



Government of Kenya

National Climate Change Response Strategy

Executive Brief



April 2010



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Foreword

The integration of climate information into Government policies is important because climate is a major driving factor for most of the economic activities in Kenya. Climate information has, however, not been easily understandable. The same has not been adequately factored into most of the sectors of the country's economy including Government development policies and plans. The current Government's blue print called 'Vision 2030' is no exception. The purpose of this National Climate Change Response Strategy (NCCRS) is to put in place robust measures needed to address most, if not all, of the challenges posed by climate variability and change.

It is important for me that this Strategy has been developed through a very participatory process conducted countrywide. We have had two national workshops, nine regional workshops as well as workshops with parliamentarians and clusters of stakeholders including the Government, private sector, civil society organisations, development partners, youth groups, women's groups, faith-based organisations, and the media, among others. These workshops were held to gather information on the impacts of climate change as well as on recommended interventions.

It is also important for me that a number of line-ministries have provided their programmes and projects towards sector-wide adaptation to and mitigation against climate change. The Action Plan of this Strategy builds on these programmes and projects, among others, and shows to me the Government's commitment towards tackling climate change.

This document is divided into ten chapters. Chapter One looks at the history of climate change, challenges and international efforts to combat climate change. The remaining chapters give details on evidence and impacts of climate change; strategic focus of the NCCRS

including the linkages between the NCCRS and the Vision 2030; adaptation and mitigation interventions; communication, education and awareness programmes; vulnerability assessments; research, technology development and transfer; policy, legislation and institutional framework; as well as action plan, implementation framework and resource mobilisation plan, respectively.

The recommendations given in this document should be translated into policies that would benefit our communities and trigger the process of active involvement in factoring climate information into all relevant activities. For climate change threats to be appreciated, the document has recommended massive awareness campaigns so that the public can be sensitised and mobilised to adapt to and mitigate against impacts of climate change.

It is important to note that this is the first time this country has developed a document of this kind dedicated to addressing the threats posed by climate change as well as taking advantage of any opportunities that may arise. Future climate change programmes and projects will have to be developed in line with the provisions of this Response Strategy. Consequently, this Strategy is now the key Government climate change agenda guide in the country and will inform nationwide climate change programmes and development activities including the formulation of documents such as the National Climate Change Policy and efforts towards the attainment of Vision 2030. For this reason, the Strategy shall be circulated widely to as many stakeholders as possible to enable extensive reading.


Honourable John Njoroge Michuki, EGH, MP.
Minister for Environment and Mineral Resources

Acknowledgement

Climate change is considered one of the most serious threats to sustainable development globally. Studies have shown that about 90% of all natural disasters afflicting the world are related to severe weather and extreme climate change events. Impacts of the projected climate change are expected in many sectors such as environment, human health, food security, economic activities, natural resources and physical infrastructure. For example, among the key findings of the Fourth Assessment Report (AR4) (IPCC, 2007) are:

- Millions of people globally will be exposed to increased water stress,
- Access to food in many African countries will be severely compromised, and
- Adaptation to climate change will be necessary.

Kenya acknowledges that the change in the Earth's climate and its adverse effects are a common concern of humankind. The Ministry of Environment and Mineral Resources (MEMR) has therefore recognised the need to enhance coordination of climate change activities in the country with a view to ensuring a climate-proof socioeconomic development anchored on a low-carbon path.

The Kenya National Climate Change Response Strategy (NCCRS) is based on outcomes of stakeholder-consultations held all over the country and therefore captures the aspirations of most Kenyans on tackling climate change challenges. The document has also drawn from sectoral climate change response activities and budgeted Action Plans of various line Ministries.

Indeed, the Strategy has come up with modalities of dealing with climate change challenges in the country with a view to ensuring a climate-resilient nation. These include recommendations on relevant policies, institutional framework, awareness creation and mobilisation of resources, among many others.

The Ministry of Environment and Mineral Resources is proud to present this Strategy, the first ever in the country. This is an indication of

the high priority the Ministry has accorded to climate change and its associated impacts. It is my hope that the document will be found useful in delivering the country out of the vicious cycle of poverty exacerbated by the changing climate and its associated severe impacts on livelihoods and economic development.

The preparation and publication of this Strategy have taken efforts of various entities and I would like to acknowledge their efforts. I take this opportunity to thank all those who participated in the production of this Response Strategy: CAMCO as a consulting firm, stakeholders who participated in the consultative workshops, the NCCRS Advisory Committee, the NEMA staff who organised the regional consultative workshops, officers of the Climate Change Secretariat at the Ministry headquarters, all Ministries that contributed concept papers on climate change projects and programmes to be undertaken by their respective Ministries, and the Environment Secretary for coordinating all these inputs and steering the publication of the Strategy.

Development of a document of this kind would be impossible without financial resources. In this regard, my gratitude goes to the Governments of Denmark and Sweden through the Danida/Sida supported Environmental Programme Support (EPS) for providing both technical and financial support for the process. Of course I can't forget the support provided by other development partners in particular the UNDP, UNEP, International Development Research Centre (IDRC), IGAD Climate Prediction and Applications Centre (ICPAC) and members of parliament particularly the Departmental Committee on Land and Natural Resources as well as the Departmental Committee on Agriculture, Livestock and Cooperatives during the awareness campaign workshops.



Lawrence Lenayapa
Permanent Secretary
Ministry of Environment and Mineral Resources

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Introduction and Overview of the Strategy

Context of the National Climate Change Response Strategy

The National Climate Change Response Strategy (NCCRS), also referred to as the 'Strategy', is the culmination of a year-long process to develop a comprehensive and concerted suite of strategies to respond to the challenges climate change is posing to Kenya's socioeconomic development. The NCCRS is a significant step in the recognition that climate change is a threat to national development. It has presented evidence on climate change and associated impacts. In addition, it has proposed a concerted programme of activities and actions to combat such impacts and an enabling implementation framework.

The formulation process

The NCCRS was developed in a participatory manner. The process involved a total of thirteen workshops. The first national workshop was used to initiate the process, and was followed by nine regional consultative workshops, one in each of the eight provinces of Kenya, except for Rift Valley Province where two workshops were held because of the province's expansive nature. The second national workshop was a consensus workshop where stakeholders reviewed the contents of the draft NCCRS document to verify that it had captured all or most of the aspirations they had articulated during the regional consultative workshops. In addition, one consultative workshop with members of parliament was held as well as a crucial consultative meeting with members

of the cabinet chaired by the Prime Minister, which endorsed the Strategy.

Over 3000 stakeholders were consulted – government representatives and agencies, members of parliament, the private sector, faith-based organisations, non-governmental organisations (NGOs), development partners, farmers' representatives as well as ordinary Kenyans especially from rural areas who represent the most vulnerable to the adverse effects of climate change.

Overview of the National Climate Change Response Strategy

The resultant National Climate Change Response Strategy (NCCRS) is divided into ten chapters. The Strategy has outlined the evidence of climate change (in terms of temperature and rainfall variation) in Kenya, climate change impacts on the country and recommended actions that the country needs to take to reduce these impacts as well as take advantage of the beneficial effects of climate change. These actions range from adaptation and mitigation measures in key sectors, to necessary policy, legislative and institutional adjustments, to ways of enhancing climate change awareness, education and communication in the country, to necessary capacity building requirements, and to ways of enhancing research and development as well as technology development and transfer in areas that respond to climate change, among many others.



1. Climate Change: A Global Perspective

A synopsis of the global perspective of climate change has been provided. The purpose is to enhance understanding of climate change in a global context, and to define key terms and concepts relevant to the understanding of the problem of climate change.

The discussion here focuses on the climate change negotiation process and outcomes, international agreements and policies, and most importantly the positions Kenya needs to adopt in order to maximise benefits. The Strategy traces the origin of climate change debate starting as an international environmental and developmental challenge beginning with the publication of the Brundtland Report in 1987 through to the formation of the Intergovernmental Panel on Climate Change (IPCC) in 1989, the 1992

United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, and the establishment of the United Nations Framework Convention on Climate Change (UNFCCC). Since then, there have been a series of Conference of the Parties (COP) to the UNFCCC, which have produced 'Accords and Protocols' (i.e. Marrakesh Accords, Kyoto Protocol and the Copenhagen Accord).

Key issues that have continued to shape the global climate change regime are also explained. These include mitigation, adaptation, finance, technology development and transfer, governance as well as the role of land-use and land-use change and forestry (LULUCF) in climate change mitigation especially in developing countries.

2. Evidence and Impacts of Climate Change in Kenya

2.1 Evidence of Climate Change in Kenya

The evidence of climate change in Kenya is unmistakable. Temperatures have risen throughout the country. Rainfalls have become irregular and unpredictable, and when it rains, downpour is more intense. Extreme and harsh weather is now a norm in Kenya. More specifically, since the early 1960s, both minimum (night time) and maximum (daytime) temperatures have been on an increasing (warming) trend. The minimum temperature has risen generally by 0.7 – 2.0 °C and the maximum by 0.2 – 1.3 °C, depending on the season and the region. In areas near large water bodies, the maximum temperatures have risen much like in other areas but the minimum temperatures have either not changed or become slightly lower. As an example, the changing temperature trends for Nairobi are shown in Figure 1.

Figure 1: Temperature trend for Nairobi from 1960 to 2005 – increase in both T_{min} and T_{max} , but decrease in diurnal range of temperature (Data and figure from the KMD)

Figure 2: Rainfall trends over Lamu and Garissa over the past half century (Data and figure from the KMD)

As regards rainfalls, the most visible feature is the increased variability year to year, and during the year. There is a general decline of rainfall in the main rainfall season of March-May (the “Long Rains”). In other words, **drought in the Long Rains Season** is more frequent and prolonged. On the other hand,

there is a general positive trend (more rains) during September to February. This suggests that the “**Short Rains**” (October-December) **season** is extending into what is normally hot and dry period of January and February.

Moreover, measured by the volume of rainfalls in a 24 hour period, *more intense rainfalls occur, and more frequently, over the coastal strip and the northern parts of the country during September - February*. This means frequent occurrence of **severe floods** in those areas. No significant trends in the 24-hour rainfall amounts are observed in other areas of the country. Figure 2 below shows changes in rainfall patterns in Lamu and Garissa.

2.2 Impacts of Climate Change on Kenya

These changing climatic (rainfall and temperature) patterns have had adverse impacts on Kenya’s socioeconomic sectors. Moreover, current projections indicate that such impacts will only worsen in the future if the world does not implement measures that result in deep cuts in anthropogenic Green House Gas (GHG) emissions, which are responsible for climate change.

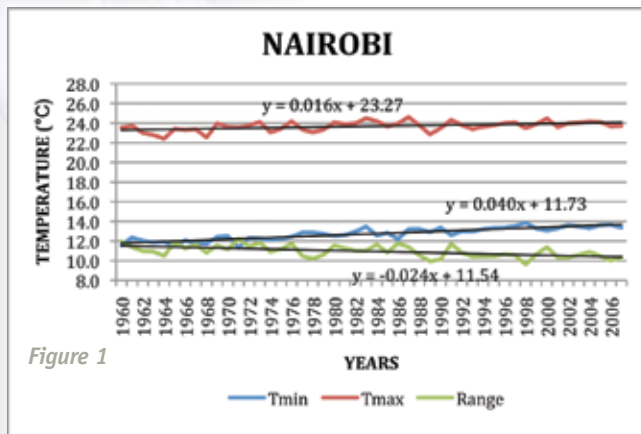


Figure 1

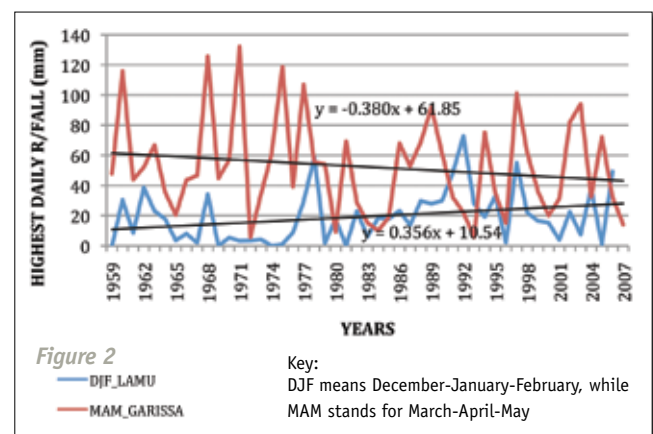


Figure 2

Key:
 DJF means December-January-February, while
 MAM stands for March-April-May

In Kenya, the adverse impacts of climate change are compounded by local environmental degradation (illegal encroachments and settlements, logging and livestock grazing), which have among others, further aggravated deforestation and land degradation. Forest cover in Kenya for instance, has fallen from 12% in the 1960s to less than 2 % at present. This has considerably affected the ability of Kenya's five main Water Towers to act as water catchments for major rivers and lakes, which are the main sources of water for daily consumption in rural and urban areas.

Thus, the impacts of climate change, compounded by local environmental degradation, are profound. In summary, some of the observed as well as projected climate change impacts on Kenya include:

- Kenya has a landmass of about 582,350 km² of which only 17% is arable while 83% consists of semi-arid and arid land (ASAL). Due to climate change and other human factors, desertification, i.e., the extent of arid and semi-arid land, is increasing.
- Kenya's natural resources, in particular its rich flora and fauna are among the country's most valuable natural assets. Climate change now threatens this rich biodiversity. Species loss has been observed, while in some places, the number of indigenous and important species has tremendously dwindled.

The desolation that often characterises dryland areas as a result of drought leads to loss of livelihoods. Photo courtesy of the Noomayianat CBO, 2009



- Kenya's rangelands support millions of pastoralists and agro-pastoralists who travel long distances in search of pasture and water for their cattle. Receding rangelands threaten the very basis of the livelihood and the way of life of the pastoralists.
- The Kenyan coastline is characterized by a rich diversity, including fish, coral reefs and mangrove forests. But the Kenyan coast is one of the most vulnerable to sea level rise in the world. For example, it is estimated that about 17% of Mombasa or 4600 hectares (ha) of land area will be submerged with a sea level rise of only 0.3 metres.
- Kenya is a water-scarce country. The natural endowment of renewable freshwater is low, and water resources are unevenly distributed in both time and space. Climate change will worsen this already precarious situation as it affects the main hydrological components: (i) precipitation and (ii) run-off. This will alter the spatial and temporal availability of water resources.
- Serious droughts have occurred in the last 4 consecutive years. Major rivers show severe reduced volumes during droughts, and many seasonal ones completely dry up. The consequent crop failures in 2009 for instance, placed an estimated 10 million Kenyans or one fourth of the entire population at risk of malnutrition, hunger and starvation.
- Droughts reduce the production of not only staple food crops such as maize but also other major crops such as tea, sugarcane and wheat. This increases imports (maize, wheat and sugar) and reduces exports (tea), weakening the country's balance of payments.
- Malaria, cholera, ebola, Lyme disease, plague, tuberculosis, sleeping sickness, yellow fever, and Rift Valley Fever are some of the diseases that are expected to spread as temperatures rise and precipitation



Submerged huts in Western Kenya. During floods especially those related to El-Niño events, environmental diseases such as typhoid, amoeba, cholera and bilharzia normally associated with contaminated water and poor sanitation reach epidemic levels in such places.

Photo by Camco Kenya.

- patterns change. In addition, during floods, diseases such as typhoid, amoeba, cholera, and bilharzia reach epidemic levels. Disease outbreaks will further burden the already stretched public health infrastructure.
- Population displacement and migration from climate disaster-prone areas (e.g. drought prone northern Kenya and sea-level rise in the coastal region) are expected to increase. It is expected that most of those on the move will be from rural areas heading towards urban agglomerations where assistance, income opportunities and infrastructure may be perceived to be more accessible and readily available. This will create an enormous social, health, infrastructural and management challenge for cities, subjecting them to unplanned population growth.
 - Global warming is likely to disrupt and even destroy some of the tourist attractions such as the snow-caps of Mt. Kenya, the coastal rainforests and fragile marine ecosystems. Coral reefs are bleaching. The number of flamingoes in Lake Nakuru is diminishing due to diminishing water levels of the lake. The great migration of the wildebeest across the Mara River is under threat as the river's flow is reduced. Along the coastline, some of the popular beaches could eventually disappear as the sea level rises. Already, hotels along the Kenyan coastline have been forced to construct sea walls to protect against increasingly strong sea tides. All these do and will continue to impact negatively on Kenya's tourism sector.
 - Further, climate change is exacerbating human-wildlife conflicts. Pastoralists in search of pasture and water have encroached into game parks, chasing wildlife away from their natural habitats. Drought has also pushed lions and other wildlife closer to waterholes and vegetation near to human settlements.
 - Changes in ocean circulation are predicted to lead to loss of certain fish populations or establishment of new ones. Temperature change may also result in changes of upwelling patterns, which might impact on fish spawning period and success of larvae, thereby altering the entire life cycle and size of fish population.
 - Climate change will also affect Kenya's energy supply. Hydropower potential has dramatically reduced during the past 20 years due to the destruction of water catchment areas. Climate change is likely to worsen the situation as it will result in prolonged droughts which will see water levels in the generating dams recede further. The country currently relies on hydropower for nearly 70% of its electricity. Further, extreme weather events such as rainstorms will destroy the energy generation and distribution systems.
 - Torrential rains accompanied by floods can also destroy roads, bridges, railway lines and other transportation and communication infrastructure. For instance, the damage caused by the eight-month 1997/1998 El-Niño rains to the country's transport and telecommunication infrastructure was estimated at one billion US Dollars. In addition, rising temperatures will cause warping of rail-tracks.

3. Strategic Focus

3.1 Importance of the NCCRS to Kenya

As the preceding chapter shows, the direct and indirect impacts of climate change are already being felt across the country and there is a high possibility of increasingly severe changes in the future unless unprecedented measures are taken to reduce emissions of Green House Gases (GHGs). Natural disasters associated with climate variability and change have in the past cost huge losses. For instance, the 1999 and 2000 droughts in Kenya caused damages equivalent to 2.4% of the Gross Domestic Product (GDP). The Stern Report of 2006 predicts that the cost of climate change in Africa could be as high as 7-10% of GDP by 2100, whereas a recent study on the economic impacts of climate change in Kenya has estimated that the annual cost of climate change impacts will be in the tune of USD 1 to 3 billion by the year 2030.

Kenya's ability to cope with the impacts of climate change is compounded by many factors including poverty, weak institutions, poor infrastructure, inadequate information, poor access to financial resources, low management capabilities, armed conflicts due to a scramble for diminishing environmental resources and high interest rates. It is vital that policies and measures for adaptation to and mitigation against climate change are put in place across all the sectors in order to minimise the impending climate change catastrophe.

3.2 Strategic Focus, Vision, Mission and Objectives

The NCCRS's primary focus is ensuring adaptation and mitigation measures are integrated in all government planning, budgeting and development objectives. It has called for collaborative and joint action with all stakeholders (private sector, civil society, NGOs, faith-based organizations, etc) in tackling the impacts of climate change. The most vulnerable sectors of the economy namely agriculture,

water, energy, forestry, rangelands, health, social and physical infrastructure are prioritized for quick and immediate action.

The vision of the NCCRS is for a **prosperous and climate change resilient Kenya**, whereas the Mission of the Strategy is **to strengthen nationwide focused actions by ensuring commitment and engagement of all stakeholders towards adapting to and mitigating against climate change.**

3.2.1 Strategic Objectives

The objectives of the NCCRS are addressed in the first nine chapters of the document and are summarized here as follows:-

- enhancing understanding of the global climate change negotiations process, international, agreements, policies and processes and most importantly the positions Kenya needs to take in order to maximise beneficial outcomes of these negotiations,
- assessing the evidence and impacts of climate change in Kenya,
- recommending robust adaptation and mitigation measures needed to minimise risks associated with climate change while maximising opportunities,
- enhancing understanding of climate change and its impacts nationally and in local regions,
- recommending vulnerability assessment, impact monitoring and capacity building framework needs,
- recommending research and technological needs and avenues for transferring existing technologies,
- providing a conducive and enabling policy, legal and institutional framework to combat climate change, and
- providing a concerted action plan, resource mobilisation plan and robust monitoring and evaluation plan.

4. Adaptation and Mitigation Measures

As a response to the challenges posed by climate change to Kenya, the Strategy has proposed a number of measures meant to curb the adverse impacts of climate change on the country (adaptation measures) and to tame global warming (mitigation measures).

4.1 Adaptation

Adaptation measures include the prevention, tolerance or sharing of losses, changes in land use or activities, changes of location, and restoration. Adaptation measures that have been proposed in key sectors include:

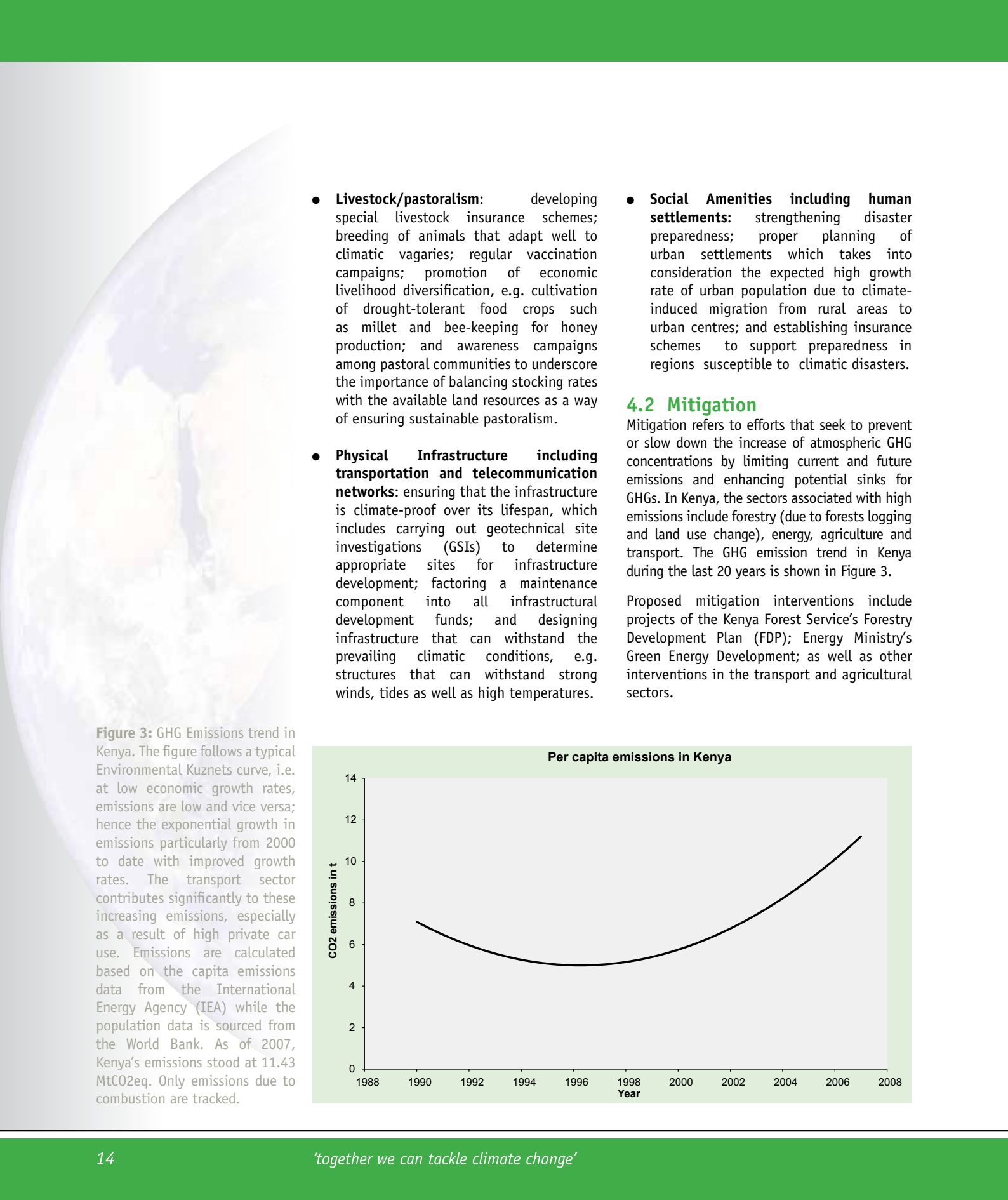
- **Health:** construction of a large number of nomadic clinics; recruitment of more (about 24,000) technical staff to strengthen public health services across the country; heightened surveillance of new outbreaks with consequent rapid responses; and health education campaigns.
- **Agriculture:** provision of downscaled weather information and farm inputs; water harvesting e.g. building of sand dams for irrigation; protection of

natural resource base (soil and water conservation techniques); and research and dissemination of superior (drought tolerant, salt-tolerant, pest and disease resistant) crops.

- **Water:** construction of dams and water pans; protection of water towers, river banks, and water bodies; de-silting of riverbeds and dams; municipal water recycling facilities; building capacity for water quality improvement, and awareness campaign to promote water efficiency measures. Interventions in the water sector will have to adapt the integrated approach to water resource management and utilization. In Kenya, this is imbedded in the '**Integrated River Basin and Large-Water Bodies-based Natural Resource Management Programme**' of the six regional basin-based institutions, e.g. the Tana & Athi River Development Authority (TARDA) and the Lake Basin Development Authority (LBDA), etc.
- **Fisheries:** developing country-wide maps that will depict areas that require shore protection measures; developing financing mechanisms using non-consumptive options for supporting marine ecosystem research and development; and encouraging a coastal and watershed- basin management approach linking land-use practices to marine and fisheries resource conservation.
- **Tourism/Wildlife:** development of a *National Wildlife Adaptation Strategy* (a suite of a suite of **well assessed climate change adaptation strategies**) by the Kenya Wildlife Service (KWS) and stakeholders including the World Wildlife Fund (WWF), the tourism industry, etc; development and enforcement of Green Strategy and Code; and branding of Kenya as a Green Destination.

Excavation of Mogole community earth dam, ALRMP, Malindi, 2008





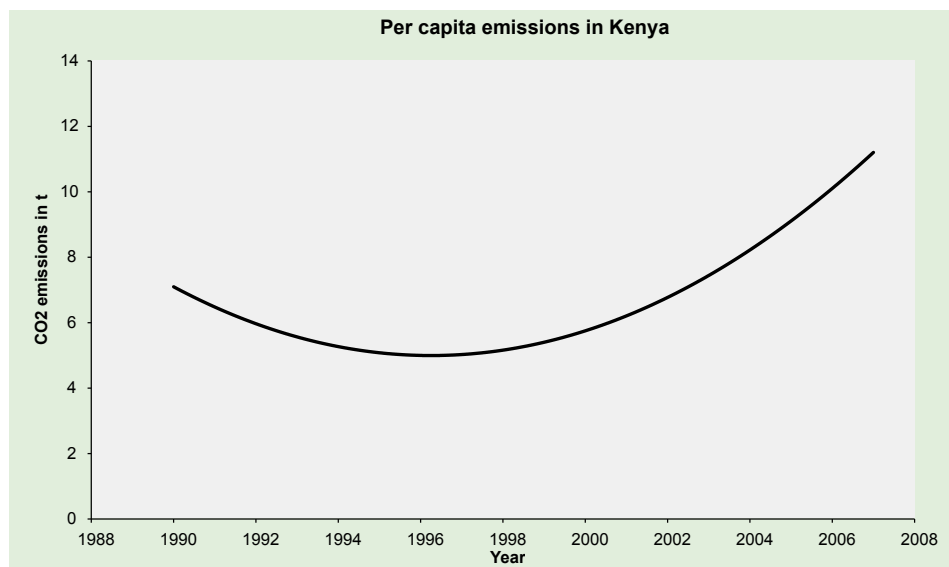
- **Livestock/pastoralism:** developing special livestock insurance schemes; breeding of animals that adapt well to climatic vagaries; regular vaccination campaigns; promotion of economic livelihood diversification, e.g. cultivation of drought-tolerant food crops such as millet and bee-keeping for honey production; and awareness campaigns among pastoral communities to underscore the importance of balancing stocking rates with the available land resources as a way of ensuring sustainable pastoralism.
- **Physical Infrastructure including transportation and telecommunication networks:** ensuring that the infrastructure is climate-proof over its lifespan, which includes carrying out geotechnical site investigations (GSIs) to determine appropriate sites for infrastructure development; factoring a maintenance component into all infrastructural development funds; and designing infrastructure that can withstand the prevailing climatic conditions, e.g. structures that can withstand strong winds, tides as well as high temperatures.
- **Social Amenities including human settlements:** strengthening disaster preparedness; proper planning of urban settlements which takes into consideration the expected high growth rate of urban population due to climate-induced migration from rural areas to urban centres; and establishing insurance schemes to support preparedness in regions susceptible to climatic disasters.

4.2 Mitigation

Mitigation refers to efforts that seek to prevent or slow down the increase of atmospheric GHG concentrations by limiting current and future emissions and enhancing potential sinks for GHGs. In Kenya, the sectors associated with high emissions include forestry (due to forests logging and land use change), energy, agriculture and transport. The GHG emission trend in Kenya during the last 20 years is shown in Figure 3.

Proposed mitigation interventions include projects of the Kenya Forest Service's Forestry Development Plan (FDP); Energy Ministry's Green Energy Development; as well as other interventions in the transport and agricultural sectors.

Figure 3: GHG Emissions trend in Kenya. The figure follows a typical Environmental Kuznets curve, i.e. at low economic growth rates, emissions are low and vice versa; hence the exponential growth in emissions particularly from 2000 to date with improved growth rates. The transport sector contributes significantly to these increasing emissions, especially as a result of high private car use. Emissions are calculated based on the capita emissions data from the International Energy Agency (IEA) while the population data is sourced from the World Bank. As of 2007, Kenya's emissions stood at 11.43 MtCO₂eq. Only emissions due to combustion are tracked.



Installation of wind turbines on Ngong Hills. Investing in renewable energy sources such as wind energy will enable Kenya meet its energy needs and contribute to global initiatives to reduce GHG emissions. Photo by Camco Kenya



- The **Forestry Development Plan (FDP)** aims at growing of **7.6 billion trees** during the next 20 years. This will be done by growing of trees by 35,000 schools; 4300 women groups; 16,350 youth groups, and the six Regional Development Authorities. Each school will be supplied with a 10, 000 litre water tank to support harvesting of water for the establishment and management of tree nurseries as well as watering of planted out seedlings. In addition, large scale land owners with at least 50 acres of land will be encouraged to construct dams for water harvesting and storage in order to support establishment of irrigated private forests.
- The **Green Energy Development Programme** will seek to take advantage of Kenya's **abundant renewable energy resources**. The proven geothermal steam reserves are equivalent to 7000 MW. The north-eastern parts of the country are ideal for wind power generation, with Class I wind¹. The arid and semi arid areas have long hours of sunshine throughout the year, making them conducive for solar energy capture and utilisation. Kenya has an ample potential to grow sugarcane, sweet sorghum, *Jatropha* and other non-food crops suitable for producing biofuels. By maximizing these potentials, Kenya can contribute significantly to reduce global GHGs as well as its unhealthy reliance on imported fossil fuels.
- A number of desirable and implementable green energy projects have been identified. The Government is prepared to allocate a large amount of budgetary resources, while the same time, is seeking support of bilateral and multilateral financial institutions. It will offer credit and subsidy facilities to private investors to facilitate rapid completion of these projects. The green energy projects are estimated to provide an additional 2790 MW by 2014. Building on the success of this programme, it is envisaged that Kenya will become a **Green Economy** by 2020. In addition, Kenya will pursue **energy efficiency options**. Such options include: (a) mandatory energy audits of large commercial and industrial consumers; (b) review of tax policies to encourage the importation of energy efficient motor vehicles; (c) subsidies and other tax incentives to promote and sustain wider adoption of energy efficient electrical gadgets such as compact fluorescent light (CFL) bulbs and solar hot water heating; and (d) constructing energy efficient buildings, e.g. buildings that use as much sunlight as possible while avoiding direct heating from the Sun in order to minimise energy requirement for cooling purposes.

¹ Wind speeds are classified based on **Wind Power Density**. The wind power density, measured in watts per square meter (W/m²), indicates how much energy is available at a site for conversion by a wind turbine. Class I wind (the lowest in the ranking) refers to wind power density of less than 100 W/m² and 200 W/m² at 10 m and 50 m above ground, respectively. For more information, refer to <http://www.awea.org/faq/basicwr.html>



An artist's impression of the Bangkok Bus Rapid Transit (BRT) line. A well developed BRT system would offer a fast, comfortable and convenient means of movement within a busy traffic metropolis such as Nairobi, and would attract middle-income people "to get out of their cars". Many developing countries are developing BRT systems to help them reduce their transport GHG emissions. Photo source: <http://transitmy.org/2010/03/17/do-bus-lanes-worsen-congestion/>

- **Transport:** some of the proposed interventions include promotion of low-cost public transport modes such as Bus Rapid Transit (BRT) and other means of mass transport; proper urban and transport planning to facilitate efficient and low GHG modes of transportation, e.g. decongesting roads; encouraging non-motorised modes of transport (NMT) by creating bikeways and pedestrian walkways; creating transport demand management measures that encourage or favour public transport and NMT; establishing a Light Rail Transit (LRT) along with the BRT in major cities and towns to help decongest traffic; and improving the country's railway network to facilitate low-cost and low-carbon long-distance transportation of cargo and passengers.
- **Agriculture:** proposed mitigation measures include appropriate use of biotechnologies which increase food production per unit area while simultaneously limiting GHG emissions; proper management of agricultural waste e.g. using manure to produce biogas; and promotion of **agroforestry** especially tree-based intercropping (TBI).

4.2.1 Carbon Markets

Developing countries (also known as Non-Annex 1) such as Kenya can choose to undertake mitigation projects in the sectors described above (e.g. energy, transport, agriculture) as well as manufacturing and others. These projects can gain monetarily from 'carbon markets' that allow them to sell Certified Emission Reduction (CER) credits to developed countries (also known as Annex 1) to help the latter mitigate against climate change cost-effectively. Certified Emission Reductions are traded through regulated compliance markets under the Kyoto Protocol's Clean Development Mechanism (CDM). Carbon markets also comprise of the buying of 'carbon offsets' as Verified Emission Reductions (VER) by individuals and organisations who wish to voluntarily offset their GHG emissions, i.e. under the Voluntary Carbon Markets (VCM). In future, the VCM will probably be dominated by the Reduced Emissions from Deforestation and Degradation (REDD) mechanism.

In order for Kenya to participate effectively in the carbon markets including the CDM, the following measures will need to be undertaken:

- calculation of the baseline GHG Grid Emission Factor (GEF) for the electricity grid of Kenya to facilitate CDM projects in the power sector and assist carbon project developers and consultants,
- target capacity building for the private sector and investors to increase the knowledge of GHG reduction project development and markets, e.g. developing a handbook for CDM Project Activities detailing the role of government and the UNFCCC, CDM cycle, types of projects, eligibility criteria, CDM transaction costs and how to sell Certified Emission Reductions (CERs),
- a government-fronted manual that guides CDM implementation should be produced and disseminated. It should be placed on a public website, as has been done by a number of countries including Tanzania,

Clearing of natural forests to make charcoal. Providing forest-dependent communities with incentives to conserve their forests can enable them benefit from opportunities offered by the REDD markets. Photo by Camco Kenya



- strengthening relevant institutions such as the Designated National Authority (DNA) and removing barriers to carbon trading such as high initial transaction costs and low level of awareness of CDM potential on the part of private sector, particularly investment and financial organisations,
- providing tax incentives and favourable import tariffs on technology for projects that reduce emissions,
- having clear energy pricing and CDM project policies including a clear, strong institutional framework and good governance,
- ensuring that Kenya establishes itself as a cost-effective host country to GHG emission reduction projects,
- designing a general ranking of the easiest and most viable project types to the most

difficult and least viable (low hanging fruits first to build momentum),

- creating a database of existing projects, emission reduction volumes, other benefits, project developers, financiers, government support, and
- exploring ways of integrating carbon markets into the main economy and opening it to conventional legal and banking systems.

Specific recommendations that can enable Kenya to benefit from REDD opportunities include:

- establishing robust monitoring, reporting and verification (MRV) institutional arrangements (clear credible national forest monitoring baselines and guidelines),
- filling the historical data gaps on forest cover throughout the country,
- addressing the risk of non-permanence and leakage as a necessary condition for any parties or entities to participate in a REDD mechanism and activities,
- establishing and building capacity on REDD methodology development especially strengthening financial support, technology transfer and provision for capacity building especially among forest-dependent communities, and
- establishing and strengthening partnerships between the public and private sectors in order to mobilise the necessary finance and accelerate REDD actions.

5. Climate Change Communication, Education and Awareness Programmes

Climate change awareness is low countrywide. This was evident from the findings of consultative workshops conducted in all the eight provinces of Kenya during the preparation of this Strategy. The need for awareness creation, targeting specific groups and communities, and using different tools and media such as the print and electronic media, drama, community forums (*barazas*) is therefore pressing. Equally important is the incorporation of climate change into the nation's educational curricula at different levels, starting with primary through to tertiary institutions.

Ways of enhancing climate change awareness that the Strategy has identified include the following:

- establishing a National Climate Change Awareness campaign. The National AIDS/STD Control Programme (NAS COP) model for sexually transmitted diseases can be adapted,
- using print and electronic media to pass climate change information in various articles and programmes on climate change in the media,
- Education-based entertainment: educating the citizens on climate change while entertaining them at the same time through theatrical performances,
- mainstreaming climate change awareness in all programmes and projects undertaken by the Government, NGOs, CBOs, media etc,
- creating climate change training material and programmes for target groups of stakeholders and specific groups, i.e. women, men, children, youth, people with disabilities, religious groups,
- promotional activities and sponsorship of events with climate change themes, e.g. a reward scheme for pupils or individuals who plant trees and maintain them,
- online blogging on sites such as Facebook, Twitter, Google Groups, and Yahoo Groups through which various topics on climate change could be discussed, and
- involving the corporate sector, especially the mobile telephone industry e.g. to display 'airtime top-up messages' on climate change.

6. Vulnerability Assessment, Impact Monitoring and Capacity Building

A thorough nationwide assessment on how climate change elements – temperature rise, change in precipitation, extreme weather events, sea level rise and other seasonal shifts – will affect phenomena such as floods, drought, water shortages (supply and quality), air quality, human health, and habitat loss should be conducted. The need to conduct climate change scenarios and develop corresponding policy responses on how these changes will affect human population, infrastructure, the environment, the economy and society as a whole should also be emphasized.

In addition to vulnerability assessments, periodic monitoring and assessment of the status of key natural eco-systems will be required to design appropriate response measures that can check against their degradation and preserve them for the sake of current and future generations. Periodic determination of levels of GHG emissions will also have to be undertaken in order to identify ‘high-emissions’ sectors and areas where significant GHG reductions can be realised. Such GHG emissions data could also feed into the National Communications as required under the UNFCCC.

A targeted capacity-building framework is recommended in the areas of science,

policy, adaptation, mitigation, technology generation, carbon finance and markets to strengthen the human resource capital base for these subjects. These include, among others:

- capacity building and support for the modernisation and development of national meteorological services e.g. the Kenya Meteorological Department and IGAD Climate Prediction and Applications Centre (ICPAC),
- strengthening planning and capacity development initiatives to reduce risk, prepare and recover from disasters including strengthening institutions in charge of Disaster Risk Reduction (DRR) cope with climate disasters,
- capacity building in the use of geo-referenced demographic and socioeconomic data, in addition to setting up a GHG reduction policy and tools,
- strengthening the Designated National Authority (DNA), including additional personnel, and
- building the capacity of local communities to enable them adapt to the adverse impacts of climate change.

7. Research, Technology Development, Absorption and Diffusion

The Strategy has identified specific sectoral research needs as a response to the impacts of climate change.

- In the **Agricultural** sector, research areas include the development of superior (drought-tolerant, fast-maturing, disease and pest-resistant) crop varieties; countrywide assessments to determine regional vulnerability of the sector to climate change elements; and strengthening research in vaccines against priority livestock diseases and inoculants for improving soil nitrogen and phosphorous in acid soils as well as enhancing soil biological resources, among others.
- In the **Energy** sector, priority research areas include energy efficient innovations and technologies, and both low-carbon

appliances and tools; the development of eco-friendly energy resources such as wind, solar, biogas, small hydros, etc; as well as research on the sustainability of biofuels especially Life Cycle Assessment (LCA) of biodiesel.

- In the **Forestry** sector, research areas entail evaluating the potential for remunerating natural resource users for natural forests conservation and restoration with funds from carbon markets (e.g. under a REDD+ scheme); developing technologies to rehabilitate naturally degraded areas or those cleared for charcoal burning; and validation as well as integration of indigenous knowledge and technologies in woodlands management.
- In the **Health** sector, research areas will encompass assessing the risks of populations to climate change impacts (including short and long-term public health effects of e.g. extreme weather events) using climate-disease prediction models, and identifying the most effective interventions; the use of Geographic Information Systems (GIS) to map the spatial distribution of interacting risk factors and other critical data, and to communicate research results effectively to policymakers, stakeholders and the public; and innovative research to produce vaccines against diseases such as malaria, cholera and others whose outbreaks will intensify with climate change.
- In the **Water** sector, areas in which research is needed are on intensified hydrologic cycle predictions as these have a direct effect on the spatial and temporal distribution of rainfall and therefore the quantity of fresh water available for domestic, commercial

Research produces improved local crop and livestock breeds with higher productivity and disease resistance.
(Source: KARI, undated)



and industrial use; assessment of watersheds and water resource vulnerability due to hydrological cycle changes; and assessment of the potential impacts of climate change on water, waste-water and storm-water infrastructure – including risk exposure of key infrastructural nodes to weather extremes – and the impact of rising sea level on coastal water infrastructure.

- In the **Fisheries** sector, research should focus on supporting vulnerability assessments of aquatic, coastal and marine ecosystems to determine resilient regions and species to be accorded conservation priority; evaluating current land-ocean interactions and the impact of their changes on fisheries resources; and assessing the socioeconomic impacts of climate change on the livelihoods of fishing and coastal communities, among others.
- In the **Rangelands and Wildlife** sector, priority research areas are assessing current and future climate change threats and risks to wildlife in order to formulate the aforementioned *National Wildlife Adaptation Strategy*. This will involve:
 - analysing the current climate variability in marginal rainfall areas,
 - identifying rainfall homogenous areas,
 - identification and analysis of climate risk factors,
 - collecting and analysing historical data on climate induced impacts in rangelands,
 - collecting and analysing data on climate induced and human disturbances in rangelands,
 - assessing the socioeconomic dynamics and activities of the communities living in and around wildlife protected areas,
 - assessing the current human-wildlife conflicts, and
- carrying out sensitivity analysis, and projecting how these indicators will affect rangelands resources including wildlife in the future.
- In addition to research in the priority sectors highlighted above, **information documentation and dissemination** are important to ensure that different stakeholders take appropriate action to respond to the challenges presented by climate change. To this end, one of the key priority areas will be improving national coordination of information through enhancing packaging and expediting timely dissemination.

Further, efforts should be made to support technology generation and absorption through institutional capacity building; research and development; and technology transfer from the industrialised countries to Kenya. To this end, the Strategy has identified some of the channels through which technology development, absorption and diffusion can be achieved, which include:

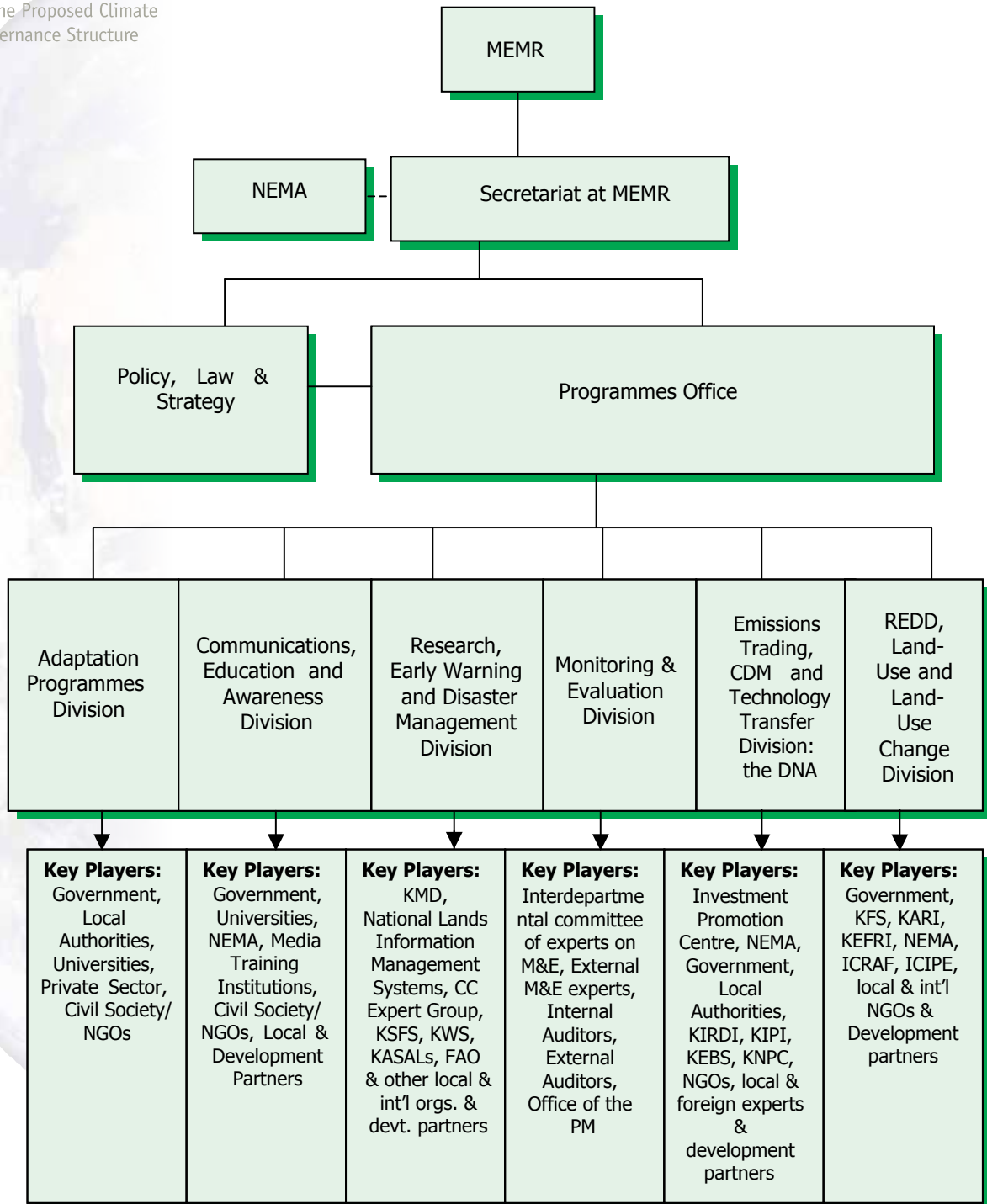
- through the Kyoto Protocol's CDM or its future successor,
- through the United Nations Industrial Development Organization (UNIDO),
- accelerating South-South partnerships,
- accelerating North-South transfers through Foreign Direct Investment (FDI) including taking advantage of 'patent-free' technologies,
- establishing local technological innovation centres which will help strengthen institutional technology generation and transfer through learning-by-doing approach, and
- including climate change research and development in all budgets of Ministries with substantial allocations to institutions of higher learning to strengthen research capacities.

8. Climate Change Governance

An analysis of existing environmental policy and legal framework currently in place to guide climate change activities in Kenya has been performed. It has revealed that Kenya currently has no policies or laws that deal directly and explicitly with climate change. The only policy that has attempted to address climate change to some extent is the draft National Environmental Policy of 2008. The same is true of the legislative framework, with the national environmental law, the *Environmental Management and Coordination Act (EMCA, 1999)*, only having certain provisions relevant to mitigation of climate change, but not effectively addressing several aspects of the problem.

- The Strategy therefore recommends that a comprehensive climate change policy and related legislation be put in place. This could be achieved by either reviewing and updating the clauses on climate change in the draft National Environmental Policy or developing a completely new climate change policy. This should be followed by a review of existing laws (in particular, the *Environment Management and Coordination Act, EMCA of 1999*) to make them climate change responsive and/or enactment of a new and comprehensive climate change law. However, the Strategy recommends that a new climate change legislation be enacted, a process that could run concurrently with formulation of a climate change policy.
- In addition, the Strategy has established that institutions currently in place to govern climate change affairs are inadequate. It has consequently recommended that a dedicated and adequately funded Climate Change Secretariat be established within the Ministry of Environment and Mineral Resources to oversee climate change issues including the implementation of the adaptation and mitigation programmes and the other aspects of the National Climate Change Response Strategy. This Secretariat, including the proposed structures within it (see figure 4 below), should be anchored on the provisions of the new climate change laws to be enacted.
- Further, in relation to climate change governance, it is recommended that the **National Climate Change Activities Coordinating Committee (NCCACC)** continue to perform its current advisory capacity. It is further proposed that MEMR establishes a **National Climate Change Steering Committee** to help it gather and collate input and advice from key climate change stakeholders for its use in the coordination of Kenya's climate change activities. The Climate Change Secretariat to be established at MEMR will provide secretarial functions for the two committees. The Climate Change Coordination Unit (CCCU) at the Office of the Prime Minister will continue to provide high-level political support to climate change activities in Kenya.

Figure 5: The Proposed Climate Change Governance Structure



9. Action Plan, Resource Mobilisation Plan and Implementation Framework

9.1 Action Plan

The adaptation, mitigation and related programmes identified in the Strategy will be implemented over the next 20 years at an annual average cost of Ksh. 235.83 billion (approximately US\$ 3.14 billion). Forestry, Energy and Infrastructure (Roads Maintenance) sectors are expected to absorb the lion's share of this budget. A detailed Action Plan presented


in the main Strategy document outlines specific activities, their timeframe, and estimated cost of implementation. The budget component of the Action Plan is shown in figure 5 below.

9.2 Resource Mobilization

From Figure 5, one notes that significant additional financial resources need to be mobilised for the implementation of this

Table 1: Estimated Annual Budget for proposed Climate Change Projects and Programmes

Sub- sector/Ministry	Annual Cost. Ksh. Billion
Productive Sector	76.96
Agriculture	10.60
Tourism	0.04
Marine & Fisheries Resources	2.52
Forestry and Wildlife	32.26
Environment & Mineral Resources	7.39
Cooperative Development and Marketing	0.15
Regional Development Authorities	24.00
Physical Infrastructure & Service Industry	111.52
Energy Sector	73.71
Water & Irrigation	5.96
Roads (maintenance)	20.00
Transport Sector (devt. of BRT and LRT)	11.85
Manpower	37.45
Youth Affairs and Sports	2.75
Gender, Children & Social Development	2.70
Special Programmes (Famine and DRR)	32.00
Education	7.90
Health (Public)	1.30
ICT	0.70
Grand Total (Approx)	235.83



Strategy, with every effort made to reallocate the country's budgetary resources and raise additional revenue for this purpose. Nevertheless, most of the funding will be mobilised from developed countries either directly or indirectly through the multilateral financial institutions and the UN agencies. Carbon trade as well as payment for ecosystems services schemes are also viable avenues of revenue generation to support implementation of this Strategy.

In addition, all governmental and non-governmental institutions should mainstream climate change proofing and responsiveness in their programmes and projects.

Further, since combating climate change is a high-investment undertaking as depicted by the indicative costs in the Action Plan, there is need to include the devolved funds – the Local Authority Transfer Fund (LATF) and the Constituency Development Fund (CDF) – in order to have great impact at the grassroots

level especially in dealing with climate-related emergencies.

The Strategy has also made recommendations for the establishment of a National Adaptation Facility (NAF) or Authority that can be used for the mobilisation and consolidation of resources from multiple sources to tackle adaptation needs.

9.3 Implementation Framework

The Monitoring and Evaluation (M&E) Division of the proposed Climate Change Secretariat to be established within the Ministry of Environment and Mineral Resources (MEMR) will oversee the implementation of the adaptation and mitigation programmes and the other aspects of the National Climate Response Strategy. Its functions will include among others, monitoring the impact of the implementation of the proposed interventions as well as monitoring the performance of the various climate change units within the Secretariat.

10. Recommendations and Conclusion

It is undeniable that climate change is currently affecting Kenya. Droughts and floods have become frequent and intense and the country has also seen an increase in average temperatures, hotter days, colder nights, successive crop failures and the spread of vector-borne diseases such as malaria to places where the disease is not known to be endemic. These climatic changes affect resources critical to the health and prosperity of Kenya. For example, the 1999/2000 La Niña droughts resulted in 4.7 million Kenyans facing starvation, while according to unofficial reports, the effects of the 2006-2009 successive drought episodes caused 10 million people – over a fourth of Kenya's population – to starve.

As global GHG emissions are continuing unabated, climate change impacts are likely to intensify an already precarious situation into the future. If no action is taken to reduce or minimise expected impacts from climate change, the costs to society and the economy will be immense. The Strategy has therefore identified the sectors that are most vulnerable to climate change impacts and proposed interventions to reduce or mitigate these impacts, while promoting a low-carbon economy and climate change-resilient production systems. In addition, the Strategy has proposed the establishment of a dedicated Climate Change Secretariat that will oversee its implementation.

Activities identified in the Action Plan require substantial additional and adequate financial resources for their implementation, and funding is therefore required from both internal and external sources. Given the importance of adaptation, it is recommended that the Kenyan Government create a multi-stakeholder National Adaptation Facility (NAF) for mobilising resources for adaptation activities.

All stakeholders should mainstream climate-proofing and climate change responsive activities in their programmes and projects. In achieving this, most line ministries, particularly those offering development and infrastructural services, have developed climate change response programme-concepts, which will form the basis of sectoral programmes and projects. These are included in the Action Plan of the Strategy.

While Kenya stands to benefit immensely from the advanced technology of developed countries, efforts should be made to support local technology generation and application through institutional capacity building programmes. Consequently, new and additional resources are needed to support and strengthen the country's research and academic institutions to enable them undertake research in climate change related fields.







Comments and Views are invited from the public.
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