research and systematic observation organisations, networks and programmes as well as efforts to strengthen systematic observation, research and technical capacities, including promoting research and systematic observation in areas beyond national jurisdiction; and
 - Develop and implement education, training and public awareness programmes on climate change and its effects to promote and facilitate scientific, technical and managerial skills as well as public access to information, public awareness of and participation in addressing climate change.

Government also acknowledges that:

- Notwithstanding the effectiveness of any strengthened international response to the climate change crisis, a certain amount of climate change is already observed and further climate change will be inevitable due to the slow response (or inertia) of the climate system to changes in the concentration of GHGs in the atmosphere. Therefore South Africa will have to adapt to these impacts by managing its climate and weather-related risks, reducing its vulnerability and increasing the resilience of our society and economy to the adverse effects of climate change and variability;
- The stabilisation of GHG concentrations in the atmosphere at a level that prevents dangerous interference with the climate system requires the implementation of a sufficiently ambitious and effective global agreement on GHG emission reductions. In this context, as a responsible global citizen, and in keeping with its developing country status, its capability and its share of responsibility for the problem, South Africa is committed to making a fair contribution to the global effort to reduce GHG emissions. At the same time, the country must ensure that the necessary climate change-related investments contribute to building South Africa's future economic competitiveness and economic growth and contribute to its over-riding national priorities for sustainable development, job creation, improving public and environmental health and poverty eradication; and
- That although there will be costs associated with South Africa's adaptation and GHG 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 lower-carbon economy and society. Furthermore, various economic studies have shown that the costs of early action will be far less than the costs of delay and inaction.

Given the cross-cutting nature of climate change impacts and responses, Government further recognises that an effective response to climate change requires national policy to ensure a coordinated, coherent, efficient and effective response to the global challenge of climate change.

The policy outlined in this White Paper embodies South Africa's commitment to a fair contribution to stabilising global GHG concentrations in the atmosphere and to protecting the country and its people from the impacts of inevitable climate change. It presents the vision for an effective climate change response and the long-term transition to a climate-resilient, equitable and internationally competitive lower-carbon economy and society – a vision premised on Government's commitment to sustainable development and a better life for all.

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2. NATIONAL CLIMATE CHANGE RESPONSE OBJECTIVE

South Africa will build the climate resilience of the country, its economy and its people and manage the transition to a climate-resilient, equitable and internationally competitive lower-carbon economy and society in a manner that simultaneously addresses South Africa's over-riding national priorities for sustainable development, job creation, improved public and environmental health, poverty eradication, and social equality. In this regard, South Africa will:

- Effectively manage inevitable climate change impacts through interventions that build and sustain South Africa's social, economic and environmental resilience and emergency response capacity.
- Make a fair contribution to the global effort to stabilise GHG concentrations in the atmosphere at a level that avoids dangerous anthropogenic interference with the climate system within a timeframe that enables economic, social and environmental development to proceed in a sustainable manner.

3. PRINCIPLES

The achievement of South Africa's climate change response objective is guided by the principles set out in the Constitution, the Bill of Rights, the National Environmental Management Act (NEMA), the MDGs and the UNFCCC. The principles include, amongst others:

- **Common but differentiated responsibilities and respective capabilities** – aligning our domestic measures to reduce the country's GHG emissions and adapt to the adverse effects of climate change with our unique national circumstances, stage of development and capacity to act.
- **Equity** – ensuring a fair allocation of effort, cost and benefits in the context of the need to address disproportionate vulnerabilities, responsibilities, capabilities, disparities and inequalities.
- **Special needs and circumstances** – considering the special needs and circumstances of localities and people that are particularly vulnerable to the adverse effects of climate change, including vulnerable groups such as women, and especially poor and/or rural women; children, especially infants and child-headed families; the aged; the sick; and the physically challenged.
- **Uplifting the poor and vulnerable** – climate change policies and measures should address the needs of the poor and vulnerable and ensure human dignity, whilst endeavouring to attain environmental, social and economic sustainability.
- **Intra- and Inter-generational sustainability** – managing our ecological, social and economic resources and capital responsibly for current and future generations.
- **The Precautionary Principle** – applying 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** – those responsible for harming the environment paying the costs of remedying pollution and environmental degradation and supporting any consequent adaptive response that may be required.
- **Informed participation** – enhancing public awareness and understanding of climate change causes and impacts to promote participation and action at all levels.
- **Economic, social and ecological pillars of sustainable development** – recognising that a robust and sustainable economy and a healthy society depends on the services that well-functioning ecosystems provide, and that enhancing the sustainability of the economic, social and ecological services is an integral component of an effective and efficient climate change response.

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4. THE SOUTH AFRICAN CLIMATE CHANGE RESPONSE STRATEGY

Responses to climate change have been commonly categorised as either aimed at reducing the rate at which climate is changing to levels that occur naturally (and especially reducing the atmospheric concentrations of GHGs, so-called "mitigation") or responding to the adverse effects of climate change ("adaptation"). In addition, there is also the issue of managing any unintended negative consequences of climate change policies and measures, widely referred to as "response measures", on other countries. However, an effective South African climate change response requires economic, social and environmental interventions that integrate mitigation and adaptation elements within a developmental framework. Furthermore, an effective South African climate change response also requires the management of any response measures generated by our action as well as being able to respond to the response measures of other countries that have negative consequences for our country. Categorising responses as either mitigation or adaptation responses can obscure the real and potential positive combined impact of these responses. Thus, although this policy still retains the mitigation and adaptation categories for the sake of clarity, the policy also reflects a strategic approach referred to as "climate change resilient development".

For further clarity, the climate change response makes use of the following time-bound planning horizons:

- **Short-term** – five years from date of publication of the policy.
- **Medium-term** – twenty years from date of publication of the policy.
- **Long-term** – a planning horizon that extends to 2050.

4.1 Overall Approach

Climate change resilient development refers to all interventions – mitigation, adaptation or both – that contribute to a fair and effective global solution to the climate change challenge while simultaneously building and maintaining South Africa's international competitiveness, its social, environmental and economic resilience to the adverse effects of global climate change, and any unintended consequences of global climate change response measures. In this regard, the policy develops a "win-win" strategic approach that is:

- **Needs-driven and customised** – Employing a wide range of different types of adaptation and mitigation approaches, policies, measures, programmes, interventions and actions consistent with the principles outlined above, but in particular, that meet the special needs and circumstances of those most vulnerable as well as being specifically tailored to the potential, best available solutions and other relevant conditions related to the specific actor, organisation, sector or sub-sector concerned;
- **Developmental** – Prioritising climate change responses that have both significant mitigation and adaptation benefits and that also have significant economic growth, job creation, public health, risk management and poverty alleviation benefits;
- **Transformational, empowering and participatory** – Implementing policies and measures to address climate change at a "scale of economy" that enables and supports the required level of innovation, sector and skills development, finance and investment flows needed to reap the full benefit of a transition to a lower-carbon, efficient, job-creating, equitable and competitive economy. The transition will necessarily be supported and enabled by policies and measures to empower and promote the participation of all citizens through changing their behaviour to more sustainable lifestyles and livelihoods. This policy is therefore part of the broader social and economic transformation as envisaged by the New Growth Path (NGP) and is fundamentally underpinned by a major shift towards sustainable consumption and production patterns, which decouples growth and development from any negative impacts on the environment and society;
- **Dynamic and evidence-based** – Recognising that this policy has not been developed in a vacuum and many sectors have already researched and have experience in implementing policies and measures to address the challenges of climate change. Therefore, this policy takes an approach of:

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- Immediate implementation of Near-term Priority Flagship Programmes comprising of –
 - Continued implementation of existing successful policies and measures with only policy alignment and integration intervention as required;
 - Scaled-up roll-out of those existing successful policies and measures, which have successfully completed a demonstration phase, where feasible;
 - Implementation of proven “no-regret policies and measures” in the immediate and near-term (e.g. best available technologies and best practices), particularly those that are well researched or understood, have socio-economic developmental and job creation benefits, and have negative-cost, zero-cost or low-cost implications for the economy and society;
- Simultaneously, further researching, consulting on, developing and demonstrating the detail of additional policies and measures consistent with the provisions of this policy, for implementation in the short-, medium- and longer-term, as and when ready; and
- Rigorously monitoring and evaluating the effectiveness of implemented policies and measures with a view to improving efficiency through adjustments or discarding those that are ineffective;
- **Balanced and cost effective** – Implementing a balanced approach to both climate change mitigation and adaptation responses in terms of cost-benefit, prioritisation, focus, action and resource allocation; and
- **Integrated and aligned** – Providing for the integration of sector-related climate change responses into the relevant sector planning processes and their developmental policies and measures. Where cross-cutting climate change responses are called for, this policy provides for their inclusion in, and consideration by, the relevant National, Provincial and/or Local planning regime as well as coherent alignment with the relevant policies and legislation.

4.2 Strategic Priorities

This White Paper sets out South Africa's climate change response strategy to achieve the National Climate Change Response Objective in a manner consistent with the principles and approach outlined above and which is structured around the following strategic priorities:

- **Risk reduction and management** – prioritise near-term adaptation interventions that address immediate and observed threats to the economy, ecosystem services and the health and well-being of South Africans while researching and developing short-, medium- and longer-term climate resilience, risk and vulnerability management policies and measures.
- **Mitigation actions with significant outcomes** – prioritise cost effective and beneficial mitigation policies, measures and interventions that significantly contribute to the country's deviation from the GHG emission “business as usual trajectory” as measured against a benchmark “peak, plateau and decline” GHG emission trajectory where GHG emissions peak between 2020 and 2025, plateau for approximately a decade and begin declining in absolute terms thereafter.
- **Sectoral responses** – prioritise, in accordance with the provisions of this policy, the requirement for all key actors, organisations or participants in relevant sectors or sub-sectors to prepare, submit, implement, monitor and report the implementation of detailed climate change response strategies and action plans that clearly articulate their roles, responsibilities, policies, measures, and interventions or actions to contribute to the achievement of the National Climate Change Response Objective in a measurable way.
- **Policy and regulatory alignment** – firstly, prioritise interventions already envisaged by national policies, legislation or strategies that have climate change co-benefits, particularly those that also contribute towards the national priorities of job creation, poverty alleviation or have other positive socio-economic benefits. Secondly, review existing national policies, legislation or strategies, with a view to optimising and maximising the climate change co-benefits of their interventions. Thirdly, integrate into the relevant

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existing or new policies, legislation or strategies those climate change response interventions that stimulate new economic activities as well as those that improve the efficiency and competitive advantage of existing activities.

- **Integrated planning** – prioritise the mainstreaming of climate change considerations and responses into all relevant sector, national, provincial and local planning regimes such as, but not limited to, the Industrial Policy Action Plan, Integrated Resource Plan for Electricity Generation, Provincial Growth and Development Plans, and Integrated Development Plans.
- **Informed decision-making and planning** – prioritise research, systemic observation, knowledge generation, information management and early warning systems that increase our ability to measure and predict climate change and the implications of its adverse effects on the economy, society and the environment.
- **Technology research, development and innovation** – prioritise cooperation and the promotion of research, investment in and/or acquisition of adaptation, lower-carbon and energy-efficient technologies, practices and processes for employment by existing or new sectors or sub-sectors.
- **Facilitated behaviour change** – prioritise the use of incentives and disincentives, including regulatory, economic and fiscal measures, to promote behaviour change towards a lower-carbon society and economy.
- **Behaviour change through choice** – prioritise education, training and public awareness programmes to build the general public's awareness of climate change so as to empower all South Africans to make informed choices that contribute to an economy and society that is resilient to climate change.
- **Resource mobilisation** – prioritise the development of comprehensive resource and investment mobilisation strategies, capacities, mechanisms or instruments that support and enable implementation of climate change responses at the scale required, including, but not limited to, public and private financial resources, incentives, non-market and market-based instruments, technical cooperation and partnership agreements, and technology transfers at domestic, sub-regional, regional, and international levels.

5. ADAPTATION

5.1 Overall approach

All states in the Southern African sub-region face the challenges of rural and urban poverty, limited water or access to water resources, food insecurity, and other development challenges. Thus, although countries of the sub-region may have differing developmental priorities, they often face similar risks due to climate change and may also have similar adaptation needs. South Africa will therefore strive to develop climate change adaptation strategies based on risk and vulnerability reduction, in collaboration with its neighbours where appropriate, and seek to share resources, technology and learning to coordinate a regional response. A regional approach that achieves climate resilience will have significant socio-economic benefits for South Africa, including a smaller risk of unmanaged regional migration.

A leading international assessment of the effects of climate change on the global economy, the Stern Review, estimates that damages from unmitigated climate change could range between 5% and 20% of global Gross Domestic Product (GDP) annually by 2100. In the absence of effective adaptation responses, such levels of damages would certainly threaten and even reverse many development gains made in South Africa.

Future climate trends are uncertain and the uncertainty rises steeply over the longer-term. Objectives for adaptation must therefore be able to adjust to changing circumstances and time-frames. For this reason, South Africa needs to plan flexibly for a wide range of possible responses over the medium- to long-term. We also need focused monitoring and evaluation systems to update our knowledge of how rapidly the change is occurring and

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the effectiveness of adaptation responses. Section 12 contains more information about these monitoring and evaluation systems.

A key feature of adaptation responses is that they have a much stronger local context than do mitigation responses and their benefits may appear much faster and are often more tangible, such as an improvement in local environmental quality, for instance. Effective adaptation responses can also potentially create many jobs, particularly "green jobs", and could contribute significantly to sustainable development goals. Well planned adaptation responses can thus be effectively integrated with sustainable development policies.

Effective planning and coordination of an integrated adaptation response will require:

- Early warning and forecasting for disaster risk reduction.
- Medium-term (decade-scale) climate forecasting to identify potential resource challenges well in advance.
- Long-term climate projections that define the range of future climate conditions.

These need to be reinforced by research, capacity development, and technology development, and to respond to the needs of disaster risk reduction in the short-term, and integrated resource and development planning in the medium- and long-term.

Government departments have begun working on sectoral adaptation responses, and these include job creation and growth strategies, especially in the green economy, as well as the protection and support of vulnerable groups. As a first step in ensuring that appropriate adaptation responses are mainstreamed into sectoral plans, a sub-committee of the Intergovernmental Committee on Climate Change (IGCCC) will be established to perform climate risk analyses on all sectoral plans, informed by the various sectoral adaptation responses, within two years of the publication of this Policy, this process will result in –

- The identification and prioritisation of key short- and medium-term adaptation interventions that must be addressed in sector plans; and
- The identification of adaptation responses that require coordination between specific sectors and/or departments.

Using the results of this analysis, adaptation strategies will be integrated into sectoral plans, including:

- The National Water Resource Strategy, as well as reconciliation strategies for particular catchments and water supply systems.
- The Strategic Plan for South African Agriculture.
- The National Biodiversity Strategy and Action Plan, as well as provincial biodiversity sector plans and local bioregional plans.
- The Department of Health Strategic Plan.
- The Comprehensive Plan for the Development of Sustainable Human Settlements.
- National Framework for Disaster Risk Management

In addition to a refinement of top-down approaches, developing more detailed bottom-up approaches informed by the responses of local communities and local government will deliver results with a higher degree of confidence than is currently possible.

5.2 Water

South Africa is a water scarce country with a highly variable climate and has one of the lowest run-offs in the world – a situation that is likely to be significantly exacerbated by the effects of climate change. Uniquely, South Africa shares four of its major river systems with six neighbouring countries. These four shared catchments

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amount to approximately 60% of South Africa's surface area and approximately 40% of the average total river flow.

Based on current projections South Africa will exceed the limits of economically viable land-based water resources by 2050. The adequate supply of water for many areas can be sustained only if immediate actions are taken to stave off imminent shortages. The water sector must balance the allocation of limited water resources amongst major users (agriculture, domestic urban use and industry), whilst addressing the need to ensure fair access to water for all South Africa's people as well as a sufficient ecological allocation to maintain the integrity of ecosystems and thereby the services they provide.

Although Government has provided basic water services to an estimated additional nine million people since 1994, they are mostly in urban areas. In many rural areas, lack of reticulated water and sanitation means that people rely on generally poorly managed local resources such as ground water, springs and rivers that are vulnerable to pollution and drought. Poor communities who are dependent on natural water resources cannot control the quality of their water or store the water supply in bulk.

While there is a degree of uncertainty as to the net effects of climate change on water availability, rainfall is expected to become more variable, with an increase of extreme events such as flooding and droughts resulting in a much more variable runoff regime. Downscaled climate modelling suggests that the western and interior parts of the country are likely to become drier, and the eastern parts of the country wetter. Increased rainfall intensity will exacerbate scouring in rivers and sedimentation in dams, potentially impacting on water supply and treatment infrastructure. Higher temperatures, combined with higher carbon dioxide levels, will contribute to increased growth of algae as well as faster evaporation rates negatively impacting water resources.

Water availability is a key climate change-related vulnerability and negative impacts on the availability of water will be felt by people, ecosystems and the economy. As a result, climate change poses significant additional risks for water security, which in turn has knock-on effects on those sectors highly reliant on water such as agriculture, electricity generation as well as some mining and industrial activities. Thus, this set of vulnerabilities must be considered and integrated into both short- and medium-term water sector planning approaches.

In the short term, the development of a climate change response for the water sector through the *National Water Resource Strategy* plays a key role in government's Integrated Water Resource Planning process and will inform the ongoing maintenance of the water balance reconciliation strategies for water management areas that have recently been developed for water supply systems for up to 75% of the country's population, and the areas which together generate well over 80% of the national GDP.

In the medium to long term, the *Water for Growth and Development Framework*, which has a 2030 planning horizon, aims to balance the critical role of water in terms of both poverty alleviation (ensuring the constitutional right to a reliable and safe water supply) and economic development (be it for domestic, industry, mining, agricultural or forestry use). Water vulnerability and response must also be adequately factored into this framework document.

A two-pronged approach will be followed in which, firstly, in the short-term, climate change is used as the catalyst for addressing urgent short comings in the water sector and implementing effective, efficient and sustainable water resources and services management measures. Secondly, a long-term strategic focus on planning, adaptation and the smart implementation of new concepts and proactive approaches to managing water resources. To this end, the key elements of the National Climate Change Response Policy for the water sector include:

- 5.2.1 Integrating climate change considerations in the short-, medium- and long-term water planning processes across relevant sectors such as agriculture, industry, economic development, health, science and technology.
- 5.2.2 Sustaining state-of-the-art, water-related research and capacity development in all aspects of climate change in order to ensure the availability of relevant high quality, complete and current data, and tools with which to analyse the data.

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- 5.2.3 Ensuring that water adaptation measures are managed from a regional perspective given the trans-boundary nature of our major rivers.
- 5.2.4 Implementing best catchment and water management practices to ensure the greatest degree of water security and resource protection under changing climatic conditions and, in particular, investment in water conservation and water demand management.
- 5.2.5 Exploring new and unused resources, particularly groundwater, re-use of effluent, and desalination.
- 5.2.6 Reducing the vulnerability and enhancement of the resilience to water-related impacts of climate change in communities and sectors at greatest risk
- 5.2.7 Providing human, legal, regulatory, institutional, governance and financial resources and capacity to deal with the long-term effects of climate change
- 5.2.8 Undertaking focused monitoring and research in order to ensure the efficacy of water adaptation approaches over the long-term.

5.3 Agriculture and commercial forestry

Climate change significantly impacts agriculture and commercial forestry and they have significant potential for adaptation. Globally, agriculture is a key contributor to climate change, being responsible for about 14% of all GHG emissions. In both the agriculture and commercial forestry sectors synergy and overlap exists between adaptation and mitigation measures, and climate-resilient sectoral plans have the potential to directly address the plight of those most impacted by climate change – the rural poor. Furthermore, in these sectors climate resilience addresses issues of strategic national importance: food security, water, health, and land reform. Agriculture is the largest consumer of water (through irrigation) and is vulnerable to changes in water availability, increased water pollution (particularly from toxic algal or bacterial blooms) and soil erosion from more intense rainfall events and increased evapotranspiration. Under-resourced, small-scale and subsistence farmers are particularly vulnerable to the impacts of climate change.

At the same time, conventional, commercial input-intensive agriculture has a range of negative environmental, social and economic externalities, which increasingly render it an unsustainable model. However, commercial agriculture remains a significant contributor to GDP and employment. Its full contribution, with multipliers, comprises up to 12% of GDP and 30% of national employment. Crop failures can therefore have a significant economic impact. A climate-resilient agricultural response depends on the recognition that agriculture should provide not only food, but also a range of other environmental and socio-economic benefits. The appropriate use of small-scale labour-intensive agriculture techniques and models could reverse the present decrease in agricultural jobs; contribute to empowerment goals; promote food security; conserve soil quality and structure; and contribute to biodiversity.

Modelling of climate change scenarios is vital to informing land-use planning decisions in agriculture that determine the mix of livestock and crop cultivation, as well as the types of crops that are likely to be commercially viable.

Commercial forestry in the form of alien plantations reduces streamflow and so impacts scarce water resources. It also reduces biodiversity. However, plantations function as carbon sinks that reduce the amount of GHGs in the atmosphere.

To build resilience to climate change, the priorities for agriculture and commercial forestry are to:

- 5.3.1 Integrate agriculture and forestry into climate-resilient rural development planning to address job creation, food security and livelihoods with a particular emphasis on building climate resilience through leveraging synergies between adaptation and mitigation.
- 5.3.2 Using the results of available risk and vulnerability studies, develop and update short-, medium- and long-term adaptation scenarios to identify climate-resilient land-uses. This will support the agricultural

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industry's proactive efforts to exploit new agricultural opportunities, new areas and new crops and it will reduce the impacts of climate change on existing agricultural potential.

- 5.3.3 Invest in and improve research into water, nutrient and soil conservation technologies and techniques, climate-resistant crops and livestock, as well as agricultural production, ownership, and financing models to promote the development of "climate-smart agriculture" that lowers agricultural emissions, is more resilient to climate changes, and boosts agricultural yields.
- 5.3.4 Use early warning systems to give timely warnings of adverse weather and possibly related pests and disease occurrence. This will also provide up-to-date information and decision support tools to assess the vulnerability of farmers and inform farm management decisions.
- 5.3.5 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.

5.4 Health

The South African health sector is one of the five key priorities of government. A significant proportion of South Africans, and in particular the poor, already have serious and complex health challenges compounded by poor living conditions. These include amongst the world's highest rates of tuberculosis and HIV infection. In particular parts of the country, the coverage of vector-borne diseases like malaria, rift valley fever and schistosomiasis may spread due to climate change, requiring a concomitant expansion of public health initiatives to combat these diseases. The links between the environment, food security and the infectious profiles of communities and regions have been well established.

Within this context, the extreme weather events and increased climate variability associated with climate change provides a number of significant compounding factors that negatively affect the health and resilience of vulnerable communities:

- The negative impacts of climate change on the socio-economic standing of the most vulnerable communities, and the consequences in terms of food security and the nutritional status of individuals within these communities threatens to further undermine their resistance to diseases such as HIV/AIDS and tuberculosis.
- The links between weather and disease are well established – for instance, studies have shown a strong association between extreme weather events such as droughts and flooding and the incidence of water borne diseases such as cholera.
- Furthermore, direct physical temperature stresses pose particular risks for children, the elderly and socio-economically vulnerable communities. South African data from the past four decades indicates an increase in the number of hotter days and nights and therefore an increased risk of casualties from heat stress.
- Women, as primary care-givers, are put under additional strain looking after sick and elderly household members whilst maintaining a household. This leaves them less time to earn a livelihood putting cyclical pressure on them as they often neglect their own health in prioritising the health of others.
- In densely populated urban areas, air pollution resulting primarily from the burning of fossil fuels may have serious health effects. Whilst South Africa's air quality is generally good, stagnant air episodes in cities can create extremely poor air quality conditions and there are indications that climate change may increase the number and intensity of such events.

In response to these challenges, South Africa will integrate climate change considerations into health sector plans to:

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- 5.4.1 Reduce the incidence of respiratory diseases and improve air quality through reducing ambient particulate matter, ozone, and sulphur dioxide concentrations by legislative and other measures to ensure full compliance with National Ambient Air Quality Standards by 2020. In this regard, the use of legislative and other measures that also have the co-benefit of reducing GHG emissions will be prioritised. Progress in this regard will be published on the South African Air Quality Information System (SAAQIS).
- 5.4.2 Recognising that the nutritional status of individuals is key to building resilience to environmental health threats, ensure that food security and sound nutritional policies form part of an integrated approach to health adaptation strategies.
- 5.4.3 Develop and roll-out public awareness campaigns on the health risks of high temperatures and appropriate responses including improved ventilation and promotion of behaviours that minimise exposure to high temperatures, namely "avoidance behaviour".
- 5.4.4 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.
- 5.4.5 Strengthen information and knowledge of linkages between disease and climate change through research.
- 5.4.6 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 (SARVA).
- 5.4.7 Improve the bio-safety of the current malaria control strategy. Although the current strategy, which includes the use of the persistent organic pollutant, DDT, has proven effective in reducing the incidence of malaria, there are significant concerns about its long-term impacts on environmental and human health.
- 5.4.8 Strengthen the awareness programme on malaria and cholera outbreaks.

5.5 Biodiversity and ecosystems

Climate change will compound the pressures on already stressed ecosystems that have resulted from the unsustainable use and inadequate management of many of South Africa's ecosystems and so potentially reduce the quantity and quality of the services that ecosystems currently provide. These critical services underpin South Africa's socio-economic activities. Stressed ecosystems will compromise one of the key responses available to the country to adapt to climate change: using ecosystem services to help society adapt to climate change, known as 'ecosystem-based adaptation'.

Although South Africa has a conceptual understanding of the possible impacts of climate change on many of its key biodiversity assets, a comprehensive and quantitative evaluation of various climate change, and climate change impact, scenarios has yet to be undertaken for all significant ecosystems, especially with respect to the services they provide.

Notwithstanding the uncertainty alluded to above, projected climate change impacts on biodiversity assets are likely to include although are not limited to:

- Roughly 30% of endemic terrestrial species in South Africa may be at an increasingly high risk of extinction by the latter half of this century if climate change is not mitigated.
- Marine ecosystems and species are at risk from changes in water temperature, ocean acidification and from changes in ocean currents such as West Coast upwelling and Agulhas current strengthening. Change in South Africa's marine and coastal environment is already being observed and this change has already had significant impacts on the fisheries sector and on the local economy of small-scale and subsistence fishing communities along the West Coast.

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- Changes in rainfall patterns and temperatures, and rising atmospheric carbon dioxide levels could shift the distribution of South African terrestrial biomes with many implications for species diversity, ecosystem processes such as wildfires, and critical ecosystem services such as water yield and grazing biomass.
- Increasing frequency of extreme rainfall events will influence runoff quality and quantity in complex ways, significantly affecting the marine and estuarine environment. Reduced water flow will increase the salinity of estuaries, affecting the breeding grounds and nursery areas of many marine species. Coastal estuaries will also be vulnerable to long-term sea-level rise.
- Rising atmospheric carbon dioxide has poorly known direct effects on ecosystems. It may be increasing the cover of shrubs and trees in Grassland and Savannah Biomes, with mixed effects on biodiversity and possible positive implications for carbon sequestration.
- Additional stresses to biodiversity resulting from climate change include wildfire frequency (which appears to already show climate change-related increases in the Fynbos Biome), and the prevalence of invasive alien species. These stresses combined with reduced and fragmented habitats will further increase the vulnerability of biodiversity to climate change.

In response to these challenges, South Africa will integrate climate change into the management of biodiversity and ecosystem services as follows:

- 5.5.1 Strengthen biodiversity management and research institutions so that they can monitor, assess and respond effectively to existing anthropogenic pressures together with the additional pressures that climate change presents.
- 5.5.2 Conserve, rehabilitate and restore natural systems that improve resilience to climate change impacts or that reduce impacts. For example, mangrove forests reduce storm surge impacts and riparian vegetation and wetland ecosystems reduce the potential impact of floods. Opportunities to conserve biodiversity and extend the conservation estate through the development of carbon off-set programmes will be actively developed, such as those presented by the preservation of Spekboom as part of the Eastern Cape Thicket Biome.
- 5.5.3 Prioritise impact assessments and adaptation planning that takes into account the full range of possible climate outcomes, in conjunction with plausible scenarios of other stresses.
- 5.5.4 Prioritise climate change research into marine and terrestrial biodiversity and ecosystem services, and institute effective monitoring to enhance the understanding and forecasting of critical future threats. Monitoring efforts at national and sub-national scale, supported by experimental studies that quantify future risks to biodiversity and that improve projections of impacts, will help to design and refine adaptation responses.
- 5.5.5 Enhance existing programmes to combat the spread of terrestrial and marine alien and invasive species, especially in cases where such infestations worsen the impacts of climate change.
- 5.5.6 Expand the protected area network (in line with the *National Protected Area Expansion Strategy*) where it improves climate change resilience, and manage threatened biomes, ecosystems, and species in ways that will minimise the risks of species extinction. A regulatory framework to support investment in conservation or land rehabilitation as a way of offsetting the environmental impacts of new property developments will be explored.
- 5.5.7 Encourage partnerships for effective management of areas not under formal protection, especially freshwater ecosystem priority areas, critical biodiversity areas, ecological support areas and threatened ecosystems.
- 5.5.8 In the medium-term, expand existing gene banks to conserve critically endangered species that show increasing vulnerability to climate change trends.

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5.6 Human Settlements – Urban Settlements

More than 60% of South Africa's population live in urban areas, which cover only 1.5% of South Africa's surface area. The average growth rate for urban areas is consistently higher than the population growth rate. Urban areas are functionally more efficient, with lower per capita costs of services and land requirements for human settlement, but urban areas consume more resources and have an impact far beyond their urban boundaries. Urban sprawl reduces biodiversity and it pollutes land, water and air. Informal settlements are vulnerable to environmental and health risks because dwellings are in areas prone to disasters and that lack basic services.

Urban human settlements face the following climate change challenges:

- Climate change may exacerbate the problems caused by poor urban management. For example, poor storm water drainage systems and urban-induced soil erosion result in flash flooding. Increased storm intensity due to climate change would exacerbate such problems.
- Cities are particularly vulnerable to climate change because they are slow to adapt to changes in the environment and they have entrenched dependencies on specific delivery mechanisms for critical services.
- The effective management of the interface between urban residents and their surrounding environment producing sustainable social-ecological systems needs to be addressed. Similarly the concept of climate resilience in the context of urban social-ecological systems needs to be further developed.
- South Africa's cities still reflect apartheid planning with the poorest communities tending to live far away from services and employment. Our cities are relatively spread out and these two factors contribute to increased transport emissions.
- Water demand in urban centres is growing rapidly, placing undue stress on water supply systems. Investment in waste water treatment works has not remained in line with the growth in demand and use.
- Informal settlements are vulnerable to floods and fires, exacerbated by their location in flood- or ponding-prone areas and on sand dunes; inferior building materials; and inadequate road access for emergency vehicles.
- Cities and dense urban settlements consume large amounts of energy.

In response to these challenges, South Africa will:

- 5.6.1 Investigate how to leverage opportunities presented by urban densification to build climate-resilient urban infrastructure and promote behavioural change as part of urban planning and growth management.
- 5.6.2 In the implementation of low-cost housing, ensure access to affordable lower-carbon public transport systems, incorporate thermal efficiency into designs and use climate-resilient technologies.
- 5.6.3 Develop effective information, monitoring and assessment tools to evaluate the resilience of our cities and towns to climate change and assist urban planners in identifying priorities for scaling-up climate change responses. Strengthen and enhance decision support tools and systems such as the *Toolkit for Integrated Planning* and develop geographic information systems that include, but not limited to, asset management components for public infrastructure.
- 5.6.4 Encourage and develop water-sensitive urban design to capture water in the urban landscape and to minimise pollution, erosion and disturbance. Urban infrastructure planning must account for water supply constraints and impacts of extreme weather-related events.
- 5.6.5 Acknowledging the current modelling limitations, encourage and support the appropriate down-scaling of climate models to provincial and, where possible, metropolitan and district levels to provide climate information at a scale that can be integrated into medium- and long-term spatial development plans and information systems.

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- 5.6.6 Ensure that land-use zoning regulations are enforced and that urban land-use planning considers the impacts of climate change and the need to sustain ecosystem services when considering settlements and infrastructure development proposals.

5.7 Human Settlements – Rural Settlements

Over nineteen million, or 39%, of South Africans live in rural areas. Eighty percent of rural areas are commercial farming areas with low population densities, and 20% are former "homelands" where the agricultural sector has been undermined, settlements are often densely populated, and people are poor and 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. Seventy percent of the country's poorest households live on small-scale farms and few of them produce enough food to feed themselves throughout the year.

Rural human settlements face the following climate change challenges:

- Small-scale and subsistence food production is particularly vulnerable to climate variability, relying mostly on dryland food production with limited capital to invest in soil fertilisation, seed and weed, pest and disease control.
- Climate change, in particular changes in production systems and climate change-related damage and crop failures, is likely to negatively affect employment in rural areas.
- Spatial planning needs to address historical inequalities in land distribution without compromising the ability of the agricultural sector to contribute to food security.
- Rural communities with the highest dependence on natural water sources are in KwaZulu-Natal, the Eastern Cape and Limpopo. The former two will probably experience more flooding and water contamination. In addition to these, Limpopo will probably experience more droughts. These are 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 the soonest and most greatly negatively affected by climate change.

In response to these challenges, South Africa will:

- 5.7.1 Educate subsistence and small-scale farmers on the potential risks of climate change, and support them to develop adaptation strategies with on-farm demonstration and experimentation. Adaptation strategies will include conservation agriculture practices including water harvesting and crop rotation, and will prioritise indigenous knowledge and local adaptive responses.
- 5.7.2 Empower local communities, particularly women who are often primary producers, in the process of designing and implementing adaptation strategies.
- 5.7.3 Design and implement economic and livelihood diversification programmes in rural areas.
- 5.7.4 Within the country's research and development system, prioritise technologies for climate change adaptation within rural areas, including low water-use irrigation systems, improved roll-out of rainwater harvesting strategies, and drought-resistant seed varieties.
- 5.7.5 Target adaptation programmes to build resilience among the most vulnerable sections of the rural population and ensure that disaster management architecture includes the provision of safety nets for rural communities most vulnerable to the impacts of climate change. This includes enhancing their knowledge of sustainable environmental conditions and optimising the ecosystem services that these provide.

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5.8 Human Settlements – Coastal Settlements

Coastal human settlements are the most vulnerable to an increase in sea-level rise due to climate change. 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 situated along the coastline. These areas also host high volumes of local and international tourists annually. A network of infrastructural installations and communication links along the coast, built by public and private enterprises, service the needs of the inhabitants, tourists and other entities in the coastal zone. The attraction of lifestyle and development opportunities in coastal area is leading to significant migration to the coast, with additional settlements and services in areas that are not immune to the impacts of climate change.

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 coastline will become increasingly vulnerable to storm surges, coastal erosion, sea-level rise and extreme weather events. A continual assessment of coastal defences, particularly at harbours, estuaries and lagoons, and along low-lying coastal land, will be needed to reduce damage in high risk areas.

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

- Flooding and coastal erosion that result in the loss of coastal infrastructure (including breakwaters, roads and public amenities), habitat and ecosystem goods and services. Predicted rises in sea level may further exacerbate these impacts.
- Increased frequency and intensity of coastal storms, which includes seasonal cyclone activity on the east coast. Estuaries are particularly vulnerable.

Increased coastal development and inappropriate land and catchment management will exacerbate these impacts.

In response to these challenges, South Africa will:

- 5.8.1 Ensure that national, provincial and municipal coastal management plans incorporate relevant climate information and geographic information systems and adopt a risk-based approach to planning that anticipates the consequences of the continued migration of communities into high risk coastal areas.
- 5.8.2 Take account of the potential impact of sea-level rise and intense weather events, such as storm surges, on infrastructure development and investment in coastal areas, particularly in terms of the location of the high-water mark and coastal set-back lines that demarcate the areas in which development is prohibited or controlled. Government will review and amend the legislation to deal with adjustments of coastal set-back lines that affect the status of existing public and private infrastructure.
- 5.8.3 Protect and rehabilitate natural systems that act as important coastal defences, such as mangrove swamps, offshore reefs and coastal dunes.
- 5.8.4 Develop Disaster Risk Management plans that take into account the potential consequences of climate change along the coast, particularly the increased incidence of extreme weather events.
- 5.8.5 Support ongoing research to determine the impacts of climate change on artisanal fishing communities and livelihoods in coastal areas that are directly connected to coastal and marine resources and identify appropriate responses.

5.9 Disaster risk reduction and management

Disaster risk reduction and management are short-term adaptations to climate change because both address vulnerability to climate change-related impacts. Resilience to climate change-related extreme events, such as

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heat waves, floods, droughts, wildfires and storm surges, will be the basis for South Africa's future approach to disaster management. Extreme weather events often cross country borders and impact on the region as a whole. As such a region-wide approach to disaster management is often needed.

South Africa's Disaster Management Act sets out a comprehensive approach to disaster management and it identifies the roles and responsibilities of key institutions and disaster management agencies. In addition, the Act establishes a National Disaster Management Centre whose role is to address disaster prevention, coordinate disaster management agencies and capacity across government and to ensure that critical information is disseminated speedily.

Climate change will require more effective disaster management to deal with the increased number of extreme weather events. The increase in extreme events will strain public resources due to the need to declare and support disaster areas in an immediate crisis as well as during long-term recovery.

In response to these challenges, South Africa will:

- 5.9.1 Continue to develop and improve its early warning systems for weather and climate (especially severe weather events) and pest infestation events and to ensure that these warnings reach potentially affected populations timeously. To this end, we will investigate and implement plans to use the mass media and appropriate information and communication technologies to alert vulnerable populations.
- 5.9.2 Seek to collaborate with our neighbouring states to share early warning systems with regional applications and benefits.
- 5.9.3 Continue to promote the development of Risk and Vulnerability Service Centres at universities, which will, in turn, support resource-constrained municipalities.
- 5.9.4 Facilitate increased use of seasonal climate forecasts among key stakeholders such as those in the water and agricultural sectors.
- 5.9.5 Maintain, update and enhance the SARVA as a tool that provinces and municipalities may use to inform their climate change adaptation planning.
- 5.9.6 Collaborate with social networks such as community organisations, non-governmental organisations (NGOs), women and farmers' organisations, and the Adaptation Network to help raise awareness and to transfer technology and build capacity.
- 5.9.7 Develop mechanisms for the poor to recover after disasters, including micro-insurance.

6. MITIGATION

6.1 Overall approach to mitigation

South Africa's approach to mitigation is informed by two contexts: first, its contribution as a responsible global citizen to the international effort to curb global emissions; and second, its successful management of the development and poverty eradication challenges it faces. The National Climate Change Response is intended to promote adaptation and mitigation measures that will make development more sustainable, both in socio-economic and environmental terms.

South Africa recognises that stabilisation of GHG concentrations in the atmosphere at a level that prevents dangerous anthropogenic interference with the climate system will require effective international co-operation. We therefore regard mitigation as a national priority and are committed to actively engaging in international negotiations under the UNFCCC and its Kyoto Protocol, which South Africa has ratified.

As a responsible global citizen and as a global citizen with moral as well as legal obligations under the UNFCCC and its Kyoto Protocol, South Africa is committed to contributing its fair share to global GHG mitigation efforts in

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order to keep the temperature increase well below 2°C. In this regard, on 6 December 2009, the President announced that South Africa will implement mitigation actions that will collectively result in a 34% and a 42% deviation below its 'Business As Usual' emissions growth trajectory by 2020 and 2025 respectively. In accordance with Article 4.7 of the UNFCCC, the extent to which this outcome can be achieved depends on the extent to which developed countries meet their commitment to provide financial, capacity-building, technology development and technology transfer support to developing countries. With financial, technology and capacity-building support, this level of effort will enable South Africa's GHG emissions to peak between 2020 and 2025, plateau for approximately a decade and decline in absolute terms thereafter.

To this end, the key elements in the overall approach to mitigation include:

- 6.1.1 **Setting the performance benchmark** – Using the National GHG Emissions Trajectory Range, against which the collective outcome of all mitigation actions will be measured. Section 6.4 contains more information about the emissions trajectory.
- 6.1.2 **Identifying desired sectoral mitigation contributions** – Defining desired emission reduction outcomes for each sector and sub-sector of the economy within two years of the publication of this policy-based on an in-depth assessment of the mitigation potential, best available mitigation options, science, evidence and a full assessment of the costs and benefits. Where appropriate, these desired emission reduction outcomes will be cascaded to individual company or entity level;
- 6.1.3 **Defining Carbon Budgets for significant GHG emitting sectors and/or sub-sectors** – Adopting a carbon budget approach to provide for flexibility and least-cost mechanisms for companies in relevant sectors and/or sub-sectors. The initial Carbon Budgets for significant GHG emitting sectors and/or sub-sectors will be drawn up and adopted within two years of the publication of this policy and revised as required based on monitoring and evaluation results, technological advances or new science, evidence and information. A mechanism and process to translate the Carbon Budgets for each relevant sector and/or sub-sector into company level desired emission reduction outcomes will be developed and implemented within three years of the publication of this policy for companies above a minimum emissions threshold. Section 6.5 contains more information about the carbon budget approach.
- 6.1.4 **Mitigation Plans** – Requiring companies and economic sectors or sub-sectors for whom desired emission reduction outcomes have been established to prepare and submit mitigation plans that set out how they intend to achieve the desired emission reduction outcomes.
- 6.1.5 **The use of different types of mitigation approaches, policies, measures and actions** – Developing and implementing a wide range and mix of different types of mitigation approaches, policies, measures and actions that optimise the mitigation outcomes as well as job creation and other sustainable developmental benefits. This optimal mix of mitigation actions will be developed to achieve the defined desired emission reduction outcomes for each sector and sub-sector of the economy by ensuring that actions are specifically tailored to the best available solutions and other relevant conditions related to the specific sector, sub-sector or organisation concerned;
- 6.1.6 **Using the market** – Deploying a range of economic instruments to support the system of desired emissions reduction outcomes, including the appropriate pricing of carbon and economic incentives, as well as the possible use of emissions offset or emission reduction trading mechanisms for those relevant sectors, sub-sectors, companies or entities where a carbon budget approach has been selected.
- 6.1.7 **Monitoring and evaluation** – Establishing a national system of data collection to provide detailed, complete, accurate and up-to-date emissions data in the form of a Greenhouse Gas Inventory and a Monitoring and Evaluation System to support the analysis of the impact of mitigation measures. Section 6.7 contains more information about emissions data collection and section 12 expands on the proposed Climate Change Response Monitoring and Evaluation System.

6.2 South Africa's emissions

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South Africa has relatively high emissions for a developing country, measured either per capita or by GHG intensity (emissions per unit of GDP). By any measure, South Africa is a significant emitter of GHGs.

The energy intensity of the South African economy, largely due to the significance of mining and minerals processing in the economy and our coal-intensive energy system, has resulted in an emissions profile that differs substantially from that of other developing countries at a similar stage of development as measured by the Human Development Index. Since coal is the most emissions-intensive energy carrier, South Africa's economy is very emissions-intensive. Furthermore, emissions from land-use change (primarily deforestation) contribute a significantly smaller share to our emission profile than for many other developing countries. In 2000, average energy use emissions for developing countries constituted 49% of total emissions, whereas South Africa's energy use emissions constituted just under 80% of total emissions. Even in some fast-developing countries with a similar reliance on coal for energy, energy use emissions are lower than South Africa.

In terms of South Africa's latest Greenhouse Gas Inventory (base year 2000), the majority of South Africa's energy emissions arose from electricity generation, which constituted around half of South Africa's energy emissions and just under 40% of total emissions in 2000. Transportation and energy used in industry contributed just under 10% each of total emissions and industrial process emissions constituted around 14% of total emissions. Emissions from agriculture and land-use change in South Africa constitute only around 5% of emissions, compared to an average of 44% in developing countries as a whole.

6.3 Mitigation potential

Currently available analyses indicate that, unchecked by climate mitigation action, South Africa's emissions could grow rapidly by as much as fourfold by 2050. The majority of South Africa's emissions arise from energy supply (electricity and liquid fuels) and use (mining, industry and transport), and mitigation actions with the largest emission reduction potential focus on these areas. The cost of mitigation actions varies significantly, and published analyses of these costs is likely to require further refinement, especially at sectoral, sub-sectoral and individual organisation levels.

Unlike in other developing countries, South Africa has limited opportunities to cut emissions by tackling deforestation, a sector in which near-term emission reductions are more easily achieved through regulatory policies and enforcement type measures and are therefore relatively inexpensive. While opportunities for mitigation of emissions from non-energy sources do exist, large mitigation contributions will have to come from reduced emissions from energy generation and use. The main opportunities for mitigation consist of energy efficiency, demand management and moving to a less emissions-intensive energy mix, with consequent economic benefits of improved efficiency and competitiveness as well as incentivising economic growth in sectors with lower energy intensities.

Policy decisions on new infrastructure investments must consider climate change impacts to avoid the lock-in of emissions-intensive technologies into the future. However, in the short-term, due to the stock and stage in the economic lifecycle of existing infrastructure and plant, the most promising mitigation options are primarily energy efficiency and demand side management, coupled with increasing investment in a renewable energy programme in the electricity sector. In addition, in the short term, the emergence of bio-fuels and a suite of non-energy mitigation options, such as afforestation, are also important.

A mix of economic instruments, including market-based instruments such as carbon taxes and emissions trading schemes, and incentives, complemented by appropriate regulatory policy measures are essential to driving and facilitating mitigation efforts and creating incentives for mitigation actions across a wide range of key economic sectors. Section 10.7 provides further details on the application of market-based policy instruments.

In the medium-term, the mitigation options with the biggest mitigation potential are:

- shifting to lower-carbon electricity generation options;

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- significant upscaling of energy efficiency applications, especially industrial energy efficiency and energy efficiency in public, commercial and residential buildings and in transport; and
- promoting transport-related interventions including transport modal shifts (road to rail, private to public transport) and switches to alternative vehicles (e.g. electric and hybrid vehicles) and lower-carbon fuels.

In the short and medium term, several other options are available with a smaller mitigation potential, including:

- carbon capture and storage in the synthetic fuels industry;
- options for mitigating non-energy emissions in agriculture and land-use; and
- transitioning the society and economy to more sustainable consumption and production patterns.

In our long-term planning, information (nationally and internationally) about the outcome of mitigation options, technology development, and other new information, may suggest additional mitigation actions.

This policy identifies or sets up processes to identify the optimal combination of actions sufficient to meet the National Climate Change Response Objective. Factors to be considered include not only the mitigation potential, the incremental and direct cost of measures, but also the broader impact on socio-economic development indicators (such as employment and income distribution), our international competitiveness, the cost to poor households and any negative consequences for key economic sectors.

6.4 The Benchmark National GHG Emissions Trajectory Range

In 2008, in the context of South Africa's moral and legal obligation to make a fair contribution to the global mitigation effort under the UNFCCC and its Kyoto Protocol, Cabinet fully considered the Long Term Mitigation Scenario study of the country's mitigation potential. This led to the announcement that South Africa's emissions should peak in the period from 2020 to 2025, remain stable for around a decade, and decline thereafter in absolute terms. The President confirmed this strategic policy direction at the 2009 National Climate Summit and further detailed this as a South African undertaking in the context of all legal obligations under the UNFCCC and its Kyoto Protocol prior to the international UNFCCC Climate Change Conference in 2009 (see 6.1 above). This strategic policy direction and international undertaking has informed a National GHG Emissions Trajectory Range, projected to 2050, to be used as the benchmark against which the efficacy of mitigation action will be measured.

The benchmark National GHG Emissions Trajectory Range:

- 6.4.1 Reflects South Africa's fair contribution to the global effort to limit anthropogenic climate change to well below a maximum of 2°C above pre-industrial levels.
- 6.4.2 Details the "peak, plateau and decline trajectory" used as the initial benchmark against which the efficacy of mitigation actions will be measured (see the document published by the Department of Environmental Affairs (DEA) in 2011 entitled "Defining South Africa's Peak, Plateau and Decline Greenhouse Gas Emission Trajectory"). In summary:
- South Africa's GHG emissions peak in the period 2020 to 2025 in a range with a lower limit of 398 Megatonnes (10⁹ kg) (Mt) CO_{2-eq} and upper limits of 583 Mt CO_{2-eq} and 614 Mt CO_{2-eq} for 2020 and 2025 respectively.
 - South Africa's GHG emissions will plateau for up to ten years after the peak within the range with a lower limit of 398 Mt CO_{2-eq} and upper limit of 614 Mt CO_{2-eq}.
 - From 2036 onwards, emissions will decline in absolute terms to a range with lower limit of 212 Mt CO_{2-eq} and upper limit of 428 Mt CO_{2-eq} by 2050.
- 6.4.3 Defines an initial National GHG Emissions Trajectory Range, which may be reviewed in the light of monitoring and evaluation results, technological advances or new science, evidence and information.

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6.5 The Carbon Budget Approach

Recognising that due to the current emissions-intensive structure of the economy, many sectors require a flexible mitigation approach, which enables the development and use of lowest-cost options such as offset and other types of market-based mechanisms. For such sectors, a Carbon Budget (CB) approach is adopted that specifies desired emission reduction outcomes consistent with the benchmark national GHG emissions range trajectory. To this end, CBs will be drawn up within two years of the publication of this policy for relevant economic sectors and subsectors, particularly in the major energy supply (electricity and liquid fuels) and use (mining, industry and transport) sectors. These CBs will be updated as required based on monitoring and evaluation results, technological advances or new science, evidence and information. The CBs will be released in conjunction with the National Climate Change Response Monitoring and Evaluation System, which includes an enhanced National Greenhouse Gas Inventory process.

The CB process will identify an optimal combination of mitigation actions at the least cost to-and with the most sustainable development benefits for-the relevant sector and national economy to enable and support the achievement of the desired emission reduction outcomes consistent with the benchmark National GHG Emissions Trajectory Range. Government will actively consult with industry and other key stakeholders in the development of CBs and approaches, mechanisms and outcomes.

The process to draw up or to review the CBs will consist of the following steps:

- 6.5.1 Review of the contributions making up the national emissions trajectory informed by historical emissions and trends and the most recent and best available scientific evidence and information.
- 6.5.2 Identification of a portfolio of enabling mitigation programmes and measures, including economy-wide measures and instruments, such as a carbon tax and incentives to industry and households, and the financial resources available to support them.
- 6.5.3 Analysis of :
 - current and future emissions trends by sector and sub-sector,
 - the timing, scale, cost and risk of different mitigation actions for each economic sector and sub-sector, and
 - the economy-wide implications of mitigation actions, in particular on jobs.
- 6.5.4 Development of desired emission reduction outcomes for each sector and sub-sector of the economy. These will include short-, medium- and long-term CBs for sectors and sub-sectors where a CB approach is relevant. In respect of significant point-source emissions, the CBs will be cascaded down to sub-sectors and, ultimately, companies whose emissions are above a specified threshold.
- 6.5.5 Consultation with:
 - The National Treasury, the Departments of Trade and Industry and Economic Development on the implementation of fiscal measures, incentives and other support measures, such as the carbon tax, including an assessment of the measures' effectiveness and benefits, and any other key parameters.
 - Any other relevant entity about other means of implementation that may be required.
 - Stakeholders, in particular organised business and labour.
- 6.5.6 The IGCCC will establish a process to provide analytical resources to support the development of the CB approach.

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6.6 Sectoral mitigation and lower-carbon development strategies

Under the leadership of the relevant national sector government department, each significantly emitting economic sector or sub-sector will be required to formulate mitigation and lower-carbon development strategies. These strategies will specify a suite of mitigation programmes and measures appropriate to that sector or sub-sector. They will also provide measurable and verifiable indicators for each programme and measure to monitor their implementation and outcome. These strategies will outline how to implement the proposed mitigation programmes via existing implementation mechanisms, such as the IRP 2010, or via modified or new mechanisms (see 10.1.2). For example, in respect of industrial emissions, approved mitigation plans will conform to the Air Quality Management Act's requirements for Pollution Prevention Plans prepared by identified industries and sectors.

6.7 GHG emissions inventory

Accurate, complete and up-to-date data is the foundation of an effective response. Two essential elements for the definition of desired emission reduction outcomes and the development of CBs are emissions data and data to monitor the outcome of specific mitigation actions. This section details the GHG Emissions Inventory and section 12 details the climate change monitoring and modelling requirements, as well as the evaluation of mitigation actions.

The DEA in partnership with the South African Weather Service, the host of the SAAQIS, will prepare a GHG Emissions Inventory annually. The inventory will conform to the IPCC's 2006 or later guidelines, and will be periodically reviewed by an international team of experts. The inventory will also undertake and report analyses of emissions trends, including detailed reporting on changes in emissions intensity in the economy and a comparison of actual GHG emissions against the benchmark national GHG emission trajectory range described in section 6.4.

As is currently contemplated by the DEA, reporting of emissions data will be made mandatory for entities (companies and installations) that emit more than 0.1 Mt of GHGs annually, or that consume electricity which results in more than 0.1 Mt of emissions from the electricity sector. Qualifying entities will also be obliged to report energy use by energy carrier and other data as may be prescribed. The emissions inventory will be a web-based GHG Emission Reporting System and will form part of the National Atmospheric Emission Inventory component of the SAAQIS. It will be developed, tested and commissioned within two years of the publication of this policy.

7. MANAGING RESPONSE MEASURES

As mentioned in section 4, in addition to the direct physical impacts of climate change, there are also secondary economic impacts. As a significant global emitter with a heavy reliance on coal-based energy, South Africa may be economically 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 the impacts of climate change regulation, the application of trade barriers, a shift in consumer preferences, and a shift in investor priorities. There are, however, also economic opportunities that arise from new or expanded markets, enhanced efficiencies and improved competitiveness, development of lower-carbon infrastructure with strong socio-economic benefits, and the development of a national environmental goods and services sector.

Government will take a multi-pronged approach to addressing and managing response measures, especially in respect of response measures that may have negative economic impacts. At the international level, South Africa will engage vigorously in the multilateral climate change negotiations, to ensure a fair and effective outcome that

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is in accordance with the principles of equity, common but differentiated responsibility, and respective capabilities, and that provides developing countries with sufficient time and development space for the required economic transition to lower-carbon economies. At the national level, the challenge will be to effectively manage and reduce the economic risks, and build on and optimise the potential opportunities, and to ensure a smooth and just transition to a climate-resilient, equitable and internationally competitive lower-carbon economy and society.

8. NEAR-TERM PRIORITY FLAGSHIP PROGRAMMES

A set of Near-term Priority Flagship Programmes will be implemented as an integral part of this policy informed by several important factors including the urgency of acting on mitigation and adaptation responses as soon as possible as well as the fact that many sectors have already researched and have experience in implementing policies and measures to address the challenges of climate change. The initial desired emission reduction outcomes, the carbon budgets and the initial adaptation intervention prioritisation process will be completed within two years of the publication of this policy. These programmes will include both the scaling-up of existing climate change initiatives and new initiatives that are ready to come on-stream.

The Inter-Ministerial Committee (IMCCC) (section 10.2.2) and the IGCCC sub-committee (section 10.2.3) will take responsibility for the development and oversight of the Near-term Priority Flagship Programmes. The appropriate line function Ministry will elaborate on each Near-term Priority Flagship Programme and the responsible Minister will establish teams to create a framework for each programme. Frameworks will consist of the following:

- A programme for implementation.
- A detailed analysis of mitigation or adaptation outcomes expected to result from the programme.
- A proposal for realising local sustainable development benefits, including employment, poverty alleviation, industrial development, reduction in local air pollution and others.
- A well-defined reporting format, which will include a set of relevant indicators, and a proposal to establish an annual reporting process.

Based on current analysis, government has identified an initial list of Near-term Priority Flagship Programmes, covering both adaptation and mitigation measures. The mitigation programmes cover the major emitting sectors, have relatively well-known mitigation outcomes and implementation processes, and are either very cost-effective and have significant co-benefits or have technology development benefits. The Flagship Programmes also utilise, test and/or demonstrate a suite of policy interventions including regulatory measures, market-based instruments, tax incentives and fiscal subsidies, and information and awareness initiatives. Regulatory measures include renewable energy and energy efficiency targets complemented by appropriate standards; market-based instruments including the electricity generation levy and taxes on motor vehicle emissions and incandescent light bulbs; tax incentives and fiscal subsidies are targeted at various programmes that support climate change mitigation and adaptation objectives; and information and awareness initiatives including the motor vehicle emissions labelling scheme.

The following Near-term Priority Flagship Programmes will be implemented with immediate effect:

8.1 The Climate Change Response Public Works Flagship Programme

The Climate Change Response Public Works Flagship Programme includes the consolidation and expansion of the Expanded Public Works Programme and its sector components such as the Non-State Sector's Community Works Programme and the suite of Environment and Culture Sector programmes including Working for Water, Working on Fire, and Working for Energy as these have proven effective in building climate resilience and relieving poverty. An example of the biodiversity impacts derived from Expanded Public Works Programme

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investment is the large-scale planting of the Spekboom on degraded public and private land, thereby re-establishing portions of the Thicket Biome in the Eastern Cape.

8.2 The Water Conservation and Demand Management Flagship Programme

The Water Conservation and Demand Management Flagship Programme includes the accelerated implementation of the National Water Conservation and Water Demand Management Strategy in the industry, mining, power generation, agriculture and water services sectors. The accelerated provision of rainwater harvesting tanks in rural and low-income settlements will also form part of this programme.

8.3 The Renewable Energy Flagship Programme

The Renewable Energy Flagship Programme is inclusive of a scaled-up renewable energy programme, based on the current programme specified in the IRP 2010 and using, for example, the evolving South African Renewables Initiative led by the Department of Public Enterprise and Department of Trade and Industry (DTI), as a driver for the deployment of renewable energy technologies. The programme will be informed by enhanced domestic manufacturing potential and the implementation of energy efficiency and renewable energy plans by local government.

Furthermore, the Department of Energy's (DoE) solar water heating programme will be expanded through, amongst others, the promotion of the domestic supply of products for solar heating with support from the DTI to build local manufacturing capacity.

8.4 The Energy Efficiency and Energy Demand Management Flagship Programme

As part of the Energy Efficiency and Energy Demand Management Flagship Programme, the DoE will continue to develop and facilitate an aggressive energy efficiency programme in industry, building on the experience of Eskom's Demand Side Management programme and the DTI's National Cleaner Production Centre, and covering non-electricity energy efficiency as well. A structured programme will be established with appropriate initiatives, incentives and regulation, and a well-resourced information collection and dissemination process.

A residential energy efficiency programme will also be included, consisting of two parts:

- The development of appropriate initiatives, incentives and regulations will be finalised by the DoE and the DTI. Furthermore, the development of energy specifications for low-income housing will be determined through the National Sustainable Settlements Facility under the Department of Human Settlements.
- Regulation of commercial and residential building standards to enforce green building construction practices. The National Regulator for Compulsory Specifications in conjunction with the National Home Builders Registration Council will ensure that building construction and operation conform to green building requirements, including measures such as controlled ventilation, using recycled material, solar power, etc.

A government building energy efficiency programme led by the Department of Public Works that initiates energy and emissions audits of all government buildings and facilities will be developed. It will develop comparable indicators and benchmarks, and make appropriate interventions. The programme will include lead programmes for key government buildings, including Parliament and the main government buildings in Pretoria. Ambitious goals for energy efficiency will be set for all new government buildings.

8.5 The Transport Flagship Programme

As part of the Transport Flagship Programme, the Department of Transport will facilitate the development of an enhanced public transport programme to promote lower-carbon mobility in five metros and in ten smaller cities and create an Efficient Vehicles Programme with interventions that result in measurable improvements in the average efficiency of the South African vehicle fleet by 2020.

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Furthermore, the planned rail re-capitalisation programme is considered an important component of this Flagship Programme in so far as it will facilitate both passenger modal shifts and the shift of freight from road to rail.

Initially led by the Department of Transport, the programme will also include a Government Vehicle Efficiency Programme that will measurably improve the efficiency of the government vehicle fleet by 2020. It will encourage new efficient-vehicle technologies, such as electric vehicles, by setting procurement objectives for acquiring such vehicles.

8.6 The Waste Management Flagship Programme

Led by the DEA, the Waste Management Flagship Programme will establish the GHG mitigation potential of the waste management sector including, but not limited to, investigating waste-to-energy opportunities available within the solid-, semi-solid- and liquid-waste management sectors, especially the generation, capture, conversion and/or use of methane emissions. This information will be used to develop and implement a detailed Waste-Related GHG Emission Mitigation Action Plan aimed at measurable GHG reductions aligned with any sectoral carbon budgets that may be set. This Action Plan will also detail the development and implementation of any policy, legislation and/or regulations required to facilitate the implementation of the plan.

8.7 The Carbon Capture and Sequestration Flagship Programme

Led by the DoE in partnership with the South African Energy Research Institute, the programme includes, among other initiatives, the development of a Carbon Capture and Sequestration Demonstration Plant to store the process emissions from an existing high carbon emissions facility.

8.8 The Adaptation Research Flagship Programme

Led by the South African National Biodiversity Institute, the design and roll-out of a national and regional research programme to scope sectoral adaptation requirements and costs and identify adaptation strategies with cross-sectoral linkages and benefits, including an assessment of climate change vulnerabilities in the sub-region, with a detailed scenario planning process to define potential sub-regional response strategies.

9. JOB CREATION

Unemployment is a key issue for South Africa and is a critical vulnerability that could be severely worsened by climate change. Severe income distortions further limit many people's ability to build resilience to climate change impacts. Climate change and responses thereto, will affect employment, job creation and living standards and, in many instances, this affect may be negative. Vulnerable low-income households and the marginalised unemployed will face the most severe impacts unless urgent steps are taken to reduce South Africa's vulnerability to climate and economic shocks.

At the same time climate change responses that improve resilience could positively impact employment in South Africa. For example, adaptation could create new jobs to which workers can migrate from sectors affected by mitigation strategies. The climate change response will attempt to reduce the impact of job losses and promote job creation during the shift towards the new green economy.

The NGP is a clear policy signal of the intention to develop South Africa's economy in a manner that harnesses our natural resources whilst developing and expanding less carbon-intensive sectors towards a 'greener' economy.

9.1 Policy outcomes

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In terms of job creation, the short- to medium-term objective of the National Climate Change Response Policy is to limit employment contraction to those areas of the economy where excessive carbon intensity is considered unsustainable, whilst promoting and expanding the green economy sectors. Growth in new sectors alone will be no guarantee of net job creation and government will promote conditions that will increase the mobility of labour and capital out of carbon intensive sectors to greener productive sectors.

The medium- to long-term objective of the National Climate Change Response Policy will be to promote investment in human and productive resources and so enable sustainable growth in green sectors. Investors will be incentivised to reallocate capital to lower-carbon investments. Practical interventions will be informed by accurate assessments of the capacity of various sectors to adapt to a lower-carbon environment. Net job creation will be a key performance indicator, as well as baseline vulnerability measures and sectoral actions to improve resilience against job losses. This will enable the monitoring of and reporting on progress made.

9.2 Policy Instruments

The National Employment Vulnerability Assessment (NEVA) and Sector Jobs Resilience Plans (SJRPs) will be used to move employment from a carbon intensive economy to a lower-carbon economy.

9.2.1 National Employment Vulnerability Assessment (NEVA)

The Ministry for Economic Development will publish the NEVA and so establish a National Employment Vulnerability Baseline (NEVB). The purpose of the NEVB will be to inform the prioritisation of mitigation and adaptation interventions and establish timeframes for addressing potentially vulnerable sectors.

The NEVA will assess the impact on jobs of climate change and climate change responses by sector and location to understand what job-related interventions may be required and where they may be required. The vulnerability assessments should also incorporate relevant aspects of similar assessments that may have been made in other sectors such as biodiversity, human settlements and disaster management. The NEVA will be reviewed on a regular basis that gives sufficient time for interventions to be effective but is sufficiently often to make proactive changes as and when necessary.

9.2.2 Sector Jobs Resilience Plans (SJRPs)

Informed by sectoral work carried out by, for example the Departments of Mineral Resources, Economic Development and Trade and Industry, SJRPs will explore the synergy between mitigation and adaptation strategies and the potential for sustainable net job creation in each sector. The goal will be to understand the risk relationship between technology and investment and so focus investments on sectors where government involvement and skills development will reduce initial barriers to creating jobs. As technologies show commercial viability with time and their risk profiles improve, projects may be auctioned off to investors as a test of the risk appetite of the market. The purpose will be to implement mechanisms that reduce risk, showcase alternative lower-carbon interventions, build capacity and develop skills. Such interventions will focus on public sector programmes to incentivise employment creation for those most vulnerable to climate change and will be a precursor to creating sustainable investments and jobs. These programmes include:

- Expanding existing poverty alleviation job creation programmes, such as the Expanded Public Works Programme and the National Youth Service.
- Promoting job creation incentives in new, green industries, especially targeting the youth.
- Tapping Sector Education and Training Authorities (SETAs) to aggressively develop and fund mentorship (including learnerships and internships) programmes.

9.3 Timing of Interventions

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The following high-level timeline for the Climate Change Response Policy with regard to net job creation provides an overview of the strategic activities required:

9.3.1 Short-Term

- Establish links with business and industry, research bodies, institutions, NGOs and local communities that can provide relevant data and methodologies for the establishment of the NEVB.
- Develop a cooperative governance framework for establishing the capability to assess employment vulnerability, including how to determine the cost of reducing vulnerability.
- Conduct the NEVA to inform interventions required to enable a pro-jobs approach in the climate change response measures contained in the various sector plans.

9.3.2 Short- to Medium-Term

- Design a SJRP framework for a pro-jobs approach to implementing climate change response strategies.
- Develop SJRPs in consultation with stakeholders from all NEDLAC constituencies.
- Establish links with responsible Ministries to integrate the outcomes of the NEVA and SJRPs into their sector plans.
- Establish a system to monitor jobs resilience.

10. MAINSTREAMING CLIMATE-RESILIENT DEVELOPMENT**10.1 Policy and planning review and regulatory audits**

Coordination and alignment of policies and actions is central to achieving climate resilience and in this respect, a comprehensive review of all government legislation, policy, strategies, plans and regulatory frameworks will underpin the successful implementation of the National Climate Change Response Policy.

The review will be undertaken in terms of Outcome 10, which forms the basis of the Minister for Environmental Affairs' delivery agreement with the President, and the purpose of the review will be to provide an implementation protocol for Output 2:

“Output 2: reduce greenhouse gas emission, climate change impacts and improved air/atmospheric quality”

Achieving climate change resilient development requires both horizontal and vertical integration of climate change into government planning, and needs to involve all sectors of society. Adaptation to climate change and mitigation of GHG emissions offer opportunities to foster a new kind of economic development that is sustainable and that will improve the distribution of resultant economic gains. The NGP, released by the Department of Economic Development, provides a significant opportunity in this regard. However this new direction requires that climate policy becomes an integral part of the country's development strategy and that economic policy tools are developed to assess the costs and benefits of proposed policy measures and to periodically evaluate policy effectiveness in terms of its economic, social and environmental impacts.

To achieve this, South Africa will:

- 10.1.1 Undertake an audit of existing policy and legislation to ensure alignment with the objectives of the National Climate Change Response Policy and promote the integration of climate change resilience into all sectoral planning instruments.
- 10.1.2 Ensure that the prioritised adaptation interventions (5.1), the benchmark national GHG emission trajectory range (6.4), sector and sub-sector desired emission reduction outcomes and CBs (6.5) and sectoral mitigation and lower-carbon development strategies are fully integrated into all relevant sector plans as and when these plans are reviewed, revised and/or updated;

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10.1.3 Undertake a review of the National Climate Change Response Policy together with a review of progress in the implementation of the policy every five years. Coordinated by IGCCC, this review will describe progress, gaps and proposed adjustments in terms of, but not limited to, priorities and desired outcomes over the short-, medium- and long-term, roles and responsibilities, and institutional arrangements. The planning horizon for a revised National Climate Change Response Policy should be, at least, 40 years and should include:

- Sectoral adaptation strategies based on sectoral plans and risk analyses.
- Sector and sub-sector desired emission reduction outcomes and CBs to be reviewed on a two-year cycle.
- The identification of economic sectors that may provide increasing job opportunities and, where practical, sector-based strategies for migrating jobs from carbon-intensive sectors of the economy to lower-carbon sectors to offset possible climate change and climate change response-related job losses. See section 9 for details.
- A description of the resource requirements and how to mobilise them (section 11.1 contains details of options), and the deployment of market-based instruments (section 10.7 describes some market-based instruments options).

10.2 Roles and institutional arrangements

The consistent implementation of the National Climate Change Response Policy requires a long-term framework for institutional coordination to:

- Coordinate research and development and promote innovation.
- Coordinate adaptation and mitigation actions.
- Measure, report and verify climate change responses.
- Facilitate and promote the use of carbon trading and off-set schemes.

This section describes the roles and institutional arrangements within the public sector, and section 8.3 describes the roles of private sector partners and institutional arrangements for coordination with stakeholders.

All three spheres of government play important roles in addressing climate change.

National government takes the lead in: formulating the climate response policy; amending and promulgating legislation to deal with climate change; establishing and administering the regulatory framework for managing emission reductions; considering and implementing market-based instruments such as carbon taxes in the short-term whilst investigating the appropriateness of emissions trading schemes as a longer-term intervention; allocating resources and incentives through the Medium-Term Expenditure Framework; and participating in international negotiations on climate change. Line function National Departments will integrate climate change into their policies and programmes, and will manage Near-term Priority Flagship Programmes to build climate resilience.

10.2.1 Parliament

Parliament will oversee the development and implementation of the National Climate Change Response Policy through the Portfolio Committees, and in particular the Committees on Water and Environmental Affairs; Energy; Agriculture, Forestry and Fisheries; Trade and Industry; Mining; Science and Technology; and Transport.

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The Portfolio Committees will review legislation to determine the legal requirements to support the institutional and regulatory arrangements proposed in this White Paper, and to ensure policy and legislative alignment. The Committees will work with the DEA and the IMCCC to draft any Bills, or an amendment to NEMA, that may be required within three years of the publication of this policy.

The Portfolio Committees may undertake public hearings on the National Climate Change Response Policy, and any of its components.

10.2.2 The Inter-Ministerial Committee on Climate Change (IMCCC)

The strategic, multi-faceted and cross-cutting nature of climate-resilient development requires a coordination committee at executive (Cabinet) level that will coordinate and align climate change response actions with national policies and legislation. To this end, the IMCCC shall oversee all aspects of the implementation of this White Paper.

In particular, the Minister of the Environment will chair the IMCCC, which will oversee the implementation of the National Climate Change Response Policy, including the sectoral desired emission reduction outcomes and carbon budgets development process and adaptation intervention prioritisation process. The IMCCC will mandate an interdepartmental task team, a sub-committee of the IGCCC, to manage the review of the National Climate Change Response Policy. Technical, analytical and administrative capacity to the IMCCC and interdepartmental task team will be provided by a secretariat based in the DEA. The DEA may co-opt any required skills from other Government departments (including provincial and local government), agencies or from outside government.

The secretariat will publish input assumptions, data and intermediate technical analyses undertaken during the National Climate Change Response Policy review processes on a dedicated website. The DEA will hold public consultations at key points in the National Climate Change Response Policy review process, including consultations on methodology and assumptions for any key technical analyses.

10.2.3 Forum of South African Directors-General clusters

The national climate change response actions shall be guided by strategic leadership of the relevant Forum of South African Directors-General clusters based on their different mandates: the Economic Sectors and Employment Cluster on issues that have a strong bearing of economic growth and employment creation; the Infrastructure cluster on all infrastructure-related aspects of this policy; and the International Cooperation Cluster on international engagements.

10.2.4 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. These include the exchange of information, consultation, agreement, assistance and support as key features of cooperative government.

The IGCCC has been established to operationalise cooperative governance in the area of climate change. Accordingly the IGCCC brings together the relevant national and provincial departments and organised local government. The IGCCC therefore has a key role to play in the review of the National Climate Change Response Policy as well as its implementation.

10.2.5 National Disaster Management Council

The National Disaster Management Council will be responsible for ensuring that the National Framework for Disaster Risk Management provides clear guidance across all spheres and sectors of government for managing climate change-related risk and for ensuring that an effective communications strategy is in place for early warnings to vulnerable communities with respect to extreme weather events such as flooding and droughts.

10.2.6 Provincial and local government

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The environment is a concurrent function between provincial and national government, and provinces will coordinate provincial adaptation and mitigation responses across their own line departments, as well as between municipalities within the province. Each province will develop a climate response strategy, which evaluates provincial climate risks and impacts and seeks to give effect to the National Climate Change Response Policy at provincial level.

Local government plays a crucial role in building climate resilience through planning human settlements and urban development; the provision of municipal infrastructure and services; water and energy demand management; and local disaster response, amongst others. Climate change considerations and constraints will be integrated into municipal development planning tools such as Integrated Development Plans, and municipal service delivery programmes.

At the same time the mandate for local government to take on various specific climate change-related issues is not always clear, and it may be useful to assign specific powers for mitigation and adaptation actions such as coastal management, infrastructure management and natural resource stewardship, some of which fall within the jurisdictions of other spheres of government. A critical review of the policy and legislation relating to local government functions and powers with respect to climate change is required. The Department of Cooperative Governance and Traditional Affairs will lead such a process.

The fiscal mechanisms to support local government capital and operating expenditures currently do not incentivise municipalities to mainstream effective climate change responses into local government activities. National Treasury will lead a process to re-examine the current fiscal measures and the appropriate incentives for adaptation and mitigation measures by local government.

Programmes to build capacity for local and provincial governments' climate response strategies will be prioritised, and a climate change toolkit will be prepared for provincial and local government practitioners.

There is a critical need for best-practice knowledge-sharing across provinces and municipalities to take advantage of innovative models in climate change adaptation and mitigation. This will be coordinated by the DEA and Department of Cooperative Governance and Traditional Affairs.

In terms of inter-governmental coordination, the Ministerial political forum (MINMEC) and Outcome 10 Delivery Forum (MINTECH) set up through the Intergovernmental Relations Act facilitate a high level of policy and strategy coherence among the three spheres of government, and will be used to guide climate change work across the three spheres.

The South African Local Government Association, 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 local government plans and programmes, and lobby for the necessary regulatory measures and resources to support local government in this regard.

10.3 Partnering with stakeholders

Climate change is an issue for all South Africans and government realises that the objectives set out in this White Paper can only be fully realised with the active participation of all stakeholders. The government is committed to substantive engagement and, where appropriate, partnerships with stakeholders from industry, business, labour and civil society in a manner that enhances coordination.

10.3.1 Business and Industry

As both a significant contributor to GHG emissions and effective climate change response actions, lower-carbon products and services and "green" jobs, business and industry have a fundamental role in South Africa's climate change response. Thus, government will continue to forge and maintain effective partnerships with business and industry to ensure that their capacity is harnessed in driving the transition to a climate-resilient, equitable and internationally competitive, lower-carbon economy and society.

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Government also recognises the importance of private sector funding in achieving national climate change response actions and will work with the financial sector to explore the most appropriate mechanisms to achieve efficient funding flows.

Business and industry have already contributed to the development of the National Greenhouse Gas Inventory by voluntarily submitting GHG data to Government. It is intended to build on these voluntary initiatives to develop the mandatory reporting system for GHG emissions (see 6.7).

Government will also continue to encourage voluntary reporting initiatives established and maintained by a variety of organised business associations.

10.3.2 Civil Society

The role of citizens and organised groupings within civil society are important to the success of a national effort. Civil society needs to critically evaluate, comment on and respond to the initiatives of government and the private sector. They must continue to raise public awareness, and motivate individuals, institutions and authorities to take actions that reduce GHG emissions and that adapt to the adverse impacts of climate change. Civil society organisations that work directly with communities and particularly with the urban and rural poor and with women are an important conduit for ensuring that climate information is timeously communicated and to inform government and research institutions of vulnerable groupings' climate change-related issues.

10.3.3 Academia and scientists

The climate change science and academic community must work together to improve projections of climate change, its impacts, key vulnerabilities in affected sectors and communities. They need to explore appropriate mitigation and adaptation responses; continue to build capacity in climate change science; and inform government and the public of climate change-related socio-economic challenges and opportunities.

10.4 Coordination Mechanisms

The following mechanisms will be used to coordinate climate change activities and consult on climate change policies with stakeholders:

10.4.1 National Committee on Climate Change (NCCC)

The NCCC has been set up to consult with stakeholders from key sectors that impact on or are impacted by climate change. The Committee advises on matters relating to national responsibilities with respect to climate change, and in particular in relation to the UNFCCC and the Kyoto protocol. It also advises on the implementation of climate change-related activities.

Government will consider proposals for increasing the functions of the NCCC beyond the current communication function and to formalise its status as an advisory council with statutory powers and responsibilities.

10.4.2 National Economic Development and Labour Council (NEDLAC)

NEDLAC serves as the forum where government comes together with organised business, labour and 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. NEDLAC has indicated that climate change should be a key component of its agenda.

10.5 Communication and behaviour change

Developing climate resilience requires all of us to change our behaviour and become conscious of our individual carbon footprints. A nuanced approach to communication will be followed, recognising that a communication strategy aimed at individuals and communities with the largest carbon footprints (the urban wealthy) needs to be very different from a communication strategy aimed at the individuals and communities most vulnerable to

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climate change impacts (the rural poor). It is also recognised that people will only make climate-friendly decisions if they have convenient, reliable and safe climate-friendly alternatives and if they know about these options.

One of the important communication challenges is to disseminate information to interested and affected people as quickly as possible and to ensure that the information is in a format that is accessible and useful to the target audience. This is especially important for early warning systems where people need to take specific actions to reduce risks to themselves, their households and property.

To meet these challenges, South Africa will:

- 10.5.1 Empower all residents with information about the potential impacts of climate change and climate change resilience actions, emphasising the information needs of those most vulnerable to climate change.
- 10.5.2 Ensure that all relevant climate change information systems implement effective communication strategies to ensure that information reaches the target audiences efficiently and effectively. This includes exploring and developing new and novel ways of communicating, especially to people who are illiterate and/or have no access to telephonic or other forms of electronic communication.
- 10.5.3 Ensure that all government climate change response strategies and actions plans include sections on education, awareness, outreach and human resource development.
- 10.5.4 Design, develop and roll-out a climate change awareness campaign that make all South Africans more aware of the challenge of climate change and the need for appropriate responses and choices at individual and community level.

10.6 Regulatory measures

Sectoral legislation already provides an extensive regulatory framework for the actions of Government departments, agencies, business and civil society. To ensure that climate change considerations and the climate change responses outlined in this White Paper are fully mainstreamed into the work of all three spheres of government, all Government departments and all state-owned enterprises will review the policies, strategies, regulations and plans falling within their jurisdiction on a regular basis to ensure full alignment with the National Climate Change Response Policy.

Local government plays a particularly important role in implementing adaptation and mitigation actions, some of which extend beyond the existing Constitutional and legislative mandate of local government. In the review process mentioned above, particular attention will be paid to local government legislation, and the Department of Cooperative Governance and Traditional Affairs will lead a review of local government legislation in this regard.

South Africa will use Section 29(1) of the Air Quality Act to manage GHG emissions from all significant industrial sources (those responsible for more than 0.1% of total emissions for the sector) in line with approved mitigation plans that conform to the Act's requirements for pollution prevention plans prepared by identified industries and sectors. The synergy between prevention measures to reduce conventional air pollutants and GHG mitigation will be used in a holistic approach to manage air quality.

10.7 Market-based instruments

In 2006, Government published a draft Environmental Fiscal Reform Policy Paper entitled *A Framework for Considering Market-Based Instruments to Support Environmental Fiscal Reform in South Africa*. This policy paper recognised the role for environmentally-related taxes to complement existing regulatory policy interventions and address environmental problems such as climate change. Government has since introduced the following climate change-related measures: the electricity generation levy; motor vehicle emissions tax; the levy on incandescent light bulbs complemented by a range of tax incentive measures to support renewable energy investments (depreciation allowances for renewable electricity generation and biofuels production); investments in projects under the Clean Development Mechanism (CDM) (that is, income tax exemption for revenues from the sale of certified emission reduction units resulting from CDM projects); biodiversity

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conservation and management; and the proposed energy efficiency savings tax allowances. As part of the process of exploring more comprehensive reforms for addressing climate change, the National Treasury published the carbon tax discussion paper entitled *Reducing Greenhouse Gas Emissions: The Carbon Tax Option* for public comments in December 2010. The paper elaborated on the role for carbon taxes as a policy measure to stimulate behaviour changes among producers and consumers in favour of less energy intensive, lower-carbon emitting alternatives.

10.7.1 Carbon Pricing

In economic terms, environmental resources can be largely classified as a "public good" which are accessible by all and can be consumed in infinite quantities. Climate change and its effects are the result of GHG emissions that impose external costs or an "externality" on society. In most cases, these negative external damage costs of an economic activity are not reflected in the prices of goods and services, often resulting in their under-pricing and an over- or mis-allocation of resources.

Accordingly, the prices of environmental goods and services that generate excessive levels of GHG emissions should be adjusted to reflect the full costs of production and consumption. Carbon taxes can help to internalise these negative externalities and create the correct incentives to stimulate behavioural changes among producers and consumer in favour of cleaner, lower-carbon technologies, promoting the uptake of energy efficiency measures and research, development and technology innovation.

In this context, the National Treasury will continue to develop carbon tax policy and the following key considerations will inform this process:

- The tax rate should, over time, be equivalent to the marginal external damage costs of GHGs to affect appropriate incentives. However, in the absence of an international climate change agreement and therefore a global emissions pricing system, a partial, rather than full, internalisation of the externality will be considered as an interim measure.
- Technical and administrative feasibility – consideration will be given to whether the tax applies to carbon emissions or a proxy for such emissions (e.g. fuel inputs or outputs). Should a proxy tax base be used, the levy of the tax according to the carbon content of fossil fuels will be considered.
- Distributional implications – measures will be taken, either in tax design or through complementary expenditure programmes, to offset the burden such a tax will place on poor households.
- Competitiveness – to address potential negative impacts on industry competitiveness, the introduction of carbon taxes at initial low rates with a commitment to phased-in increasing levels of taxation over a specific period will be considered; which would grant taxpayers an opportunity to adjust to the new tax.
- A phased implementation of the tax towards comprehensive coverage of all economic sectors is believed to be desirable and will be considered.
- The minimisation of the potential regressive impacts on the poor and the protection of the competitiveness of key industries will be considered. Furthermore, revenue recycling to minimise the costs of the tax through, for example, some form of tax shifting will be considered. However, although the full earmarking of revenues is not regarded as being in line with sound fiscal policy principles, some form of on-budget funding for specific environmental programmes will be considered.
- Relief measures, if any, will be considered by these will be regarded as being minimal and temporary.

Although a carbon tax does not set a fixed quantitative limit on GHG emissions over the short-term, such a tax - at an appropriate level and phased-in over a period to the "correct" level - will provide a strong price signal to both producers and consumers to change their behaviour over the medium- to long-term. The National Treasury's carbon tax policy will seek to primarily stimulate behaviour change through the price mechanism, and as a secondary benefit, generate a revenue stream that may allow fiscal decisions over time that support climate change policy and broader sustainable development objectives.

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10.7.2 Carbon Markets

Carbon markets are mechanisms for exchanging emission reductions between entities, thereby optimising efficiency and minimising cost in controlling pollution levels. They include both cap-and-trade mechanisms (in which mandatory limitations on emissions create markets in which polluters trade emissions allowances) and offset schemes where actors voluntarily pay compensation for emissions.

In respect of carbon markets, the National Treasury will investigate the feasibility of an emissions trading scheme as a medium- to long-term response to climate change.

10.7.3 Incentives

Incentives, including regulatory, economic and fiscal measures, encourage and reward efforts to curb GHG emissions. They can apply to a broad range of sectors. Some existing incentives include lower fuel taxes on cleaner fuels and energy efficiency incentives. Further incentive measures will be explored as part of a suite of policy instruments to promote climate resilience, including job creation incentives in new, green industries, especially for the youth.

Government recognises the important role for market-based instruments that create fiscal incentives and disincentives to support climate change policy objectives. Thus, South Africa will employ market-based instruments as part of a suite of policy interventions to support the transition to a lower-carbon economy. These instruments will be designed to incentivise behaviour change at the individual, institutional and macro-economic levels for a climate-resilient South Africa contributing to a diversification of our energy mix, drive people to implement far-reaching energy efficiency measures, achieve passenger modal shifts, and generate investments in new and cleaner technologies and industries.

11. RESOURCE MOBILISATION

Responding to climate change is expensive and will require a comprehensive resource package. South Africa is therefore committed to mobilising the resources that are necessary for both mitigation and adaptation. This includes financial resources, technical cooperation and technology transfers at domestic, sub-regional, regional, and international levels.

Estimates for the cost of responding to climate change indicate that between 1% to 2.5% of global GDP will need to be spent on mitigation and 1.5% to 3% of GDP in Africa will need to be spent on adaptation by 2030. Impacts (and benefits) will be unevenly distributed across countries and between sectors. The cost of adaptation is likely to increase in future years.

South Africa's resource mobilisation strategy will be informed by the mainstreaming of climate change into the planning and decision-making of government, private sector and civil society. Government aims to:

- Create an enabling environment whereby government, private sector and civil society collectively respond to the economic and social changes necessary for climate-resilient development and job creation, providing for the economic and social upliftment of the people of South Africa, while minimising negative impacts on future development.
- Promote the green economy as an effective investment in climate change response and secure resources to support climate change and green economy interventions.
- Consolidate and extend existing initiatives towards a climate-resilient economy. Thus, the Near-term Priority Flagship Programmes mentioned in section 8 will form the foundation for the next phase in the transition to a lower-carbon and climate-resilient economy and society. However, Government will endeavour to continuously evaluate its priorities to adjust to the dynamic nature of the socio-economic transformation envisaged.

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11.1 Finance

As a developing country, South Africa recognises that international resources (as envisaged under the UNFCCC) need to complement domestic resources to finance the cost of transition to a climate-resilient society. Hence, Government will actively pursue the mobilisation and effective use of these international resources.

Further, Government recognises that improved finance policy coordination is critical to creating a sustainable climate finance architecture for South Africa. New market-based instruments as well as environment-related financial reforms in the private and public sectors will seek to fundamentally transform South Africa into a climate-resilient economy and society.

11.1.1 The role of financial institutions

South Africa recognises that financial institutions are important intermediaries to allocate and transfer capital between different economic activities. Government acknowledges and supports initiatives by the South African banks to integrate environmental considerations into their decision-making frameworks. The different distribution channels in the financial system, such as public finance, banks (including development finance and microfinance institutions), investors and insurers, are important development partners for Government in the following ways:

- Public finance can support climate change through the procurement of sustainable technologies by Government as well as developing catalytic projects and programmes.
- The development finance system in South Africa is critical to integrating development with climate change. Development finance institutions, such as the Development Bank of Southern Africa (DBSA), Industrial Development Corporation, Land Bank and Khula Enterprises can incubate climate-resilient development. This is particularly true for climate-proofing of infrastructure and industrial processes; designing and testing new financing instruments; localising and rolling out of sustainable technologies; and unlocking new economic opportunities through enterprise development and job creation. Further, these institutions serve an important role in building technical capacity and knowledge platforms to mobilise action at regional, provincial and local level.
- Private banks and microfinance institutions support a range of corporate and entrepreneurial ventures that could contribute to climate change resilience.
- Investors such as asset managers, venture capital and private equity firms are essential for both long-term and early-stage investments.
- Insurers are essential for risk mitigation and innovative climate change-related products.
- International and corporate grant-providers are necessary to support the comprehensive financing package necessary for the scale of mitigation and adaptation interventions that South Africa needs.

Different types of financial institutions should work together in a coordinated manner to blend different forms of capital.

11.1.2 Mobilising finance

The emerging climate change response finance options include grants for research and development; project development and technical cooperation; and commercial finance through debt and equity, concessionary finance, risk insurance, specialised environmental funds and new capital market innovations, such as green and climate bonds. These options may be extended by integrating financing for biodiversity and other environmental resources, such as payment for ecosystem goods and services, for example. By necessity, South Africa's climate finance strategy will comprise a comprehensive suite of measures to create and maintain a long-term funding framework for mitigation and adaptation actions and to trigger swift and urgent action towards climate-resilient development.

Government will:

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- 11.1.2.a Continue to proactively contribute to the technical and institutional reform debates of the UNFCCC financing measures to ensure that developing and least-developed countries such as those in the Southern African Development Community region can access the additional and necessary resources in a fair, transparent and timely manner.
- 11.1.2.b Make every effort to attract and secure additional international resources through official development assistance and bilateral development agencies. Government will ensure that such climate change-related contributions are directed to national, provincial and local government development priorities.
- 11.1.2.c Create a transitional climate finance system to support the implementation of the priority mitigation and adaptation actions identified in sections 5 and 6. See section 11.1.3 for details.
- 11.1.2.d Create a transitional tracking facility for climate finance mechanisms and climate responses that will monitor and coordinate existing climate finance flows.
- 11.1.2.e Partner with domestic financial institutions to fast-track and mainstream climate-resilient development (i.e. mitigation and adaptation).
- 11.1.2.f Support donor organisations in their efforts to apply funding towards climate change-related pilot programmes and activities.
- 11.1.2.g Promote the development of, and investment in, a climate-resilient region and work with regional partners to create and maintain interdependent economic and social opportunities that reduce the region's dependency on climate vulnerable sectors.

11.1.3 The Immediate Transition

During the immediate transition period between the publication of this Policy and the evolution of appropriate climate financing systems and institutions, Government will establish an interim climate finance coordination mechanism to secure the necessary resources for mitigation and adaptation priority programmes identified in sections 5, 6 and 8. The mechanism will match the resources to the priority programmes, including grants, concessionary debt and risk insurance products.

The mechanism will also contain a climate finance tracking facility to track the use and impact of funds. Government will determine the terms of reference for the mechanism in consultation with the private sector and civil society.

The National Treasury will identify the initial custodian of the coordination mechanism.

11.1.4 Financing the National Climate Change Response Policy

Stable, well governed institutions are critical to funding South Africa's transition path to climate-resilient development. In pursuit of a long-term funding framework for climate finance, Government will:

- 11.1.4.a Promote fair, transparent and timely access to international and domestic resources for both mitigation and adaptation actions by the public and private sectors as well as civil society.
- 11.1.4.b Mainstream climate change response into the fiscal budgetary process and so integrate the climate change response programmes at national, provincial and local government and at development finance institutions and state-owned entities.

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- 11.1.4.c Enable the local development finance institutions to create and implement long-term climate-resilient investment programmes. This includes project development, financial and risk insurance products, technical assistance and capacity-building within their mandates.
- 11.1.4.d Identify opportunities in the existing financial regulations governing the domestic finance sector to enhance the financial sector's capacity to mainstream climate change in risk and investment decisions.
- 11.1.4.e Establish and/or support public platforms to assimilate and disseminate climate science, finance, technology and other related research and information to enable effective decisions about risk and investment.
- 11.1.4.f Develop a climate finance strategy that contextualises and integrates existing and emerging policy and financing instruments, including addressing the role of market-based measures to achieve the desired economic and social changes.

The Ministers of Finance, Economic Development, and Water and Environmental Affairs will appoint a multi-stakeholder working group to oversee the realisation of these actions within three years of the publication of this policy.

11.2 Education

Climate change is a relatively new issue that has cross-disciplinary and cross-sectoral implications in South Africa. Understanding the concept as well as the options to mitigate it and adapt to it is fundamental to future development pathways and the wellbeing of South African society. This will require systematic interventions to empower and capacitate people. We need to mainstream climate change knowledge into education and training curricula. Climate change education should be part of the broader framework of education for sustainable development, and should equip South African citizens to re-orient society towards social, economic and ecological sustainability.

To meet this challenge, South Africa will:

- 11.2.1 Ensure that a holistic understanding of climate change and related issues (specifically the required response to climate change) is included in all relevant aspects of formal education curricula. This will prepare future generations for a rapidly changing planet and the transition to a lower-carbon society and economy.
- 11.2.2 Include climate change elements in the review of the National Skills Development Strategy and ensure that all SETAs add climate change to priority skills development programmes in the formal, informal and non-formal sectors of the education and training system. This will be accompanied by requisite resource reallocation.
- 11.2.3 Establish incentives for research and training such as bursaries to encourage students and scholars to research and study climate change.
- 11.2.4 Ensure that the building of knowledge and expertise in new and emerging economic sectors is considered in all tertiary education curricula and relevant formal and informal training.
- 11.2.5 Establish a robust research agenda that, amongst others, focuses on quantitative research on the labour requirements for the green transition as well as on other societal adaptation strategies and needs.
- 11.2.6 Encourage tertiary and research institutions to develop national monitoring, reporting and verification guidelines for a climate-resilient South Africa. These guidelines would focus on mitigation and adaptation actions such as land-use practises and change.

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11.3 Science and technology development

South Africa needs a robust and highly functional climate change science and technology platform to enable the development and implementation of appropriate actions to minimise the negative impacts of climate change on the economy and the people of South Africa. With such a platform, South Africa can become a significant global player in the green economy. More specifically, South Africa should aim to be a leading supplier of climate change knowledge, technologies and services.

The decision at a national level to adopt innovations depends on the benefits users expect from the innovations as well as on the expected costs to research and master them. In addition, a country needs the technological capability to imitate, adapt and absorb foreign technologies into local productive activities. This capability influences the relative costs and benefits of adopting new technologies.

For South Africa to enhance its international competitiveness in climate change response science and technology, it needs sound science, a robust technology base and sound human capital in this arena. To achieve this vision, the following measures will be implemented:

11.3.1 Highly informed decision-making

A new governance arrangement will be instituted comprising a Chief Scientific Advisor to the Minister of Science and Technology. The Minister of Science and Technology, with the advice of the Chief Scientific Advisor, will establish and constitute a Scientific Advisory Council. The Council will consist of a wide range of expertise to cover the spectrum of South Africa's climate change response requirements. The Chief Scientific Advisor will chair this Council. The Advisory Council will produce a biennial report to the Cabinet on the state of climate change science and technology in South Africa. It will be developed into an institution with a good international record that can give scientific advice and it will bring the scientific community closer to decision-makers and implementers.

11.3.2 Medium- and long-term planning

An analysis of the state of climate change science and technology reveals that the current scientific output, technology development, intellectual property and the pool of high level skills are inadequate to support a robust climate change response. Because the response to climate change is so complex, Government and the scientific community will conduct a climate change foresight exercise. Such an exercise will deliver the following:

- A human capital development plan for climate science and technology informed by the country's climate change response requirements and the outcomes of the National Employment Vulnerability Baseline and Assessments as well as the Sector Jobs Resilience Plan.
- A complementary science and technology plan for climate change in partnership with the Department of Science and Technology (DST).
- A climate change technology roadmap.

To address the funding needed to support climate change research and development, the DST will conduct a feasibility study into the development of a specialised funding agency: the Climate Change Science Council. In parallel to this study, the DEA will engage the relevant partners in the DST, National Research Foundation (NRF), the Technology Innovation Agency and the DTI to develop the following R&D funding instruments:

- Climate Change Research Chairs in the family of the DST/NRF South African Research Chairs Initiative.
- A Climate Change component within the current NRF-administered Technology and Human Resources and Innovation Programme sponsored by the DTI.
- Climate Change Centres of Excellence to develop much higher levels of climate change science and produce more PhDs and Post-Doctoral fellows in this area and to develop intellectual property and technologies that will make South Africa a global leader in climate change science.

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- Research and innovation partnerships in the area of climate change resilience.

11.3.3 Technology transfer

Technology transfer continues to be very prominent in the multilateral environmental agreements in general, and in climate change-related agreements in particular. A national capacity to optimally engage climate change-related technology for South Africa, both as a recipient as well as donor to other developing countries, will be developed.

12. MONITORING AND EVALUATION

Measurement and monitoring of climate change responses is critical to ensure their effective implementation. South Africa's efforts in this regard will be coordinated through the cooperative governance mechanisms reflected in section 10. The DEA as the responsible coordinating department will define review mechanisms as well as a process to develop this White Paper into a suite of regulatory and legislative instruments where required.

12.1 Monitoring Climate Change

Given the nature and implications of climate change and 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 that interventions are effective. South Africa will:

- 12.1.1 Ensure that nation-wide climate change and atmosphere monitoring systems are maintained and enhanced where necessary, including through monitoring networks at appropriate spatial density and frequency that monitor, among others, rainfall, ambient air temperature, humidity, soil moisture, wind and solar radiation, lightning, extreme weather event characteristics and their impacts, selected atmospheric GHGs, gas fluxes from selected vegetation, soil and marine carbon pools, sea levels, sea surface temperature, ocean current behaviour and acidity. Data analysis, synthesis, archiving, interpretation and dissemination will be a key component of this effort.
- 12.1.2 Ensure that climate change impacts are monitored at appropriate spatial density and frequency, where feasible, of changes in spatial distribution and incidence of climate-sensitive diseases; ecosystems and the goods and services they supply; key species responses (including invasive alien species); wildfire hydrology and water resources; and agricultural and forestry production.
- 12.1.3 Establish a monitoring system for gathering information (with bottom-up inputs where possible) and reporting progress on the implementation of adaptation actions.
- 12.1.4 Identify the key role-players involved in monitoring and measuring these indicators. Describe how these role-players will share and report information on observed climate change.
- 12.1.5 In line with internationally agreed reporting requirements, include a summary of climate change impacts and adaptation actions in the National Communication, which highlights new areas of concern and areas in which observations do not align with modelled projections.

12.2 Medium- and long-term modelling

Adaptation requires proactive interventions that minimise projected climate change impacts. To achieve this, medium- and long-term climate projections that represent the full range of possible climate outcomes must be available. They include the risk and scale of projected impacts, the costs and benefits of possible responses, and the risks of their failure. Because local authorities will plan and implement many of the climate change responses, predictions need to be at a level that they can use. To this end, South Africa will:

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- 12.2.1 Within two years of the publication of this policy, finalise, publish and start implementing the 10-year Global Change Research Plan for South Africa, especially those elements of the plan that increases South Africa's modelling capacity for climate and impacts projections and vulnerability assessments.
- 12.2.2 Within two years of the publication of this policy, compile and publish a strategy to continuously update and maintain the SARVA, using the full range of medium- and long-term climate modelling results and the full range of possible risks.
- 12.2.3 Within two years of the publication of this policy, develop and pilot a methodology to downscale climate information and comprehensive impact assessments to specific geographical areas, including provinces and municipalities. This methodology will avoid inappropriate treatment of fine-scale information as indicating greater certainty in climate outcomes, allow for plans that can respond to unfolding climate trends, and lower the risk of mal-adaptation.
- 12.2.4 Roll out the downscaling work within two years of the publication of this policy onwards, with appropriate monitoring and evaluation safeguards.
- 12.2.5 Ensure that all National Communications submitted as part of South Africa's UNFCCC commitments contain the most up to date medium- and long-term modelling results and appropriately downscaled risk and impact assessments.

12.3 Monitoring responses

To monitor the success of responses to climate change and to replicate the ones that have worked well, we need to measure their cost, outcome and impact. To this end, South Africa will, within two years of the publication of this policy, design and publish a draft Climate Change Response Monitoring and Evaluation System. The system will evolve with international measuring, reporting and verification (MRV) requirements.

12.3.1 An outcomes-based system

Monitoring and evaluation of the Country's climate change programme shall be undertaken through the outcomes-based system that the Presidency has established and shall be reported through the delivery forums for these outcomes. As part of its overall responsibility to review progress across government and across the outcomes, the Department of Performance Monitoring and Evaluation in the Presidency will make sure that climate change implementation is properly integrated across Government. Reporting on climate responsibilities and adaptation measures will consequently be integrated into the Programme of Action and the Ministerial delivery agreements, as well as the quarterly reporting requirements of government at all levels. Key outcomes include:

- Outcome 4: Decent employment through inclusive growth;
- Outcome 5: A skilled and capable workforce to support an inclusive growth path;
- Outcome 7: Vibrant, fair 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;

12.3.2 Mitigation

South Africa's climate change mitigation interventions will be monitored and measured against the National Emissions Trajectory Range (see section 6.4).

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Furthermore, the implementation of objectives and measures specified in the Carbon Budget and sectoral mitigation strategies will be measured, reported and verified to assess progress in their implementation. The Climate Change Response Monitoring and Evaluation System will assess indicators defined in the Carbon Budget and sectoral mitigation strategies (see section 6.5), which may include indicators of implementation, local sustainable development benefits and the impact of programmes and measures on emissions. The monitoring process will be implemented through sectoral implementation mechanisms, and will be coordinated and overseen by the DEA, which will publish the outcomes of the monitoring process annually.

An international climate deal is likely to include an international MRV system that will monitor and report on mitigation actions in developing countries. South Africa will use the National Communication reporting requirements of the UNFCCC for this.

13. CONCLUSION

Amongst a range of environmental constraints that are of necessity playing an increasing role in social development planning, climate change represents the most urgent and far-reaching challenge of our time. While every country will have to develop its own adaptive responses to the effects of climate change, mitigating climate change to ensure the disruption caused to human and natural systems is within manageable parameters can only arise out of a global response. Furthermore, responding to climate change is a cross-generational challenge. The effects of action or inaction will not be felt immediately, but will have significant consequences for future generations.

It is within this context, and informed by an appropriate sense of urgency, that the South African government has developed this National Climate Change Response Policy. The current plan represents the first iteration of South Africa's ongoing efforts to adapt to climate change and contribute to the global mitigation effort. In terms of our contribution to the global mitigation effort, the decision to institute sectoral desired emission reduction outcomes and carbon budgets is momentous – it represents a concrete and practical commitment by South Africa.

Realising this commitment will require sustained effort and cooperation from all spheres of government, the private sector and civil society formations, and ultimately will depend on decisions by individual citizens to embrace climate-friendly lifestyles and habits. Everyone is a stakeholder in this plan, and the level of engagement from the public in the process of drafting the National Climate Change Response suggests that there is no shortage of the requisite will to make the far-reaching changes that are required. Government wishes to thank all stakeholders for their contributions to this process, and more importantly, for their commitment to building a climate-resilient South Africa for the current and future generations.