Kenya's Climate Change Action Plan: Mitigation

Chapter 1: Methods, Key Findings and Priority Actions

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Chapter 1: Introduction

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Abbreviations

AFOLU	Agriculture, Forestry and Other Land Use
BAU	business as usual
CGE	computable general equilibrium model
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COP	Conference of the Parties
CCS	Climate Change Secretariat
GDP	gross domestic product
GEEM	general equilibrium and emissions model
GHG	greenhouse gas
IPCC	Intergovernmental Panel on Climate Change
KAM	Kenya Association of Manufacturers
KEPSA	Kenya Private Sector Alliance
KCCAP	Kenya's Climate Change Action Plan
KCCWG	Kenya Climate Change Working Group
KFS	Kenya Forest Service
KSh	Kenyan Shilling
LPG	liquefied petroleum gas
MEMR	Ministry of Environment and Mineral Resources
MPND	Ministry of State for Planning, National Development and Vision 2030
Mt	million tonnes
MTP2	Second Medium Term Plan
NAMA	nationally appropriate mitigation action
NEMA	National Environment Management Authority
REDD+	reducing emissions from deforestation and forest degradation plus the role of conservation, sustainable management of forests and enhancement of forest carbon stocks
SC4	Subcomponent 4
T21	Threshold 21
TWG4	Thematic Working Group for Subcomponent 4
UNFCCC	United Nations Framework Convention on Climate Change

1.1   Introduction

Kenya Vision 2030 – the long-term development blueprint for the country – aims to transform Kenya into "a newly industrialising, middle-income country providing a high quality of life to all its citizens in a clean and secure environment."[1] Following a conventional development path would result in a large increase in greenhouse gas (GHG) emissions, while acting on the *National Climate Change Response Strategy* would allow Kenya to move toward a low-carbon development pathway. This mitigation component of Kenya's Climate Change Action Plan sets out low-carbon opportunities that will reduce emissions and support sustainable development.

This report describes the analysis of *Subcomponent 4 (SC4) – Mitigation, of Kenya's Climate Change Action Plan*. The analysis examines potential low-carbon development opportunities in the six mitigation sectors set out in Article 4.1 of the United Nations Framework Convention on Climate Change (UNFCCC): energy, transport, industry, agriculture, forestry and waste management. This low-carbon scenario analysis – which includes a bottom-up assessment of mitigation opportunities and a top-down economy-wide economic, energy and emissions model – provides the evidence base for prioritizing low-carbon development opportunities and developing proposals for 1) nationally appropriate mitigation actions (NAMAs); and 2) reducing emissions from deforestation and forest degradation plus the role of conservation, sustainable management of forests and enhancement of forest carbon stocks (REDD+).

NAMAs and REDD+ are international climate policy instruments that aim to address developing country GHG emissions while supporting sustainable development. NAMAs refer to actions (such as strategies, policies and programmes) that developing countries can voluntarily implement, and for which they may access international finance, technology and capacity building support. NAMAs are expected to be government interventions that create an enabling environment for increased investment in low-carbon opportunities, although limited experience has been gained with NAMAs being a relatively new instrument under the UNFCCC. A REDD+ mechanism is expected to provide international finance, technology and capacity building support for mitigation in developing countries through the preservation and enhancement of forests.

This chapter, Chapter 1, provides an overview of the *methods, key findings and priority actions identified by SC4*, first setting out an introduction to low-carbon development in the Kenyan context. Section 1.3 explains the methodology used to undertake the low-carbon scenario assessment, including the development of the reference case and the identification and analysis of low-carbon development opportunities. Section 1.4 provides a summary of key findings and potential priorities by sector, and Chapter 1 concludes with a discussion of priority actions to enable low-carbon development in Kenya. The Annexes include lists of the considerable stakeholders who contributed to the SC4 analysis.

The other chapters of the Mitigation report are included in separate documents, listed below:

- Chapter 2: Preliminary Greenhouse Gas Inventory – detailed description of the methodology and key assumptions used to develop the inventory of historical and current GHG emissions and the reference case out to 2030.

- Chapters 3: Agriculture – including examination of actions to increase carbon sequestration in soils and trees on farms.

- Chapter 4: Forestry – REDD+ and reforestation opportunities.

- Chapter 5: Electricity Generation – supply-side low-carbon opportunities in the energy sector.

- Chapter 6: Energy Demand – low-carbon opportunities for household and industrial energy-demand.

- Chapter 7: Transportation – including options to decrease urban traffic congestion.
- Chapter 8: Industrial Processes – a focus on improved charcoal production.
- Chapter 9: Waste – a focus on landfill methane capture.
- Chapter 10: GEEM-Kenya – top-down economy-wide economic, energy and emissions model.

Each chapter contains information on the sector; a description of its GHG emissions reference case; and a discussion of low-carbon development opportunities to bring down emissions, visually presented as a wedge analysis. The assessment also addresses sustainable development and climate resilience impacts, feasibility of implementation and potential policy options. The chapters conclude with the identification of suggested priority low-carbon development opportunities, which account for both emission reduction potential and sustainable development benefits. Each chapter, except Chapter 10, has an annex that includes fact sheets for the low-carbon development opportunities.

1.2 Low-carbon Development in Kenya

Kenya Vision 2030 sets out a development path aimed at creating a prosperous country with a high quality of life.[2] Many of the actions needed to achieve the development ambitions in Vision 2030 can be undertaken in a low-carbon way, meaning that GHG emissions are lower than business as usual (BAU) practices, but without compromising sustainable development goals. A low-carbon development pathway builds on the current low levels of GHG emissions in Kenya, keeping emissions as low as possible without compromising expected growth and development. Kenya has little historic responsibility for climate change and a low-carbon development pathway can help ensure that Kenya remains a low emitter on a global basis, although recognizing that GHG emissions will increase with economic growth and development.

In addition to reduced GHG emissions, low-carbon development can bring other benefits to Kenya:

- **Sustainable development** – The best low-carbon development opportunities deliver multiple benefits, helping to address pressures related to a growing population and increasing resource use. Agro-forestry is an example: increasing the carbon stock on farmland, improving food security, increasing climate resilience, and helping to meet the government's goal of 10 percent tree cover on farms.

- **International climate finance** – The evidence base provided through the low-carbon analysis can help development partners ensure their investments align with Government of Kenya low-carbon priorities, which are nested within Vision 2030 and Kenya's general development planning process. International climate finance for these actions can be sought through NAMAs and REDD+, but also through other bi- and multilateral support, or the carbon markets.

- **Demonstration of global leadership** – The implementation of low-carbon development demonstrates Kenya's leadership in the global fight against climate change.

The analysis in this report shows that many low-carbon actions have significant sustainable development and climate resilience benefits, and that many low-carbon alternatives can be achieved at costs comparable to higher GHG emitting options. At the same time there are barriers to implementing low-carbon interventions. Many of these barriers could be addressed through NAMAs and REDD+ mechanisms, which could provide finance, technology or capacity building to fill information gaps and overcome financial, regulatory and policy barriers.

1.3 Methodology

This section describes the methodology used to develop the low-carbon scenario assessment. The starting point for analysing the various low-carbon opportunities in Kenya is the reference case, which sets out how GHG emissions are expected to grow out to 2030 in the absence of mitigation-related interventions. The reference case provides the baseline against which to measure the impact of low-carbon development opportunities. The potential for mitigation from the different low-carbon actions in each sector is measured against this reference case, and represented as a "wedge". The result is wedge analysis, showing how various low-carbon opportunities can bend down emissions from the expected baseline.

Figure 1.1 illustrates the general process of developing the reference case for each sector (left column, described in Section 1.3.1), as well as the low-carbon development options (right column, describe in Section 1.3.2). A critical element was the local validation process, which is described in Section 1.3.3.

Figure 1.1:   Approach for determining greenhouse gas emissions and low-carbon development option potentials
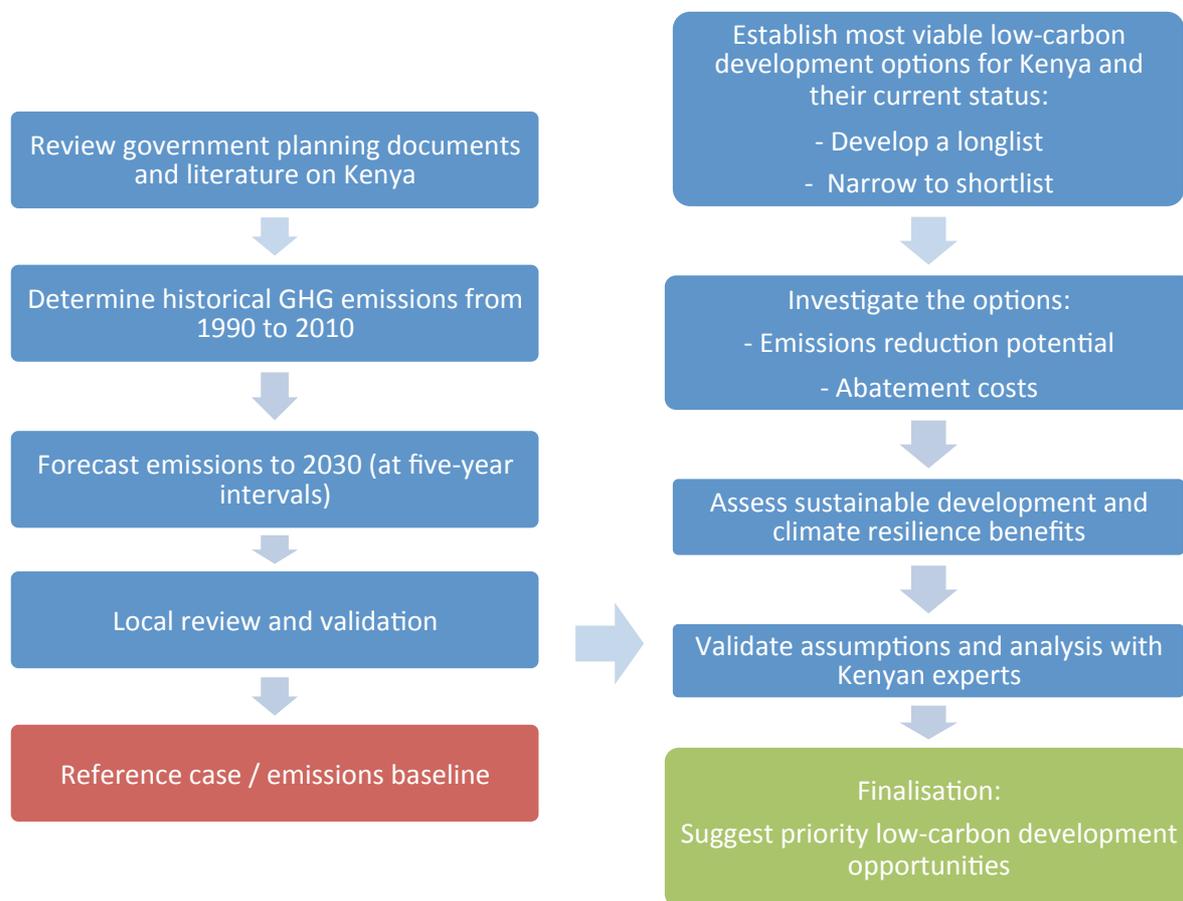
1.3.1 Reference case method

The reference case included the development of an inventory of historical emissions from 1990 to 2010, and the projection of emissions out to 2030. This formed the reference case – or the baseline – against which to demonstrate the abatement potential of low-carbon development options out to 2030.

Inventory of historical greenhouse gas emissions

An independent emissions inventory and forecast was developed because the last GHG emissions inventory for Kenya was completed for the year 1994 for the first national communication.[3] No comprehensive emissions inventory has been completed since then, although several partial and less rigorous inventories have been developed, including the Threshold 21 model produced by the Ministry of State for Planning, National Development and Vision 2030 (MPND) and a forecast by the Stockholm Environmental Institute.[4]

Kenya's 1994 inventory divided emissions between six major sectors that align with the 1996 Intergovernmental Panel on Climate Change (IPCC) guidelines for conducting emissions inventories.[5] The Revised 2006 IPCC Guidelines divide emissions into four major sectors.[6]

The low-carbon analysis began with the calculation of historical emissions from 2000 to 2010. This detailed preliminary inventory set out GHG emissions in the four major sectors in the 2006 IPCC guidelines.[7] This preliminary GHG inventory used primarily Tier 1 approaches and was informed by a comprehensive review of the literature. Data availability varied by sector, with uncertainties in data much higher in the agriculture and forestry and other land use sectors. The local validation process (see Section 1.3.1) helped to fill data gaps in the inventory process, identifying potential sources of information and verifying assumptions. This inventory is not suitable for reporting to the UNFCCC, but is a very strong starting point and can easily be built on. Detailed information on the underlying data and assumptions is included in Chapter 2 – Preliminary Greenhouse Gas Inventory.

Emissions in this preliminary inventory were then allocated across the six mitigation sectors identified in Article 4.1(c) of the UNFCCC,[8] examining the energy sector from demand and supply perspectives. The relationship between the six sectors of the low-carbon analysis and the major IPCC sectors in the 2006 and 1996 guidelines is set out in Table 1.1 below.

Table 1.1: Relationship of emission baseline reference case sectors to IPCC guideline sectors

Low-Carbon Scenario Analysis Sectors (from Article 4.1 of the UNFCCC)	2006 IPCC Guideline Sectors	1996 IPCC Guideline Sectors
Energy Demand	Energy	Energy
Electricity Supply		
Transportation		
Industrial Processes	Industrial Processes and Product Use	Industrial Processes
		Solvent and other Product Use
Agriculture	Agriculture, Forestry and other Land Use	Agriculture
Forestry (and other land use)		Land-Use Change and Forestry
Waste	Waste	Waste

In 2010, the agriculture and forestry and other land use sectors were the largest emitters, accounting for approximately 67 percent of emissions, mainly due to emissions from livestock and deforestation, respectively. Energy demand was the next largest sector, accounting for about 14 percent of emissions in 2010, followed by transportation at about 10 percent.

Projection of GHG Emissions

Historical trends and projections of sector and economic growth then were used to project annual emissions out to 2030 as illustrated in Figure 1.2. These projected emissions to 2030 form the reference case that is used as the baseline against which to demonstrate the expected abatement potential in each of the four major IPCC sectors. These were then allocated across the UNFCCC sectors dividing the energy sector into electricity supply, energy demand and transportation; and the Agriculture, Forestry and Other Land Use (AFOLU) sector into Agriculture and Forestry.

In most sectors, the projections assume that historical trends in population, energy demand and economic growth will continue with constant relative growth rates, and no major structural changes in the economy will occur. The projections rely on estimates and assumptions about future growth, which were informed through the local validation process described in Section 1.3.3. Expert opinion and data in two sectors indicated that future growth would be substantially different, and emissions do not follow historical trends:

- Electricity generation – Detailed government forecasts of installed capacity were employed instead of historical trends.

- Agriculture – Lower growth in agricultural livestock was assumed because of expert opinion and an assessment of the carrying capacity of rangelands to support livestock.

The ambitious goals set out in Vision 2030 and other policy documents are assumed to be aspirational and unlikely to be achieved without outside financing, technology transfer and capacity building. This ensures that Kenya will not penalized for ambitious and progressive policy goals when determining if a low-carbon development action is additional to the GHG reference case to 2030.

1.3.2 Method to identify and assess low-carbon development options

The identification and analysis of the low-carbon development options followed a participatory, multi-step approach; illustrated in Figure 1.1 and described below.

Step 1: Develop a long list of options

Sixty low-carbon development opportunities were identified through a literature review that placed emphasis on Government of Kenya and development partner documentation. Additional options that could be pursued in Kenya were identified by Kenyan and International sector experts in the SC4 team.

Step 2: Narrow to a short list of options

A short list of potential low-carbon development opportunities was categorized by the six UNFCCC sectors. Sector experts in the SC4 team narrowed the list of potential opportunities in each sector by screening for options that met three broad criteria:

- **Substantial emission reduction potential** – Low-carbon development opportunities need to reduce GHG emissions on a scale large enough to have notable impact on sector emissions. That is, the low-carbon development opportunity can be illustrated in a wedge analysis, demonstrating how the option can bend down emissions from the reference case. Some low-carbon opportunities that were promising at the firm or community level because of their sustainable development benefits and potential cost savings (for example, brick making), were not large enough at the national level to form a wedge of potential emission reductions.

- **Significant sustainable development and climate resilience co-benefits** – Recognizing that development is the priority in Kenya, low-carbon development opportunities need to generate development co-benefits such as economic growth,

improved rural livelihoods or enhanced energy security. The screening also considered if the low-carbon development option might build climate resilience.

- **Alignment with Government of Kenya development priorities** – The low-carbon development opportunities should build on or contribute to Government of Kenya priorities to enable development, such as those set out in the *Updated Least-cost Power Development Plan* or the *Agricultural Sector Development Strategy 2010-2020*.[9]

The second screening process resulted in a list of 25 potential low-carbon development opportunities.

Step 3: Analyse emissions reduction potential

Kenyan and international sector experts then analysed the 25 low-carbon development opportunities for emissions reductions potential. The general methodology was to estimate the potential emissions reductions that could be achieved by 2030 versus the reference case, looking at five-year periods. The mitigation potentials for each option were determined using a variety of methods depending on the sector and technology because each required some specific assumptions on rates of and limits to growth. The subsequent analysis considered a wide variety of factors such as the available renewable energy resources in Kenya, potentials for efficiency improvements from current performance levels to benchmarks, possible penetration rates of new technologies over time, land degradation conditions and extent, as well as many others. The scenarios, detailed methodologies and assumptions are described in further detail in each of the respective sectoral chapters (Chapters 3 to 9).

The resulting mitigation potentials then formed the basis for low-carbon scenarios that could be illustrated as wedges of potential emissions reductions below reference emissions. These wedges indicated how the low-carbon development opportunity could reduce emissions from the reference case. This approach is illustrated for the transportation sector example in Figure 1.2 below.

Figure 1.2: Low-carbon mitigation wedges in the transport sector – interaction between options not considered
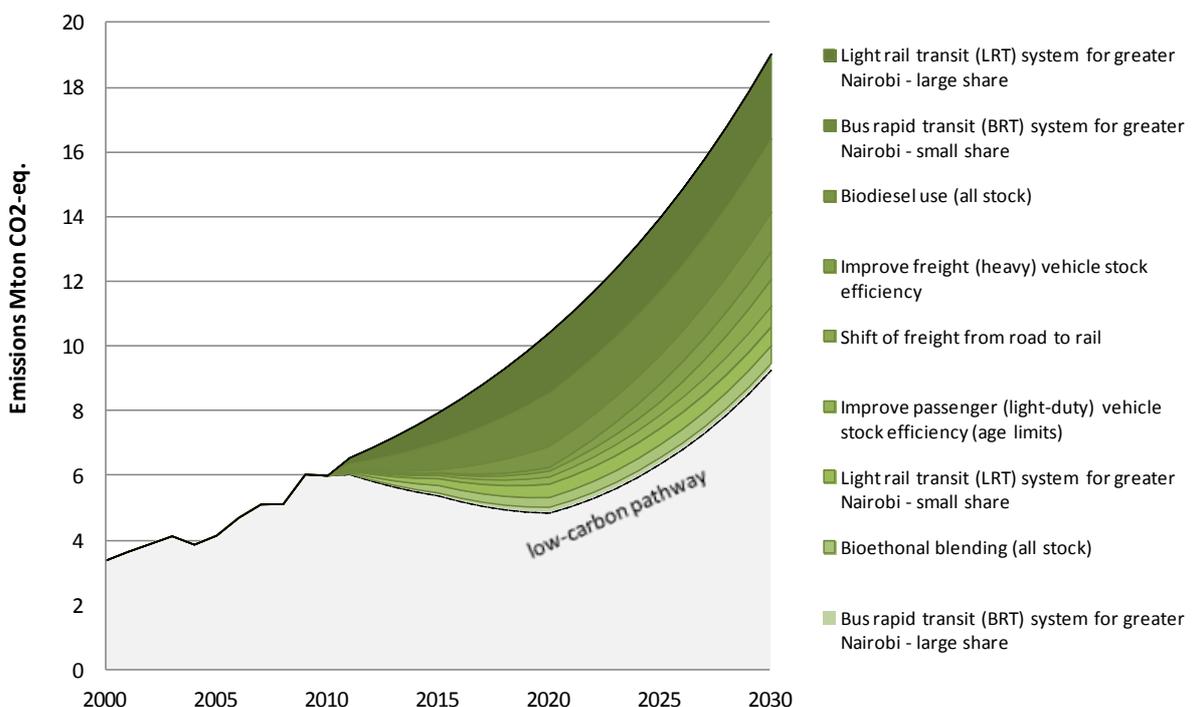
Step 4: Estimate abatement costs

When feasible, marginal abatement costs were calculated for the various low-carbon development opportunities to provide comparative information on mitigation cost within a sector. The marginal abatement cost represents the cost of mitigating one tonne of carbon dioxide equivalent (CO_2e) in comparison to a reference case or technology. A marginal abatement cost could not be determined with a reasonable level of accuracy for some low-carbon opportunities. In these instances, surrogate figures from studies performed in other countries were used, or estimates of total abatement costs (for example investment requirements) were provided.

For most sectors, abatement costs are highly variable, both in terms of their magnitude and the reliability and ease with which they can be calculated. The electricity sector is an exception because options in this sector have a convenient metric through which they can be compared (the cost per unit electricity supplied over a plant lifetime). This is not true in the transport, agriculture, forestry or energy demand sectors. Further detail is provided in the respective sectoral chapters.

Step 5: Assess sustainable development and climate resilience co-benefits

The low-carbon development opportunities were assessed for their contribution to sustainable development and climate resilience. This qualitative assessment was undertaken in each sector by an expert team, building on previous exercises and experience to measure sustainable development impacts. Sustainable development indicators were developed for each of the six UNFCCC sectors, recognizing that full comparability across sectors was beyond the scope of this study. The team also identified potential adaptation impacts, determining whether the low-carbon development opportunities could have positive, neutral or negative impacts on climate resilience. Chapter 1 of *Kenya's Climate Change Action Plan* explores the interaction of mitigation and climate resilience in greater detail, and Chapter 2 explores adaptation.

The sustainable development and adaptation assessment was visualized for each sector, illustrated below in Table 1.2 for the electricity sector.

Step 6: Validate assumptions and analysis with Kenyan experts

Consultations were held with Kenyan stakeholders at a series of local validation meetings (described in Section 1.3.3) on the short-listed low-carbon development opportunities. The reference case was also discussed for each sector, including data sources and assumptions made. Revisions were made to the reference case on the basis of information provided by Kenyan experts. For example, the energy sector reference case was improved by input from the Ministry of Energy, particularly in regard to the amount of planned electricity generation.

The low-carbon development opportunities were also discussed by sector. Additional options were put forward by Kenyan experts and, as a result, three low-carbon opportunities were added to the analysis: liquefied petroleum gas (LPG) cookstoves in the energy demand sector; freight to rail in the transport sector; and limiting use of fire in range and cropland management in the agriculture sector. Some low-carbon options were changed; for example a conservation agriculture option was changed to conservation tillage as the latter was determined to be measurable with greater accuracy.

The team also considered a range of low-carbon development opportunities put forward by Kenyan experts that did not result in GHG reduction wedges, either because there was insufficient data available to develop a rigorous assessment of emission reduction potential, or because the emissions would not be significant at the national level. A low-carbon development opportunity in the livestock sector is the most significant omission in this analysis because of the large emissions from this sector in the reference case. Kenyan experts were not able to definitively identify a viable low-carbon development opportunity for this sector because of a lack of data and strong barriers to action, including the cultural and

economic importance of cattle, and resistance to change in rural communities. Other opportunities examined but not included in the wedge analysis included brick production in the energy demand sector, electricity generation from biomass in the electricity generation sector, and road improvements in the transport sector.

Table 1.2: Overview of development benefits of low-carbon development options in the electricity sector

	Climate			Development			
	Abatement potential 2030 (MtCO$_2$)	Abatement cost 2030 (USD/tCO$_2$)	Adaptation impact	Energy security	GDP growth	Employment	Improved waste management
Expanding geothermal power	14.1	-19.9	🟢 High Positive	🟢 High Positive	🟢 High Positive	▬	▬
Expanding wind power	1.4	-36.7	◓ Positive	◓ Positive	◓ Positive	▬	▬
Expanding hydro power	1.1	-13.2	◡ Uncertain	◓ Positive	◓ Positive	▬	▬
Distributed solar photovoltaic	1.0	13.3	◓ Positive	◓ Positive	◓ Positive	◓ Positive	▬
Landfill gas generation	0.5	-12.4	◓ Positive	◓ Positive	◓ Positive	▬	🟢 High Positive
Clean coal (ultra super critical)	1.1	-11.1	◓ Positive	▬	◓ Positive	▬	▬

Legend:
- 🟢 High Positive
- ◓ Positive
- ▬ Neutral / Minor impact
- ▽ Negative
- ◡ Uncertain

Step 7: Finalize assessment and suggest priority low-carbon development opportunities

The reference case and low-carbon development opportunities were revised to incorporate input from stakeholders and information gained through additional data sources identified by stakeholders. The final scenario assessment included 28 low-carbon development opportunities. Suggested priority low-carbon development opportunities were identified on the basis of the assessed emission reduction potential and sustainable development benefits.

Step 8: Develop priority actions

Priority actions were identified to inform the overall Action Plan. These actions were identified through consultation with Kenyan experts, who suggested general overall actions to further NAMAs and REDD+ because the government has yet to engage in a prioritization process. This low-carbon scenario analysis provides an evidence base to inform the government's prioritization process. The priority mitigation actions focused on identifying priority NAMAs and REDD+ activities and presenting them for international support. The mitigation actions, discussed in greater detail in sections 1.5 and 1.6, also highlight the need

to improve information and data, and to mainstream low-carbon development opportunities in the Government of Kenya planning process.

Step 9: Expert review

The final report was reviewed by the Thematic Working Group for SC4 (TWG4), nine Kenyan sector experts, the Climate Change Secretariat of the Ministry of Energy and Mineral Resources (MEMR) and an external reviewer, AEA. (See Annex 2 for a list of reviewers.) Final revisions were made to the analysis based on the input received from the various review processes. In addition, the overall results were reviewed and approved by the Permanent Secretary of MEMR, and the energy results by the Permanent Secretary of the Ministry of Energy. Finally, IISD and ECN conducted an extensive quality control review.

1.3.3 Local validation process

A critical element of the analysis was the local validation processes that brought together Kenyan experts to ground-truth and inform the low-carbon scenario assessments. These consultations allowed for a testing of assumptions, improved information sources and identification of potential viable low-carbon opportunities. Kenyan experts approved the data used, underlying assumptions and final recommendations. The broad consultations also helped to create buy-in and ownership with the various line ministries, which will need to be engaged to move forward on NAMAs and REDD+ actions.

The local validation process and engagement of Kenyan experts played an important role in building awareness and understanding of low-carbon development and the opportunities available in the various sectors. Local experts noted that the process helped to change mind-sets by introducing new concepts and creating awareness of new opportunities that can emerge by adopting a low-carbon development path.

The various processes used by the SC4 team to consult with stakeholders and locally validate the work are described below:

Thematic Working Group for SC4 (TWG4) - TWG4 provided oversight and guidance for the work of the SC4 team. Two meetings were held with TWG4 members, and these members also participated in the SC4 local validation meetings and the stakeholder consultations coordinated by the MEMR. TWG4 provided overall approval of the SC4 analysis, including the suggested priority low-carbon development opportunities. Annex 1 includes a list of TWG4 members.

Sector validation meetings – Five sector validation meetings were held: agriculture and forestry, electricity generation, energy demand, transportation, and industrial processes and waste. Representatives from government, civil society (including non- governmental organizations, research institutes and universities), and the private sector attended these meetings. These groups discussed the information sources, underlying assumptions, and selection of low-carbon development opportunities for analysis. Several experts commented on the draft sectoral chapters. A list of the participants at the five local validation meetings is included in Annex 1.

Individual meetings and discussions with experts and advisors – Members of the SC4 team met with advisors and experts from government, civil society organizations and the private sector. The most important meetings were with the Permanent Secretary, MEMR, who provided guidance on the direction of the analysis, and reviewed and approved the final results. Critical meetings were also held with the Permanent Secretary, Ministry of Energy, who reviewed the final results of the analysis in the energy sector; and the Secretary of the National Economic and Social Council, who provided overall context for the analysis. A list of all individuals consulted is included in Annex 2.

Review of technical chapters by Kenyan experts – The chapters were reviewed by Kenyan sector experts, who verified the analysis and results. The Climate Change Secretariat,

MEMR, and an external reviewer, AEA, also reviewed the SC4 analysis. A list of reviewers is included in Annex 3.

County consultations – The analysis was also informed by input provided at the eight county consultations that were led by the MEMR. The SC4 team attended these consultations to gain insights on mitigation issues at the county and local level, which was incorporated into the low-carbon scenario assessment.

Stakeholder consultations – Input to the low-carbon scenario assessment was provided at three stakeholder consultations to review progress on Kenya's Climate Change Action Plan. These consultations, held in Karen and led by the MEMR, provided an opportunity to get input from a several stakeholders from a variety of technical backgrounds and sectors.

Through the first five processes described above the SC4 team consulted over one hundred and fifty individuals from government, civil society organizations, the private sector and the donor community. Many more stakeholders were reached in the latter two processes – the county consultations and the MEMR stakeholder consultations – with these stakeholders accounted for in the overall MEMR process to develop Kenya's Climate Change Action Plan.

1.4 Key Findings

1.4.1 GHG reference case

The reference case, illustrated in Figure 1.3, demonstrates that baseline emissions will likely increase up to 2030 in all sectors but the forestry sector. The growth rate of emissions will be greatest in the electricity sector, where emissions increase more than twenty-fold from 2010 to 2030. Emissions in the transportation sector will increase by almost six times in the same time period, with waste and energy demand emissions approximately doubling. The forestry sector will experience declines in emissions from 2020 onward because of reduced clearing of forests and increases in the number and size of trees, a result of tree-planting programmes and a projected reduction in wood harvesting. The agricultural sector will continue to dominate emissions, and relative share of agriculture in total emissions is likely to remain constant.

**Figure 1.3: Greenhouse gas emissions reference case, 2010 to 2030**
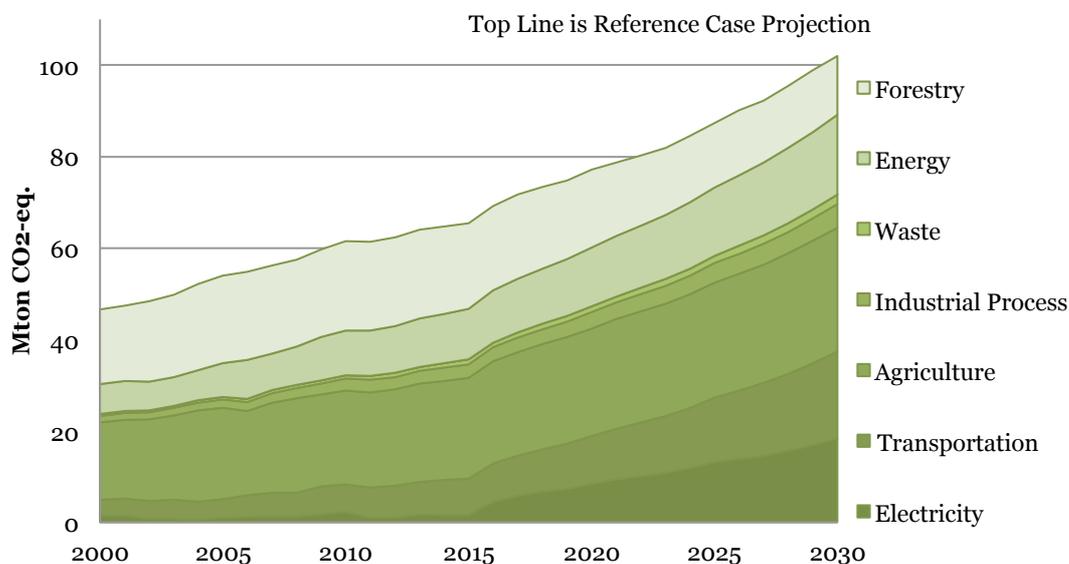
1.4.2 Low-carbon development opportunities

The low-carbon scenario analysis evaluated the potential for GHG emissions reduction in Kenya over the coming decades. The technical analysis for the six UNFCCC sectors, with energy split into electricity production and energy demand, is included in Chapters 3 to 9. The wedge analysis, showing how the emissions in each sector can be abated from the reference case, is included in Figure 1.4

Significant emissions reduction potential exists in the forestry sectors, an area with significant sustainable development and climate resilience co-benefits. The restoration of forests on degraded lands has the largest abatement potential at 32.6 million tonnes (Mt) of carbon dioxide equivalent, followed by reforestation of degraded forests at 6.1 $MtCO_2e$. The restoration of forests option helps to increase climate resilience by abating the risk of flooding and landslides, and can increase adaptive capacity in vulnerable areas such as the Arid and Semi Arid Lands. This effort also works toward the goal of 10 percent tree cover stated in Kenya's constitution.

Options in the agriculture sector can also bring important sustainable development benefits, contributing to improved food security and livelihoods, and enhanced ability to withstand climate change. Agroforestry has the largest abatement potential at 4.1 $MtCO_2e$; and can help the government reach its goal of 10 percent tree cover on farmland. All options in the agriculture and forestry sectors require awareness raising and capacity building, including improved extension services in the agriculture sector; and research and development to improve data, and measurement, monitoring and reporting techniques.

Figure 1.4: Wedge analysis showing emissions reductions by sector
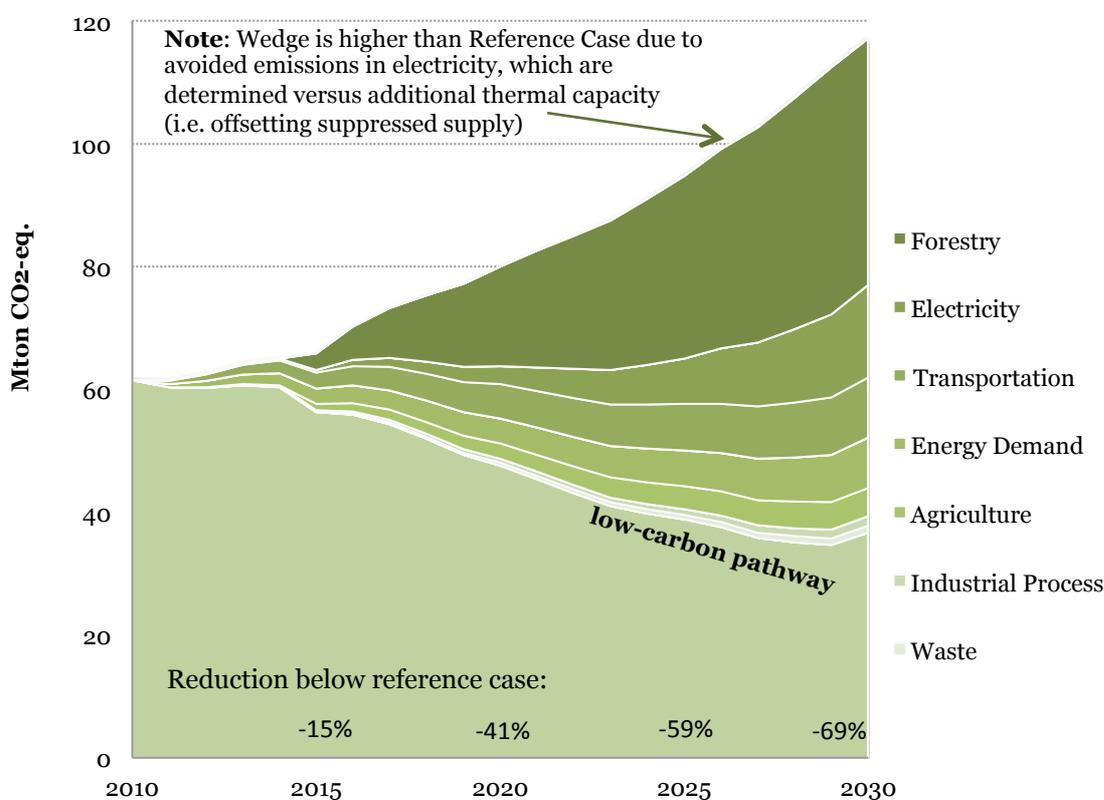
The low-carbon development opportunity to expand geothermal electricity also offers large abatement potential at 14.1 MtCO$_2$e and provides energy security benefits. On the energy demand side, improved cookstoves offer emission reduction potential of about 5.6MtCO$_2$e as well as very large rural development benefits, including improved indoor air quality and related health benefits. Improved cookstoves also offer substantial cost savings for households and institutions over the life cycle of the equipment. Bus rapid transit is the most attractive short-term option in the transport sector, offering an abatement potential of 2.8 MtCO$_2$e and providing a much-needed benefit of reduced traffic congestion. The options analysed for industrial processes and the waste sector have lower mitigation potentials, and no priority opportunities were selected.

The low-carbon development opportunities analyzed in Chapters 3 to 9 are listed in the Table 1.3, which also includes the suggested priority opportunity in each sector.

Table 1.2: Suggested priority low-carbon development opportunities

UNFCCC sector / GoK planning sector	Suggested priority and other low-carbon development opportunities	Abate-ment potential MtCO$_2$e	Sustainable development benefits and potential barriers
Forestry Environment, Water and Sanitation - Forestry	*Restoration of forests on degraded lands* *Reforestation of degraded forests* Reducing deforestation and forest degradation	32.6 6.1 1.6	– Contributes to constitution's goal of 10% tree cover – Sustainable forest products, including, resins, nuts and fuelwood contribute to improved livelihoods – Environmental benefits (for example, biodiversity) and increased climate resilience – *Conservation may limit access to forests for communities*
Electricity Generation Physical Infrastructure	*Expanding geothermal electricity generation* Wind generation expansion Clean coal Hydroelectricity expansion Solar photovoltaic, distributed and grid-connected Landfill gas generation	14.1 1.4 1.1 1.1 1.0 0.5	– Improved energy security and economic growth – Renewable electricity (other than solar photovoltaic) is likely to be cheaper than electricity generation based on (imported) coal and medium-speed diesel – Important to support expansion of electricity generation capacity with grid development – *Geothermal may require relocation of communities*
Energy Demand Physical Infrastructure and Agriculture and Rural Development	*Improved cookstoves* LPG stove substitution Renewable lamps Co-generation in the agricultural sector Energy efficient light bulbs Energy efficiency improvements in industry Energy efficient electric appliances Emission reductions in the cement sector Solar thermal water heating	5.6 1.7 1.8 1.6 1.0 0.9 0.6 0.4 0.1	– Most energy demand options lead to (substantial) cost savings for households or companies over the life time of equipment – Health benefits from reduced indoor air pollution – Lower fuelwood demand and deforestation

Agriculture	Agroforestry	4.1	– Increased soil fertility and crop yields, improving livelihoods of farmers and food security
Agriculture and Rural Development	Limiting use of fire in range and cropland management	1.2	– Improved climate resilience – improved soil quality, perennials more able to withstand climatic changes
	Conservation tillage	1.1	– Contributes to goal of 10% tree over on farms – *All options require awareness raising and capacity building, including improved extension services*
Transport	***Bus rapid transit***	2.2	– Reduced traffic congestion
Physical infrastructure	Biodiesel use	1.2	– Improved local air quality – Improved road safety
	Improved heavy duty vehicle stock efficiency	0.8	– Biodiesel and bioethanol offer the highest potential to improve energy security through lower fuel imports
	Freight to rail	0.8	– *Biodiesel and bioethanol could have impacts on food security through conversion of farmland to non-food crops*
	Improved passenger vehicle stock efficiency	0.6	
	Light rail transit	0.6	
	Bioethanol use	0.5	
Industrial Processes Tourism, trade and industry	Improved charcoal manufacturing	1.6	– Lowers rate of deforestation – *Initial investment cost and informal nature of the sector are barriers*
Waste Environment, water and sanitation	Landfill methane capture	1.1	– Improved management of landfills – Lower ground and surface water pollution

1.4.3 Economic, energy and emissions modelling

The low-carbon analysis also included economy-wide economic, energy and emission modelling. A computable general equilibrium modelling (CGE) approach was used to inform climate investment choices and long-term development impacts in Kenya. The top-down CGE modelling also incorporated the bottom-up low-carbon development options and emission forecasts described above. The resulting analysis provides a wider view of the possible scale and scope of reductions available within Kenya. Figure 1.5 identifies the mitigation potential that is available at different carbon offsets prices ranging between US $15 and $50 per tonne. Costs are not the only factor affecting prospects for implementation; barriers to implementation and potential policy measures are discussed for each low-carbon development option in Chapters 3 to 9.

Figure 1.5: Economy-wide abatement potential for all sectors (US$/tonne)

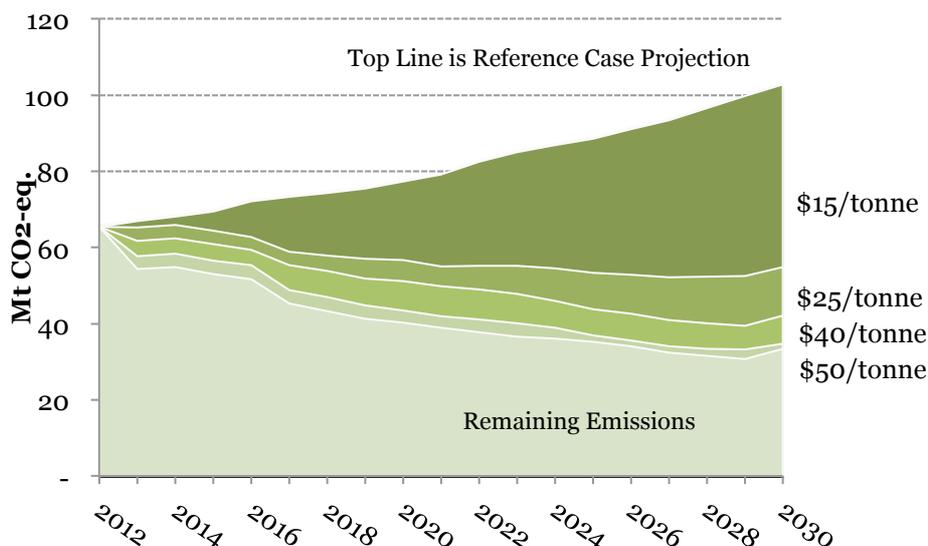Figure 1.6 provides an overview of the emissions reduction potentials by sector at two carbon offset prices: US$15 and US$40. At these prices, a wide range of reduction opportunities are available within the Kenyan economy; but opportunities in forestry, the electricity sector and cook stoves dominate. Commercial buildings also represent an opportunity (but were not assessed in detail in the bottom-up and more technically detailed analysis). A more disaggregated view of reductions relative to the UNFCCC six sectors is provided to reveal a wider range of low-carbon development opportunities.

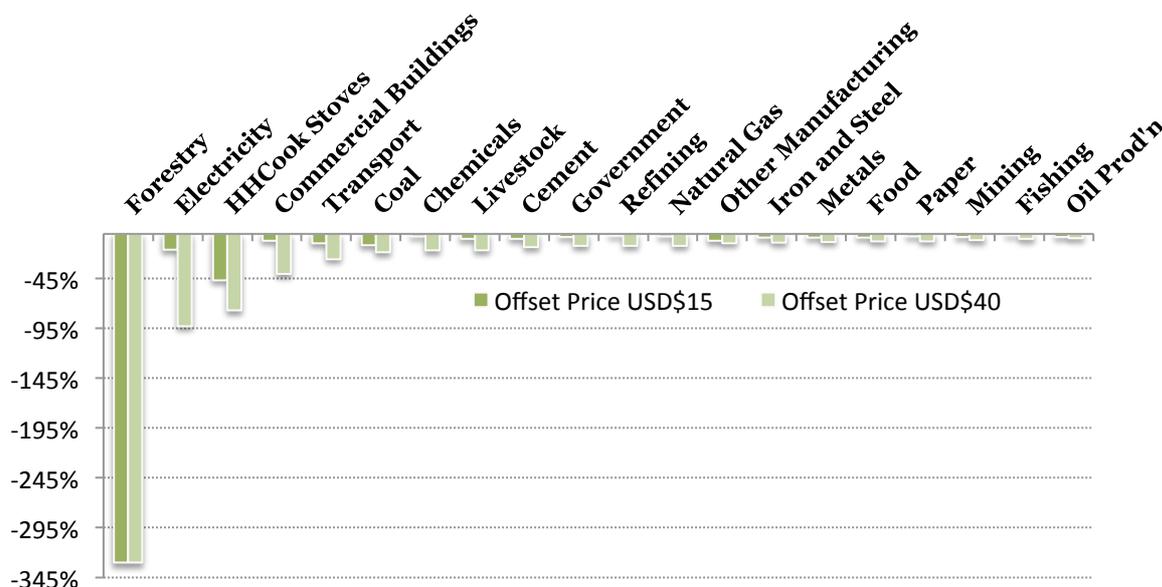**Figure 1.6: Sector reduction potentials at US$15 and US$40 in 2030**

Table 1.4 provides a summary of the impact of international climate finance that targets economy-wide offsets at US$15 per tonne based on the results of the CGE modelling. At an offset supply price of US$15 per tonne, offsets supply rises steadily throughout the simulation, primarily as a result of forestry reductions which account for over 90 percent of

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all offsets supply out to 2030. The total climate investment to deliver the reductions climbs from US$12 million in 2015 (US$ 2011 at a 10 percent discount rate) to on average about USD$40 million annually out to 2030. With an international demand for Kenyan offsets, the increased spending to supply offsets increases economic activity in Kenya, thereby increasing Kenyan GDP throughout the entire period.

Table 1.4: Summary of climate finance impacts: US$15 offset supply

	2015	2020	2025	2030
GHGs offsets supply (Mt)	3.0	16.5	30.1	40.8
Climate finance (millions US$ 2011 @10% discount rate)	$12.8	$43.8	$49.5	$41.7
GDP (% change from reference case)	0.18%	0.17%	0.19%	0.17%

1.5   Priority Mitigation Actions

The six priority actions represent quick-win opportunities with implementation beginning in 2012 or 2013. The six priority actions are listed below and described in detail in the Action Sheets in Section 1.6:

- SC4-1: NAMAs prioritisation process;

- SC4-2: Development and submission of NAMAs proposals;

- SC4-3: Development of proposals for REDD+ activities;

- SC4-4: Development of GHG inventory and improvement of emissions data and use of data;

- SC4-5: Measuring, reporting on and monitoring forestry emissions and sinks; and

- SC4-6: Mainstreaming of low-carbon development opportunities into planning processes.

The suggested priority low-carbon development opportunities with near-term feasibility are listed below with the relevant Government of Kenya planning sectors:

- Restoration of forests on degraded lands - Environment, Water and Sanitation sector.

- Expanding geothermal electricity generation - Physical Infrastructure sector.

- Restoration of degraded forests - Environment, Water and Sanitation sector.

- Improved cookstoves and use of LPG for cooking - Agriculture and Rural Developments sector.

- Agroforestry - Agriculture and Rural Development sector.

- Improved public transport systems based on bus rapid transit complemented by some light rail transit corridors - Physical Infrastructure sector.

These suggested priority opportunities were selected on the basis of a technical analysis that considered abatement potential, sustainable development benefits and feasibility of implementation. The priority opportunities were reviewed and approved by Kenyan experts. The suggested options could be prioritized for NAMAs and REDD+ activity development, to allow for fast-start action while the government undertakes a broader process for NAMAs prioritization.

REDD+ programmes and financing could help with the implementation of forestry options, including restoration of forests on degraded lands, and reducing deforestation and forest degradation. The development and implementation of NAMAs could help to harness Kenya's low-carbon potential in the other sectors. NAMAs and REDD+ action could assist the Government of Kenya in introducing required institutional and regulatory changes, improving public financing mechanisms, building capacity for government and stakeholders, and promoting other institutional and behavioral changes needed to move toward a low-carbon development pathway.

1.6   Action Sheets

Action #1: NAMAS PRIORITISATION PROCESS	Action Reference Number: SC4-1

Action summary

Undertake a prioritisation process, building on the low-carbon scenario assessment of Subcomponent 4, to identify NAMAs to put forward for international support (financial, technology, capacity building).

Rationale: The SC4 analysis provides the evidence base for the identification of priority low-carbon development opportunities in the six UNFCCC mitigation sectors: energy, transport, industry, agriculture, forestry and waste management. A Government of Kenya prioritisation process is needed to identify NAMAs, which generally are defined as voluntary developing country mitigation actions for which they may receive international support. NAMAs are largely considered to be government interventions such as policies and programmes that lead to lower GHG emissions by creating the right incentives and enabling environment for increased investment in low-carbon actions. The emission reductions generated by NAMAs (no carbon credits are issued) will "belong" to and represent the Government of Kenya's contribution to prevent climate change. Unilateral NAMAs are actions that Kenya would implement without support because they are very attractive for non-climate change related reasons, whereas Kenya would receive international support for supported NAMAs.

The SC4 analysis identified potential priority opportunities for NAMA development based on the low-carbon scenario analysis. A technical assessment considered potential emission reductions, sustainable development benefits and feasibility of implementation to identify suggested priorities – which were reviewed and approved by Kenyan experts. These opportunities could be prioritized for NAMA development, to enable fast-start action while the government undertakes a broader NAMAs prioritisation process.

 The potential priority low-carbon opportunities for fast-track NAMAs identified by SC4 are:
  •   Restoration of forests on degraded lands;
  •   Expanding geothermal electricity generation;
  •   Reforestation of degraded forests:
  •   Improved cookstoves and use of LPG for cooking
  •   Agroforestry; and
  •   Improved public transport systems based on BRT, complemented by some light rail transit corridors.

Impact: Improved ability to integrate low-carbon development considerations in the planning processes of relevant ministries and the overall planning process; and development of a NAMAs prioritization process that is recognized by potential international funders.

Areas of relevance

Sectors: 1. Agriculture and Rural Development; 2. Environment, Water and Sanitation; 3. Physical Infrastructure Sector; and 4. Tourism Trade and Industry.

Adaptation ☐ Mitigation √ Development √ - including building climate resilience into actions where applicable

Current status

Some ministries, such as the Ministry of Agriculture and Ministry of Energy, have undertaken initial work to understand and identify potential NAMAs; but no formal Government of Kenya prioritisation process exists to identify NAMAs.

Lead Agency to take this Action forward

Prioritization can be undertaken either on the level of single ministries or (preferably) on an overall level. The MEMR, working with the Ministry of State for Planning, National Development and Vision 2030 (MPND), and building on the SC1 and SC4 analyses, is requested to lead the overall prioritization process. Various ministries – such as energy, agriculture, transport, industrialisation – are requested to

initiate a process to identify sectoral priorities, which can then be brought into an overall Government of Kenya priority process.

Stakeholder support required to take the action forward

Various stakeholders would need to be involved, which would vary by sector. For example, the Ministry of Energy would need to engage the Geothermal Development Corporation, Kenya Power and Lighting Company, Energy Regulatory Commission and others. The Ministry of Transport would need to engage city governments. All prioritization processes would need to engage the private sector and civil society (non-governmental organizations, universities and research organizations).

Indicative timeframe - Quick win opportunity □

Launch timeframe: Short-term action – next six months

Duration of the Action: Three months (to allow outputs/priorities to feed into the second Medium Term Plan process)

Cost associated with the Action in Kenyan Shillings

Total costs – KSh 3,300,000 (US$40,000) to cover costs of government and stakeholder meetings, and short-term consultancy to develop prioritization process. The various ministries would provide in-kind support through personnel to undertake prioritization process.

Immediate next steps

1. MEMR to develop suggested prioritization approach (building on the SC4 low-carbon scenario assessment and processes in other countries): August- September 2012
2. MEMR to share approach and seek input from relevant ministries (for example, MEMR asks various ministries to submit three priority NAMAs): October-November 2012
3. Cross-ministerial process with stakeholders to identify Government of Kenya priorities: November 2012
4. Presentation of Kenyan NAMA priorities at the seventeenth Conference of the Parties (COP 17) in Doha, Qatar: December 2012.

Action#2: DEVELOPMENT AND SUBMISSION OF NAMA PROPOSALS	Action Reference Number: SC4-2

Action summary

Develop NAMA proposals for 3-5 priority NAMAs, building on the prioritization process developed under Action SC4 -1 and the evidence base for NAMAs established in the SC4 low-carbon scenario assessment. The action includes the development of concrete fundable proposals, capacity building for ministries to develop NAMA proposals and submission of the proposals to the UNFCCC.

Rationale: To secure funding for identified NAMAs, proposals must be developed that meet the requirements of international donors who have an interest in supporting NAMAs in Kenya. In the short term it is expected that NAMAs will be supported through bilateral channels. Proposals must also include the required information for the UNFCCC NAMAs registry, so that the proposals can be submitted to the UNFCCC. There is considerable international interest in the Kenyan low-carbon climate resilient action plan and potential for Kenya to move forward on "supported" NAMAs delivered with international support (financial, technology transfer, capacity building).

Impact: Funding and implementation of NAMAs will eventually lead to lower GHG emissions and support sustainable development in line with Government of Kenya priorities. Through the proposal preparation process, ministry officials will improve capacity to develop NAMA proposals (and funding proposals in general), and to establish systems to generate confidence in international funders.

Areas of relevance

Sectors: 1. Agriculture and Rural Development; 2. Environment, Water and Sanitation; 3. Physical Infrastructure Sector; and 4. Tourism Trade and Industry.

Adaptation ☐ Mitigation √ Development √- including building climate resilience where applicable

Current status

The Government of Kenya has not developed NAMA proposals or submitted proposals to the UNFCCC.

Lead Agency to take this Action forward

Responsibility for the development of specific NAMA proposals should be with the respective ministry (or other government agency) who will lead the implementation of the NAMA. The MEMR, working with the MPND, is requested to coordinate the overall NAMAs development process in the country and assume responsibility for submission of proposals to the UNFCCC. The proposal development process would include building capacity in the MEMR, MPND and relevant ministries (and agencies) to develop NAMA proposals.

Stakeholder support required to take the action forward

Various stakeholders would need to be involved, depending on the priority NAMAs. All proposal development processes would need to engage potential donors, the private sector (including the financial sector) and civil society.

Indicative timeframe - Quick win opportunity ☐

Launch timeframe: Short-term – within one year

Duration of the Action: 6-8 months, beginning November 2012

Cost associated with the Action in Kenyan Shillings

Given the limited international experience in developing fundable NAMA proposals, the cost of developing a full NAMA proposal that is ready for funding and implementation is at least KSh 12,000,000 (US$ 150,000) if outside consultants are used to work alongside government officials in the preparation of the proposal. The cost of developing five NAMA proposals in different sectors would be KSh 60,000,000 (US$ 750,000). The costs are expected to decline as experience is gained.

Immediate next steps

1. MEMR and responsible ministries to select 1-3 priority NAMAs to develop first, based on NAMA priorities identified under Action SC4-1 or earlier selection of fast-track NAMAs: August-December 2012

2. Proposal development for three priority NAMAs by responsible ministry or agency (in coordination with MEMR: October 2012 to June 2013

3. Submission of first three NAMA proposals to UNFCCC in Bonn, Germany: June 2013

4. Agreement with potential donors for funding of NAMAs: mid to end 2013

5. Start of implementation of NAMAs: end of 2013

6. Development of additional NAMA proposals, building on the expertise gained in step 2: 2014 onward

Action #3: DEVELOPMENT OF PROPOSALS FOR REDD+ ACTIVITIES	**Action Reference Number:** SC4 - 3

Action summary

Develop proposals for three priority REDD+ actions, building on Kenya's on-going work to develop a National REDD+ strategy, and the forestry and agriculture low-carbon scenario assessments. The action includes capacity building for the Kenya Forest Service (KFS) to develop REDD+ proposals, as well as submission of the proposals to the UNFCCC and potential funders.

Rationale: REDD+ is potentially an important mechanism to help Kenya meet its forest-related goals, including the goal of 10 percent forest cover stated in the constitution. Kenya has developed its REDD+ Readiness Preparation Proposal that provides a roadmap of REDD+ preparation activities—outlining actions for analysis and preparation, and early action and testing—with the aim of enabling REDD+ implementation. This proposal has informed the development of Kenya's National REDD+ Strategy and implementation framework. The REDD+ actions put forward under Kenya's Climate Change Action Plan will further the goals of Kenya's REDD+ strategy.

Impact: Funding and implementation of REDD+ activities will eventually lead to reduced deforestation and improved forest management and associated co-benefits, such as improved water availability, hydropower generation, reduced flooding and landslides, and sustainable use of forest products such as fuelwood, charcoal and medicines. Through the proposal development process, KFS officials will gain improve capacity to develop REDD+ proposals (and funding proposals in general), and to establish systems to generate confidence in international funders.

Areas of relevance
Sectors: 2. Environment, Water and Sanitation; 2.2 Forestry; 1. Agriculture and Rural Development
Adaptation √, Mitigation √ Development √ - REDD+ actions can have strong adaptation benefits if properly designed.

Current status
The Government of Kenya has not submitted REDD+ proposals to potential funders or to the UNFCCC.

Lead Agency to take this Action forward
The KFS is requested to lead the REDD+ proposal development. The KFS would work closely with the MEMR to submit proposals to the UNFCCC.

Stakeholder support required to take the action forward
The KFS could engage the National REDD+ Steering Committee to provide oversight and advice on the development of REDD+ proposals.

Indicative timeframe - Quick win opportunity ☐
Launch timeframe: Short-term – within one year
Duration of the Action: 6-8 months, beginning October 2012

Cost associated with the Action in Kenyan Shillings
The cost of developing a full REDD+ proposal that is fundable and implementable is KSh 12,000,000 (US$150,000) if outside consultants are used to work with government officials in the preparation of the proposal. The cost of developing three REDD+ activity proposals would be KSh 36,000,000 (US$ 450,000). The costs are expected to decline as experience is acquired.

Immediate next steps
1. KFS to identify framework for REDD+ activity proposals: November-December 2012
2. Proposal development for three priority REDD+ activities (either with outside consultants, or through capacity building process): January-May 2012
3. Submission of first two REDD+ activity proposals to UNFCCC in Bonn, Germany: June 2013
4. Development of other REDD+ activity proposals, building on the expertise gained in step 2: July-December 2013

Action #4: DEVELOPMENT OF GHG INVENTORY, IMPROVEMENT OF EMISSIONS DATA AND ANALYSIS OF MITIGATION OPTIONS	Action Reference Number: SC4 – 4

Action summary

Develop Kenya's GHG inventory, building on the information developed in the SC4 reference case of GHG emissions, and build capacity to develop, use and monitor data and impacts.
Kenya would benefit from a centralized government agency with continued funding and support to collect inventory data and prepare and complete rigorous emission inventories in accordance with IPCC guidelines on an on-going basis. As part of this work, a national energy balance should be prepared that identifies fuel consumption according to IPCC energy sub-sectors and improves estimates of biomass consumption. The work would include capacity building, developing a planning process for preparing and reporting, identifying a strategy and priority areas for improvement in data and methodologies, establishing a reliable mechanisms to ensure appropriate documentation, quality control and completeness, and integration with other government planning processes.

The work would also allow for increased capacity building for making emission projections and assessing low-carbon development options to enable the updating of the SC4 low-carbon analysis over time; and capacity building for monitoring the impacts of policies and programmes.

Rationale: This action would contribute to a robust and reliable inventory that would meet international reporting requirements to the UNFCCC and would contribute to an improvement in the data available to inform government of Kenya planning decisions regarding climate change, investment and sustainability. The improved understanding of GHG emissions could help Kenya to leverage climate financing into the sector.

The SC4 GHG emissions reference case was developed based primarily on 2006 IPCC guidelines. SC4 used the best available data to generate historical emissions data up to 2010. The 2010 data provides a substantive base for Kenya's GHG inventory, but due to limited resources and budget the inventory work is not a substitute for what is required for reporting to the UNFCCC which would require substantially more effort, quality assurance and sensitivity analysis. Despite limitations, the GHG emissions reference case developed contributes substantial data and tools that can be used to generate future emission inventories. All methodologies, along with specific data and assumptions to estimate emissions, are identified in the SC4 report; and the underlying Excel spreadsheets that set out the calculations for GHG emissions by sector have been provided to the MEMR. This approach to developing the inventory allows for transparency and ease of use (as many people have access to the Excel program).

Major potential areas to improve the emission inventory that were identified in the development of the SC4 GHG emissions reference case include:

- Develop Kenya specific emissions factors for the agricultural sector particularly the livestock enteric fermentation emissions factors that is the single largest source of GHG emissions of the six sectors examined in the SC4 assessment, as well as for charcoal and cement production in the industrial process sector.
- Improve estimates of livestock populations that account for 30 percent of total emissions in Kenya.
- Improve GHG emissions data in the transport sector to gain a better understanding of the GHG emissions impact of proposed transport initiatives and of new investments in transportation infrastructure.
- Improve estimates of waste disposal rates to different types of disposal sites in Kenya
- Improve recent estimates of land-use changes from forestry to other land-uses (such as the rate of deforestation)
- Include emission sources related to fugitive emissions in the oil and gas sector, consumption of ozone depleting substances and industrial wastes.
- Develop a yearly national energy balance for fuel consumption in Kenya that is disaggregated by major IPCC energy sub-sectors and balances primary fuels produced, plus imports, minus exports and international bunker fuels and the net change of stocks.
- Improve capacity to use emission inventory tools including those developed by SC4 to estimate emissions and abatement potential of the low-carbon options.

Impact: 2010 GHG inventory developed, enabling improved low-carbon policy development, and assessment of needed emission reduction actions and the impacts of emission reduction actions, contributing to improved planning decisions.

Areas of relevance
Sectors: Sectors: 1. Agriculture and Rural Development; 2. Environment, Water and Sanitation; 3. Physical Infrastructure Sector; and 4. Tourism Trade and Industry.
Adaptation   Mitigation √   Development

Current status
The Government of Kenya submitted a GHG inventory to the UNFCCC in 1994. The MEMR received capacity building on inventory development in June 2012.

Lead Agency to take this Action forward
The MEMR is requested to develop the GHG inventory. Relevant ministries, such as the Ministries of Agriculture, Transport and Roads should be involved in specific actions to improve data availability and build capacity to interpret data in their sectors.

Stakeholder support required to take the action forward
The MEMR will engage stakeholder groups in the six sectors to validate information; the MEMR will also draw on information from the Bureau of Statistics and relevant ministries.

Indicative timeframe - Quick win opportunity □
Launch timeframe: Short-term – within one year to develop 2010 GHG inventory
Duration of the Action: beginning August 2012, and on-going to meet UNFCCC reporting requirements and to develop Kenya-specific emissions factors.

Cost associated with the Action in Kenyan Shillings
The cost associated with developing a 2010 inventory is KSh 20,500,000 (US$250,000) (to build on the SC4 development of the 2010 inventory), plus KSh 20,500,000 (US$250,000) for a two-year capacity building process to fill data gaps, build capacity for future inventory development and undertake longer-term research to develop processes and fill data gaps.

Immediate next steps
1. MEMR to identify approach for development of 2010 inventory: August 2012
2. Capacity building on use of IPCC methodologies and additional information gathering through consultations with required departments and stakeholder consultations: September-December 2012
3. Finalization of 2010 GHG inventory: January to April 2013
4. Submission of GHG inventory to UNFCCC: May 2013
5. Research and study to fill emission data gaps, develop UNFCCC reporting processes, and develop Kenya-specific emission factors: January 2013 to January 2015 (two-year process)

Action #5: **CAPACITY BUILDING FOR MEASURING, REPORTING ON AND MONITORING FORESTRY EMISSIONS AND SINKS**	**Action Reference Number:** SC4-5

Action summary

Develop a national forest inventory, forest reference scenario, and a monitoring and reporting system that allows for transparent accounting of emissions and removals in the forestry and land-use sectors. Developing these measurement and monitoring tools requires increased capacity for carbon stock assessment, remote imagery interpretation, community monitoring, applying IPCC methodologies, economic analysis and information management systems.

Rationale: The development and implementation of an effective REDD+ strategy requires accurate and rigorous information. Of importance, and identified in the REDD+ Readiness Preparation Proposal, are: i) an updated national forest inventory: ii) the development of a reference scenario that projects emissions and removals of CO_2 into the future in the absence of REDD+ incentives, and iii) a monitoring and reporting system that allows for transparent accounting of emissions and removals. The current estimates of carbon stock in the forest sector have a high degree of uncertainty. Estimates of Kenya's current forest cover and associated GHG emissions from the sector are incomplete and out of date. The most recent known forest assessment was conducted between 1990 and 1994 for the Kenya Forest Master Plan (1994), and current estimates of emissions from the forestry sector are based on a simple tier estimation approach. Updated information is needed regarding the state of Kenya's forests. Support is needed to measure, monitor and report on changes in forest cover, including the development of a forest reference scenario. The Government of Kenya recognized the need for improved information on the country's forest resources in its Technology Needs Assessment, National Climate Change Response Strategy and Medium Term Plan (2008-2012).

Impact: Improved capacity to measure, monitor and report on (including reporting to the UNFCCC) on the forestry sector, which will enable improved policy and program development in the sector.

Areas of relevance
Sectors: 2. Environment, Water and Sanitation; 2.2 Forestry; 1. Agriculture and Rural Development
Adaptation √   Mitigation √   Development √ - REDD+ actions if well designed have climate resilience benefits

Current status
The KFS is undertaking a forest mapping exercise funded by the Government of Japan, but has not developed a National Forest Inventory. The UNDP supports aerial surveys under its Forestry Recovery Strategies and Policies project. The World Bank's Natural Resource Management project includes a national forest resource assessment component, and the Government of Australia is supporting the Clinton Initiative to deliver regional activities on national carbon monitoring systems. The Government of Finland has provided institutional support for REDD+ readiness activities.

Lead Agency to take this Action forward
The KFS is requested to lead the national forest inventory, and the development of a monitoring and reporting system in the forestry sector.

Stakeholder support required to take the action forward
The KFS could engage the National REDD+ Steering Committee to provide oversight and advice the national forest inventory, forest reference scenario, and monitoring and reporting initiatives.

Indicative timeframe - Quick win opportunity ☐
Launch timeframe: Short-term – within one year
Duration of the Action: Three years, beginning January 2013

Cost associated with the Action in Kenyan Shillings
The establishment of a national forest inventory is capital-intensive, requiring technical and institutional capacity building and training. Based on costs of developing national forest inventories in other countries, an estimated cost is KSh 425 million (US$5.15 million). The development of the reference scenario and monitoring system is estimated to cost KSh 180 million (US$ 2.186 million), for a total cost of KSh 605 million.

Immediate next steps
1. KFS to develop proposals and seek funding for the National Forest Inventory, and a monitoring and reporting system, building on the forest mapping exercise: by June 2013
2. Funding approved and project start-up: December 2013
3. Development of forest inventory, reference scenarios, measurement and monitoring; including capacity building for KFS officials, community forest association and other stakeholders: January 2014 to January 2016

Action#6: MAINSTREAMING OF LOW-CARBON DEVELOPMENT OPPORTUNITIES INTO PLANNING PROCESSES	Action Reference Number: SC4-6

Action summary

Develop a process to mainstream low-carbon development opportunities into the Government of Kenya planning process.

A mainstreaming or embedding process would help to ensure that various government departments act on low-carbon development opportunities. The action would include identification of potential intervention points, assessment of the climate impacts of policy decisions and informing the policy process. All domains of planning, policy and regulation, attention should consider low-carbon development opportunities – including removing barriers to implementation. This could include spatial planning to support mass transit, planning of waste landfills so that they are well managed and compatible with methane capture, assessment of current policies (such as the feed-in tariff under the *Least Cost Power Development Plan*), assessment of impacts of renewable energy development, land-use planning to support forest restoration, and assessment of impact of agricultural extension services. The work could also include a low-carbon assessment of current and new flagship projects.

The mainstreaming process would include capacity building on the use of the tools developed in the low-carbon scenario assessment, and how to use the information generated by the tools to inform policy and programme development. The low-carbon scenario analysis should be viewed as an iterative process that is updated on a regular basis to take advantage of new and improved information. This was a recommendation of TWG4.

Rationale: Many of the low-carbon development opportunities will only gain traction if they are recognized and taken up in the formal Government of Kenya planning process. The MPND is involved in the Action Plan process and taken steps under SC1 to mainstream or embed climate change considerations in the Second Medium Term Plan (MTP2), which sets our actions to guide Kenya toward the goals of Vision 2030. It will be important to extend this mainstreaming process to other aspects of national planning, including the county and sectoral plans. Capacity building is needed to allow Government of Kenya officials to maintain the low-carbon scenario analysis over time, and to take up and effectively use the tools to inform the policy process.

Mainstreaming low-carbon considerations across the planning process would embed climate change in Government of Kenya processes, and would ensure that the Action Plan informs the planning process. This would differentiate Kenya's action plan process from that of many other countries, where the action plan remains marginalized because it is not owned or acted upon by relevant departments.

Impact: Low-carbon development actions mainstreamed in the planning process, including the MTP2, the county plans and the sectoral plans. Improved ability of the Government of Kenya to identify intervention points to mainstream low-carbon development actions, and to raise external funds to support these actions.

Areas of relevance
Sectors: 1. Agriculture and Rural Development; 2. Environment, Water and Sanitation; 3. Physical Infrastructure Sector; and 4. Tourism Trade and Industry
Adaptation √   Mitigation √   Development √

Current status
 The MPND and MEMR have initiated a process under SC1 to mainstream low-carbon and climate resilience considerations into the Second Medium Term Plan.

Lead Agency to take this Action forward
The MPND is requested to lead the mainstreaming of low-carbon development options in the planning process, with support from MEMR and other ministries as required.

Stakeholder support required to take the action forward
County and line ministry officials will be engaged in the county and sectoral plans, as will Kenyan experts from civil society and the private sector.

Indicative timeframe - Quick win opportunity ☐
Launch timeframe: Short-term – within one year
Duration of the Action: December 2012 to December 2013

Cost associated with the Action in Kenyan Shillings

The cost of a capacity building program that builds on the SC1 process to expand capacity building on the low-carbon development tools, and to mainstream low-carbon considerations in flagship project, county plans and sectoral plans is estimate to be KSh 200,000 (US$250,000).

Immediate next steps
1. MPND and MEMR to develop proposal and seek funding for mainstreaming low-carbon development in the planning process: by September 2012
2. Funding approved and project start-up: December 2012
3. Capacity building and tool development: January 2013 to December 2013

Annex 1: List of Participants in the Local Validation Process

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Annex 3: List of Individuals Consulted

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Bernard Karicho	Ministry of Water and Irrigation
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Paul Mbole, Country Programme Coordinator	Norwegian Church Aid
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Yves Le Texier, Power Economist Engineer	Egis bceom International
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Surish Patel, CEO	Kridha Limited, Environment Sector Board, KEPSA and KAM
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Neil Bellefeuille, CEO	The Paradigm Project
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George Wamukoya, Climate Change Advisor	Common Market for Eastern and. Southern Africa
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Bilateral Donor Agencies	
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Endnotes

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[7] The calculations could be used as a starting point for developing Kenya's GHG emissions inventory. The analysis provides a draft inventory for 2010, consistent with IPCC methodologies. See Chapter 2 of the SC4-Mitigation report.

[8] The terms of reference for the low-carbon scenario assessment specifically identified the six UNFCCC sectors as the starting point for the analysis.

[9] Ministry of Energy. 2011. *Updated Least Cost Power Development Plan*. Nairobi: Ministry of Energy; and Government of Kenya. 2010. *Agricultural Sector Development Strategy 2010-2020*. Nairobi: Government of Kenya.

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