NATIONAL CLIMATE CHANGE ACTION PLAN

REPUBLIC OF KENYA

Mapping of GHG Emissions and Low-carbon Development Opportunities to Government of Kenya Planning Sectors

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National Climate Change Action Plan:

Mapping of GHG emissions and low-carbon development opportunities to GoK planning sectors

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The website for Kenya's Climate Change Action Plan can be accessed at: http://www.kccap.info

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Table of Contents

Abbreviations

BRT	bus rapid transit
CO_2e	carbon dioxide equivalent
GHG	greenhouse gas
Gt	gigatonne
Kton	kilotonne
LRT	light rail transit
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
NCCAP	National Climate Change Action Plan
UNFCCC	United Nations Framework Convention on Climate Change
USC	ultra super critical

1. Introduction

The mitigation analysis of the Kenya's National Climate Change Action Plan (NCCAP) provides a low-carbon assessment in the six mitigation sectors of the United Nations Framework Convention on Climate Change (UNFCCC): energy, transport, industry, agriculture, forestry and waste management. The assessment includes an initial inventory of historical greenhouse gas (GHG) emissions; a projection of how these could change up to 2030; and an examination of mitigation potential, costs and sustainable development benefits of low-carbon development opportunities in the six sectors.[1]

For the low-carbon assessment to inform development planning processes in Kenya, specifically the development of the Second Medium-Term Plan (2013-2017), the information provided on GHG emissions and low-carbon development opportunities by UNFCCC sector had to be translated to Government of Kenya planning sectors. This report provides a mapping of GHG emissions and low-carbon development opportunities to the planning sector.

This report is ideally read in parallel with the technical chapters of the NCCAP mitigation analysis. These technical chapters provide detail on the GHG emissions inventory and analysis of the low-carbon development opportunities.

2. Mapping Greenhouse Gas Emissions to Government of Kenya Planning Sectors

2.1 Assumptions and data sources

The mapping of GHG emissions to the Second Medium-Term Plan (MTP2) planning sectors presented in Figure 1 and Graph 1 assumes the following:

- The planning sectors for MTP2 set out by the Ministry of State for Planning, National Development and Vision 2030 are used.
- GHG emissions related to transport and electricity generation are assigned to the Infrastructure sector.
- GHG emissions related to industrial energy use (excluding electricity) and industrial process emissions are assigned to the Manufacturing sector.
- GHG emissions related to residential and commercial fuel use (excluding electricity) are assigned to the Population, Urbanisation and Housing sector. This includes emissions from kerosene used for lighting and biomass used for cooking, but does not take into account that 35 per cent of biomass is assumed to come from unsustainable sources. Emissions related to unsustainable biomass use are included in emissions from forestry and land-use change in the Environment, Water and Sanitation sector.
- GHG emissions related to waste and forestry and land-use change are included in emissions from the Environment, Water and Sanitation sector.

[1] IISD/ECN (2012). Kenya's National Climate Change Action Plan: Mitigation – Technical chapters. Available at: http://www.kccap.info/index.php?option=com_phocadownload&view=category&id=6&Itemid=41

- It was not possible to quantify GHG emissions related to water supply.
- Less than one per cent of total petroleum consumed in Kenya is used in the tourism sector, based on government statistics. Thus, it was not possible to quantify GHG emissions from the Tourism sector.

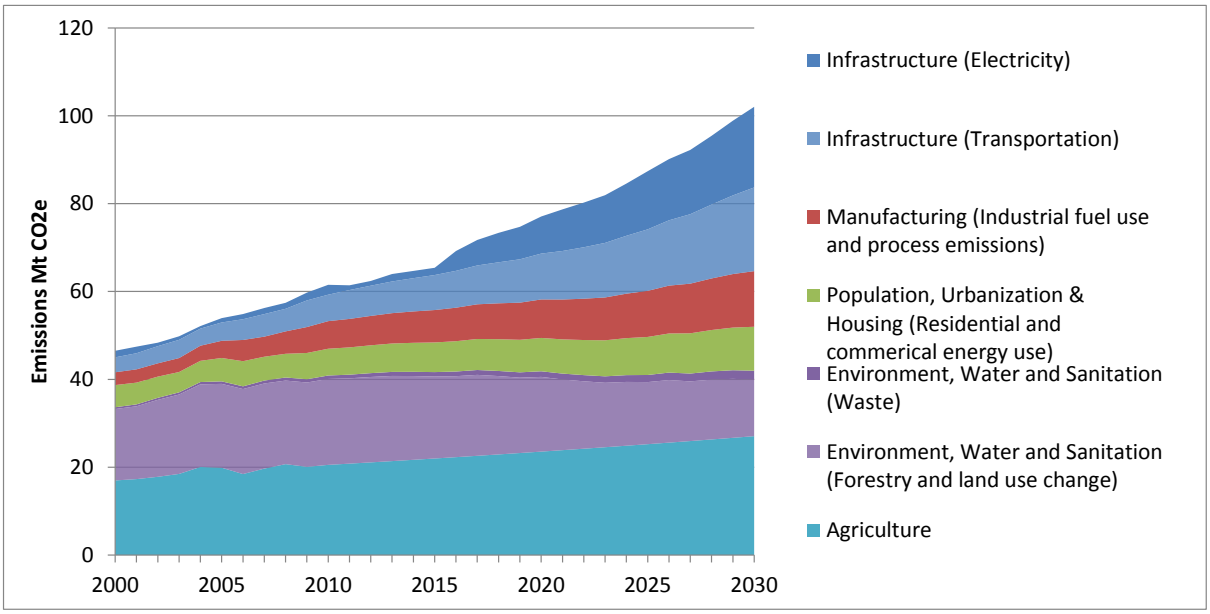
These assumptions assign emissions mostly to the supply side. This means that emissions from electricity generation are assigned to the related electricity generation infrastructure rather than to industrial, commercial and private consumers. But emissions related to electricity generation could also be linked to the demand side of electricity use in the Manufacturing and Population, Urbanization and Housing sectors.

Emissions related to forestry and land-use change, which are assigned to the Environment, Water and Sanitation sector, could also be considered as partly related to the Agriculture sector (taking into consideration the expansion of agricultural land and developments in tree cover on farms) and Population, Urbanization and Housing (through the demand for fuel wood and charcoal for cooking).

2.2 Results

Figure 1 shows the business as usual GHG emissions for select MTP2 sectors between 2000 and 2030. Table 1 presents the same information in numbers. In 2010, emissions in the Agriculture and Environment, Water and Sanitation sectors form the largest share of total GHG emissions in Kenya. Emissions in the Infrastructure and Manufacturing sectors have the largest growth rates. By 2030, emissions related to transport and electricity generation infrastructure are expected to contribute the largest portion of total GHG emissions in the country.

Figure 1: Greenhouse gas emissions by MTP2 sectors between 2000 and 2030



Source: Derived from the IISD/ECN mitigation chapter of Kenya's National Climate Change Action Plan.

Table 1: Total greenhouse gas emissions (Gt CO_2e/year) by MTP2 sectors

MTP2 Sectors	2000	2010	2020	2030
Infrastructure (electricity generation and transport)	4.9	8.3	18.9	37.4
Manufacturing (industrial fuel use and process emissions)	2.9	6.3	8.8	12.7
Population, Urbanisation and Housing (residential and commercial energy use)	5.0	6.1	7.6	10.0
Agriculture	20.5	20.5	23.6	27.1
Environment, Water and Sanitation (including forestry)	16.7	20.3	18.3	14.9
TOTAL	**50.1**	**61.5**	**77.1**	**102.1**

Source: Derived from the IISD/ECN mitigation chapter of Kenya's National Climate Change Action Plan.

3. Mapping low-carbon development options to MTP2 sectors

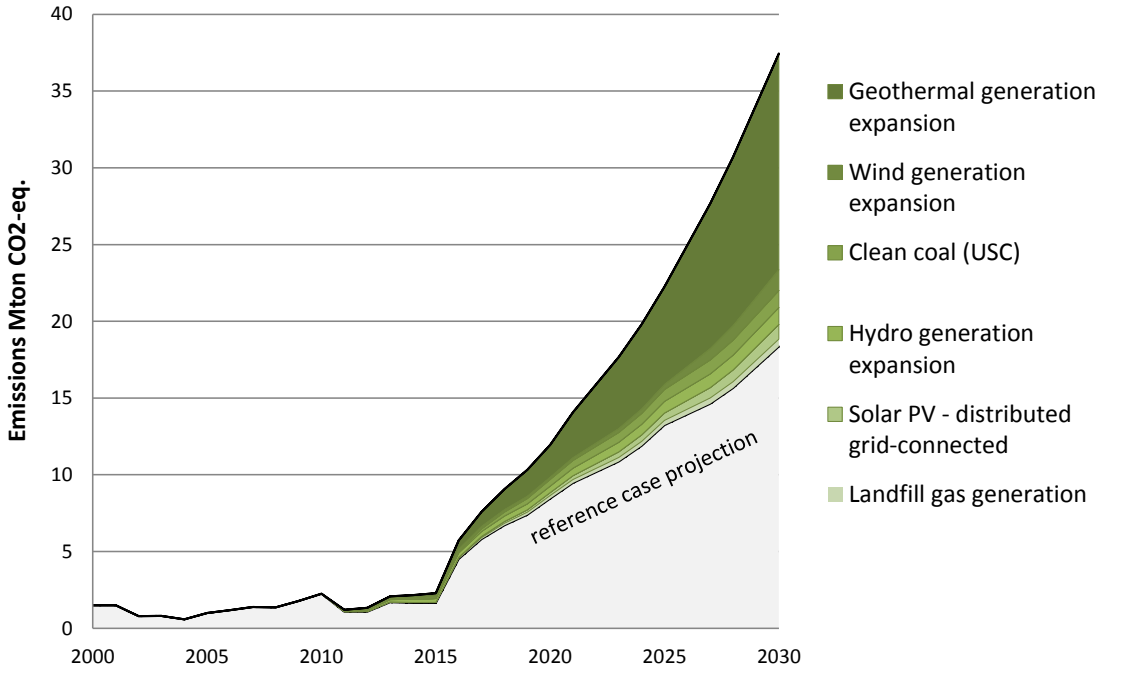
3.1 Infrastructure

The low-carbon development options identified in the 'Infrastructure' sector are listed below:

- Improving the passenger vehicle stock efficiency
- Improving freight vehicle stock efficiency
- Shift of freight from road to rail
- Bus rapid transit
- Light rail transit
- Use of biodiesel
- Use of bioethanol
- Expanding wind power
- Distributed solar photovoltaic
- Expanding hydro power
- Electricity generation from landfill gas
- Geothermal electricity generation
- Clean coal

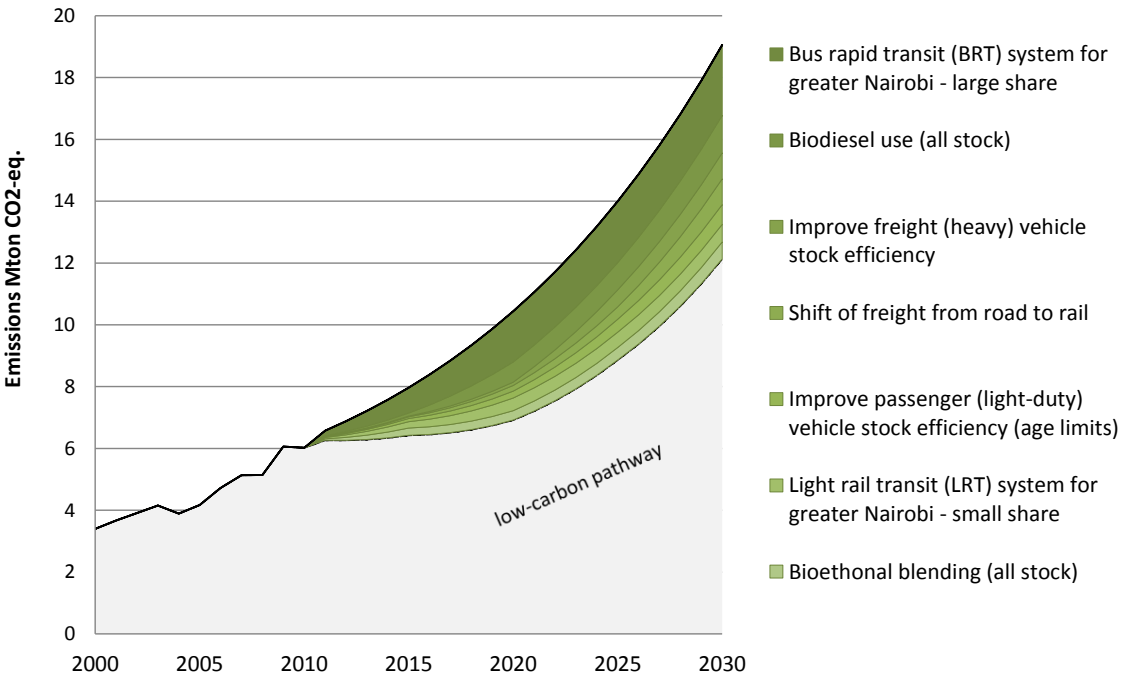
Figures 2 and 3 are wedge diagrams for the low-carbon development options related to electricity generation and transport infrastructure. (One graph with all the options would be difficult to read because of the large number of low-carbon development options in the Infrastructure sector.)

Figure 2: Wedge diagram for low carbon development options related to electricity generation infrastructure



Source: Derived from the IISD/ECN mitigation chapter of Kenya's National Climate Change Action Plan.

Figure 3: Wedge diagram for low carbon development options related to transportation infrastructure



Source: Derived from the IISD/ECN mitigation chapter of Kenya's National Climate Change Action Plan.

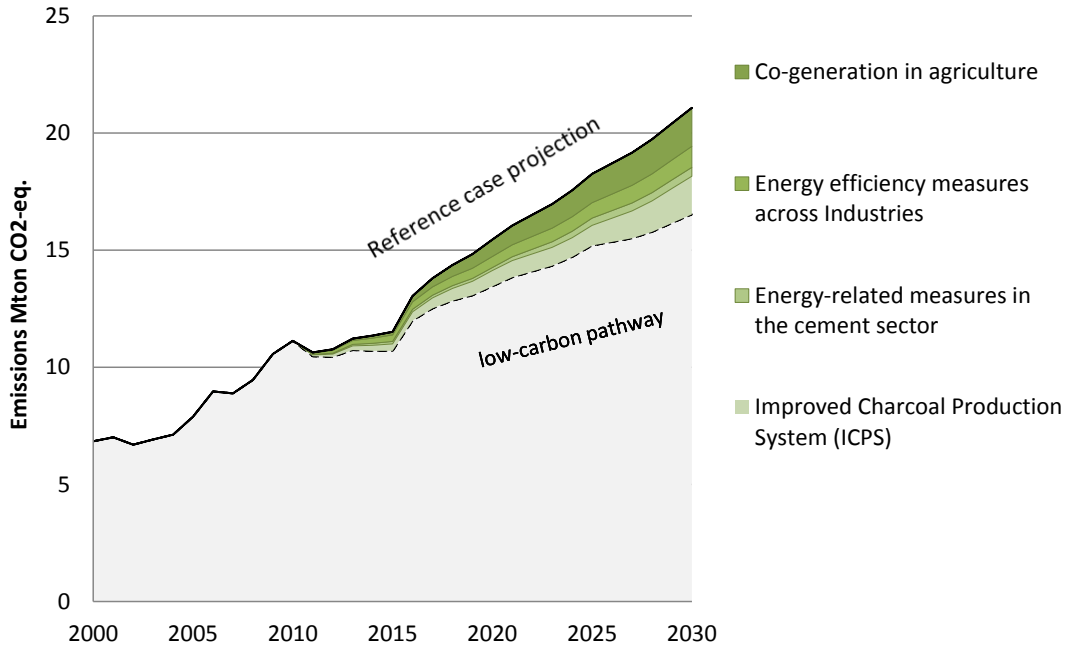
3.2 Manufacturing

The low-carbon development options identified in the 'Manufacturing' sector are listed below:

- Energy efficiency improvement in industry
- Reducing emissions from cement manufacturing
- Co-generation in agro-industry
- Improved charcoal manufacturing

Figure 4 shows the wedge diagram for the low-carbon development options in the manufacturing sector.

Figure 4: Wedge diagram for low carbon development options in the manufacturing sector



Source: Derived from the IISD/ECN mitigation chapter of Kenya's National Climate Change Action Plan. Note that the low-carbon development option related to charcoal production assumes 35 per cent of unsustainable biomass use.

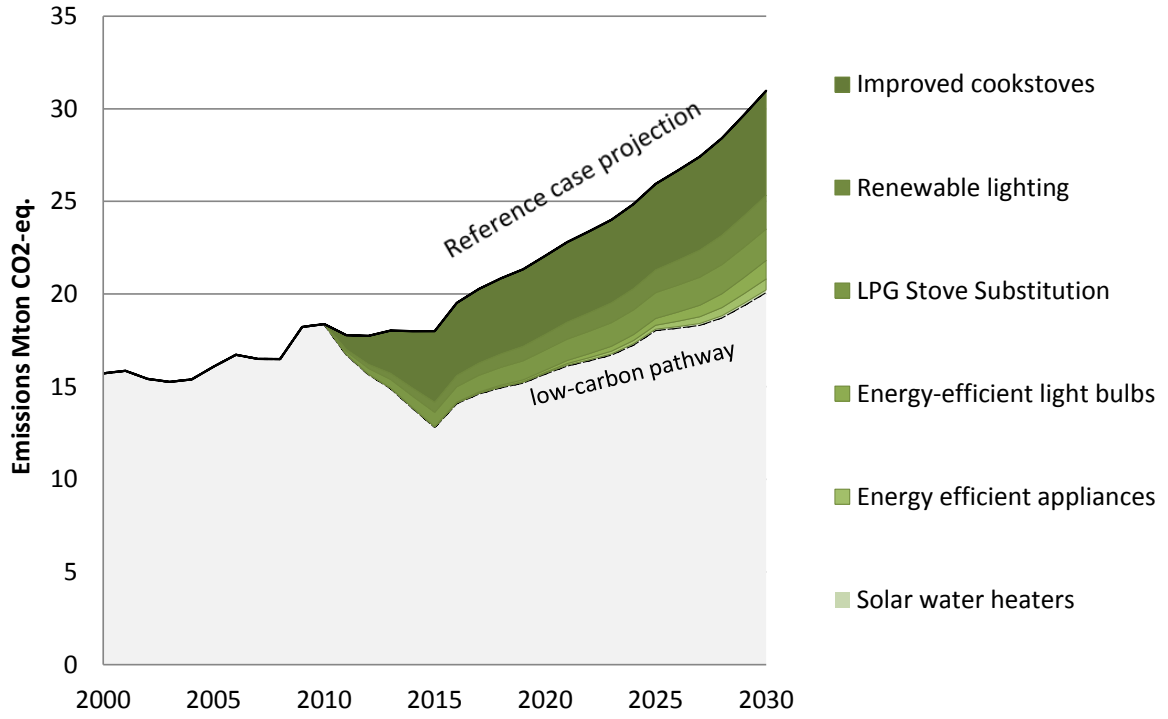
3.3 Population, Urbanization and Housing

The low-carbon development options identified in the 'Population, Urbanization and Housing' sector are listed below:

- Solar thermal water heating
- Energy efficient light bulbs
- Efficient appliances
- Improved cook stoves
- Low carbon/solar lighting replacing kerosene

Figure 5 shows the wedge diagram for the low-carbon development options related to Population, Urbanization and Housing.

Figure 5: Wedge diagram for low carbon development options related to Population, Urbanization and Housing



Source: Derived from the IISD/ECN mitigation chapter of Kenya's National Climate Change Action Plan. Note that the low-carbon development option related to cookstoves assumes 35 per cent of unsustainable biomass use.

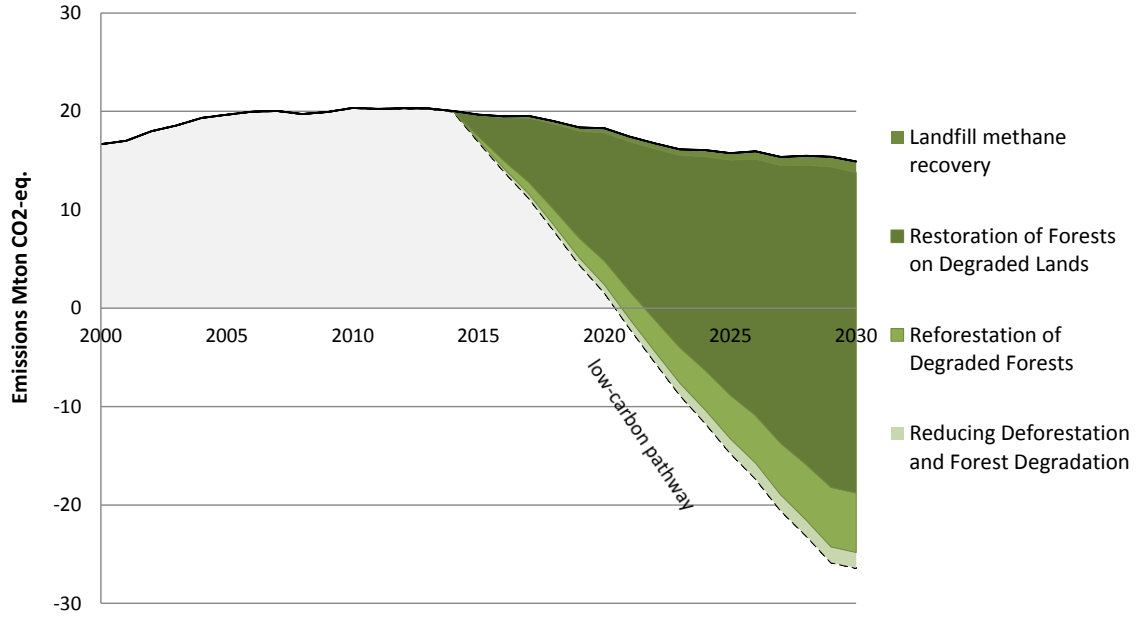
3.4 Environment, Water and Sanitation

The low-carbon development options identified in the 'Environment, Water and Sanitation' sector are listed below:

- Reforestation and afforestation
- Rehabilitation and restoration of degraded forests
- Reducing deforestation and land degradation
- Landfill methane capture

Figure 6 shows the wedge diagram for the low-carbon development options related to Environment, Water and Sanitation.

Figure 6: Wedge diagram for low carbon development options in the 'Environment, Water and Sanitation' sector



Source: Derived from the IISD/ECN mitigation chapter of Kenya's National Climate Change Action Plan.

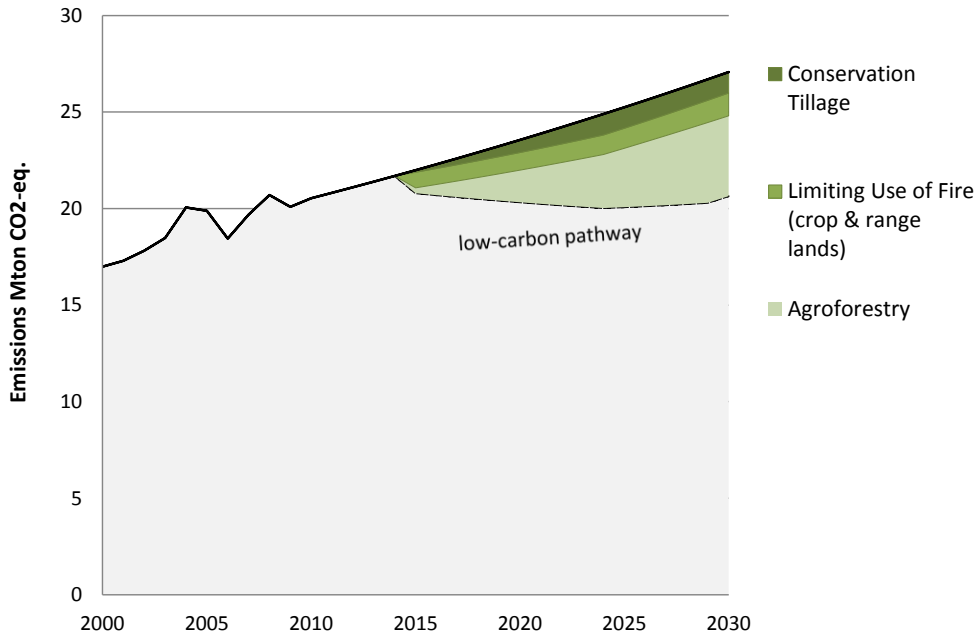
3.5 Agriculture

The low-carbon development options identified in the 'Agriculture' sector are listed below:

- Agroforestry
- Conservation tillage
- Limiting use of fire in range and cropland management

Graph 7 shows the wedge diagram for the low-carbon development options related to Agriculture.

Figure 7: Wedge diagram for low carbon development options in the 'Agriculture' sector



Source: Derived from the IISD/ECN mitigation chapter of Kenya's National Climate Change Action Plan.

3.6 Tourism

The analysis undertaken for the Kenya Climate Change Action Plan did not quantify GHG emissions related to the tourism sector in Kenya because the total emission were less than one per cent of national emissions. However, some low-carbon development opportunities related to other planning sectors could also be applied in the tourism sector, such as:

- Solar thermal water heating
- Energy efficient light bulbs
- Efficient appliances
- Improving the passenger vehicle stock efficiency