



# Greenhouse Gas Emissions in Kenya

## Kenya Numbers at a Glance (2013)

**60.2 MtCO<sub>2</sub>e\***

Total GHG emissions  
(0.13% of world total)

World: 45,261 MtCO<sub>2</sub>e

**43,692,881**

Population

World: 7,176,092,192

**1.38**

tCO<sub>2</sub>e per capita

World: 6.31 tCO<sub>2</sub>e

**US\$46,904 Million**

GDP\*\*

World: US\$71,059 Billion

**1,283**

tCO<sub>2</sub>e/million US\$ GDP

World: 637 tCO<sub>2</sub>e/million

US\$ GDP

**+24.07 MtCO<sub>2</sub>e**

(+67%)

Change in GHG  
emissions (1990–2013)

World: +15,257 MtCO<sub>2</sub>e

(+51%)

Source: WRI CAIT 2.0, 2017.  
Emissions excluding Land-Use Change and Forestry

\*Million metric tons of carbon dioxide equivalent

Global Warming Potentials are from the Intergovernmental Panel on Climate Change Second Assessment Report

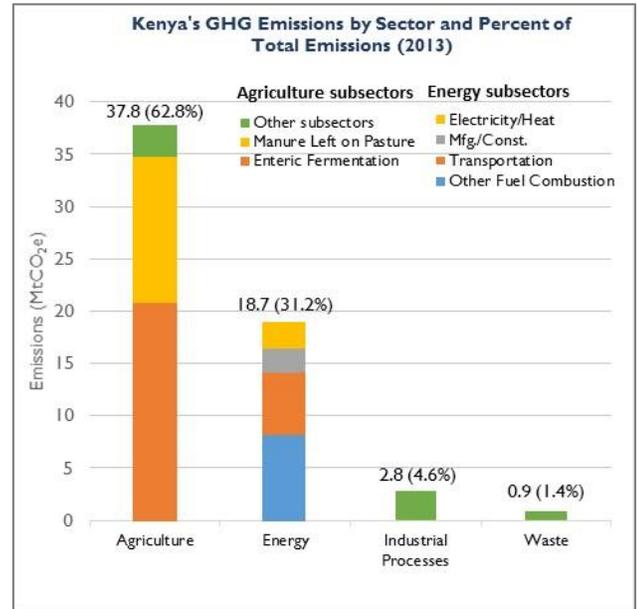
\*\*Gross Domestic Product (GDP) in constant 2010 US\$

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## Greenhouse Gas (GHG) Emissions by Sector

According to the World Resources Institute Climate Analysis Indicators Tool (WRI CAIT), agriculture was the leading source of GHG emissions in Kenya in 2013, contributing 62.8% of total emissions,<sup>1</sup> excluding the land-use change and forestry (LUCF) sector.<sup>2</sup> Within agriculture, 55% of emissions were due to enteric fermentation from livestock and 36.9% due to manure left on pasture.<sup>3</sup> Energy was the second largest source of emissions (31.2%), with other fuel combustion and transportation contributing 74.3% of energy emissions.<sup>4</sup> Industrial processes (IP) and waste contributed 4.6% and 1.4%, respectively.<sup>5</sup> WRI CAIT shows activities in the LUCF sector to have removed 31.2 MtCO<sub>2</sub>e in 2013, which represents a substantial carbon sink.<sup>6</sup>

In contrast, Kenya's [Second National Communication \(SNC\)](#) to the UNFCCC, which includes a GHG inventory for the period 1995-2010, shows LUCF to be a source of emissions rather than a sink.<sup>7</sup> The SNC shows LUCF activities to have released on average 17.2 MtCO<sub>2</sub> per year from 1990 to 2010, which it notes to be consistent with the observed loss of forest cover in Kenya over the same time. Other government and international sources have also cited deforestation in Kenya.<sup>8</sup> Despite the difference in LUCF findings, both the SNC inventory and WRI CAIT show the agriculture sector to be the leading source of GHG emissions in Kenya, followed by energy.



Sources: WRI CAIT 2.0, 2017; FAOSTAT, 2017.

Note: Percent of total emissions exclude LUCF – see Footnote 2.

<sup>1</sup> World Resources Institute Climate Analysis Indicators Tool (WRI CAIT 2.0, 2017). Global Warming Potentials (GWPs) are from the Intergovernmental Panel on Climate Change (IPCC) [Second Assessment Report \(SAR\)](#). WRI CAIT draws on data from the International Energy Agency (IEA), primarily, for energy emissions, the US Environmental Protection Agency for IP and waste emissions, and the Food and Agriculture Organization (FAO) for LUCF and agriculture emissions.

<sup>2</sup> Despite data from various sources indicating continued deforestation and forest degradation in Kenya throughout the 1990-2013 period, WRI CAIT data show that LUCF emissions changed dramatically between 2001 and 2013, switching the LUCF sector from a carbon source to a sink absorbing on average 36.6 MtCO<sub>2</sub>e during this period. Due to data discrepancy between WRI CAIT and other sources showing continued forest loss, LUCF sector emissions are excluded from the total GHG emission estimates in this factsheet and are not shown in the graphs.

<sup>3</sup> Food and Agriculture Organization of the United Nations Statistics Division (FAOSTAT), Kenya, [Emissions – Agriculture total](#), viewed on March 30, 2017.

<sup>4</sup> “Other fuel combustion” includes biomass combustion and categories of stationary and mobile combustion that are not included in the production of electricity and heat, manufacturing and construction, and other large categories of emissions (WRI, [CAIT Country Greenhouse Gas Emissions: Sources & Methods](#), 2015).

<sup>5</sup> WRI CAIT 2.0, 2017.

<sup>6</sup> WRI CAIT 2.0, 2017. WRI draws on international data from the FAO for the LUCF sector and notes that its data is useful as reference only and may not coincide with LUCF emissions reported by countries to the UNFCCC (WRI, [CAIT Country Greenhouse Gas Emissions: Sources & Methods](#), 2015).

<sup>7</sup> Republic of Kenya. Kenya's [Second National Communication \(SNC\)](#) to the UNFCCC, 2015. The SNC uses GWPs from the IPCC SAR. In keeping with good practice, Kenya conducted an uncertainty analysis of its GHG inventory that identified the highest uncertainty of emissions estimates to be related to estimates of forest carbon stocks in the land use, land use change and forestry (LULUCF) sector.

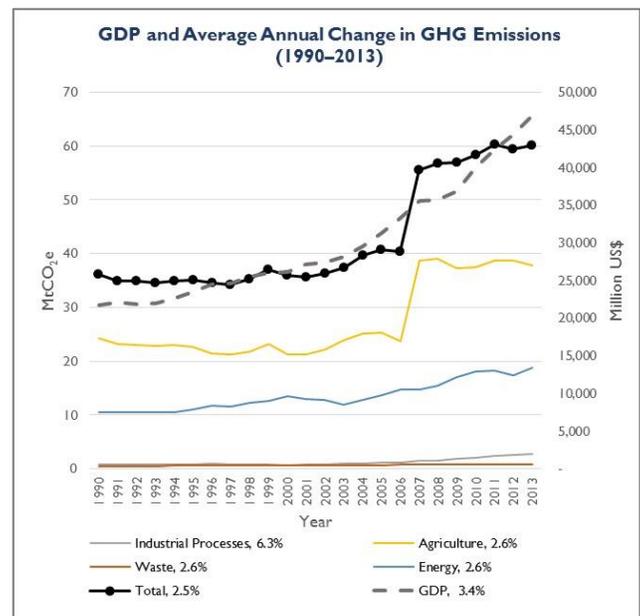
<sup>8</sup> The Kenyan Ministry of Forestry and Wildlife states that there is deforestation and forest degradation in Kenya, with the principal drivers being clearance for agriculture, rural poverty and rapid population growth, unsustainable utilization (including timber harvesting, charcoal production, grazing in forests), and past governance and institutional failures (Ministry of Forestry and Wildlife, [Analysis of drivers and underlying causes of forest cover change in the various forest types of Kenya, 2013](#)). The [REDD Desk](#) also states that there is low deforestation in Kenya, and cites the same drivers as the Ministry of Forestry and Wildlife in identifying threats to Kenya's forests.

## Change in GHG Emissions in Kenya (1990-2013)

According to WRI CAIT, Kenya's GHG emissions, excluding LUCF, increased 24.07 MtCO<sub>2</sub>e from 1990 to 2013. The average annual change in total emissions during this period was 2.5%, with sector-specific average annual changes as follows: agriculture (2.6%), energy (2.6%), IP (6.3%), and waste (2.6%). The change in emissions in the two highest emitting sectors is discussed below.

**Agriculture:** According to WRI CAIT, agriculture emissions increased by 13.53 MtCO<sub>2</sub>e (59%) from 1990 to 2013, driven by enteric fermentation (56%) and manure left on pasture (37%).<sup>9</sup> Data from the Food and Agriculture Organization (FAO) show a 32% increase in the number of cattle, approximately a doubling of sheep and goats, and a threefold increase in camels from 1990 to 2013.<sup>10</sup> Within this time frame, from 2006 to 2007, agriculture emissions rose significantly. FAO noted a significant jump in the livestock population at this time.<sup>11</sup> In addition to the number of livestock, enteric fermentation is affected by the type of livestock, feeding, and nutrition practices.<sup>12</sup> [Kenya's 2009-2020 Agricultural Sector Development Strategy](#) aims to establish a central authority for recording animals and regulating breeding programs, enhancing animal feeding and nutrition practices, strengthening livestock extension services, and improving livestock disease and pest control.<sup>13</sup> In its draft [2015-2030 Climate Smart Agriculture \(CSA\) Framework Programme](#), Kenya described plans to reduce agriculture sector GHG emissions by increasing livestock production and productivity through adoption of improved adaptive technologies by 2030, reducing GHG emissions intensity by adopting low cost, "climate smart" technologies to minimize carbon emissions and enhance soil carbon sequestration, developing a national carbon accounting and measurement, reporting and verification system, and promoting efficiency in dairy and livestock manure management and in paddy rice management, among others.

**Energy:** Data from WRI CAIT show that energy emissions increased 8.16 MtCO<sub>2</sub>e (77%) from 1990 to 2013, driven by transportation (39%), electricity and heat production (26%), and other fuel combustion (25%). The SNC notes that the transport sector, dominated by road transport, is a significant and growing contributor to Kenya's GHG emissions: Kenya's total vehicle fleet (excluding motorcycles) has more than tripled in recent years, from 600,000 vehicles in 2000 to 2.2 million vehicles in 2013, leading to severe traffic congestion in major cities.<sup>14</sup> The SNC conveys government plans to invest in rail to shift passenger and freight transport from road to rail, and to implement a bus rapid transit system complemented by light rail transit. Kenya is proposing a Nationally Appropriate Mitigation Action (NAMA) for the development of a Bus Rapid Transit Plus (BRT+) System for the Nairobi Metropolitan Region, which is expected to contribute to an annual emission reduction of 2 MtCO<sub>2</sub>e by 2030.<sup>15</sup> Electricity generation also drives energy emissions. Generation almost tripled from 1990 to 2013, with fuel oil and geothermal taking a growing share of the electricity mix.<sup>16</sup> As of 2013, 44% of electricity was generated by hydropower from pumped storage plants, 31% by oil, 23% by geothermal and 2% by biofuels. In terms of consumption, 46% of electricity is consumed by the industrial sector, 24% by residential, 13% by commercial, with 17% network losses.<sup>17</sup> World Bank data show that 58% of the urban population had access to electricity in 2012.<sup>18</sup> In rural areas, this figure dropped to 6.7%.<sup>19</sup> To increase rural access to



Source: WRI CAIT 2.0, 2017.

<sup>9</sup> FAOSTAT, 2017.

<sup>10</sup> FAOSTAT. Kenya. [Live Animals, Cattle, Sheep, Goats and Camels](#), viewed on March 30, 2017.

<sup>11</sup> Ibid.

<sup>12</sup> FAO Animal Production and Health Paper 177. [Mitigation of Greenhouse Gas Emissions in Livestock Production](#), 2013.

<sup>13</sup> Republic of Kenya. [2009-2020 Agricultural Sector Development Strategy](#). 2009.

<sup>14</sup> Republic of Kenya. Kenya's [Second National Communication \(SNC\)](#) to the UNFCCC, 2015.

<sup>15</sup> Low Emission Capacity Building Project – Kenya. [NAMA Bus Rapid Transit Plus \(BRT+\) System for the Nairobi Metropolitan Region \(UNFCCC Poster\)](#), viewed on March 30, 2017.

<sup>16</sup> International Energy Agency (IEA). Kenya Electricity and Heat, [1990](#) and [2013](#).

<sup>17</sup> Ibid.

<sup>18</sup> World Bank. Indicators: [Kenya - Access to electricity, urban \(% of urban population\)](#), viewed on March 30, 2017.

<sup>19</sup> World Bank. Indicators: [Kenya - Access to electricity, rural \(% of rural population\)](#), viewed on March 30, 2017.

electricity, and as part of its [Vision 2030](#),<sup>20</sup> Kenya implemented 315 MW of geothermal power projects and completed Phase I (2008-2012) of the [Rural Electrification Programme](#). Kenya is seeking support to implement its NAMA for accelerated geothermal electricity development, which will offset 3.77 MtCO<sub>2</sub>e per year by 2020.<sup>21</sup> Over 80% of Kenyans rely on wood biomass for fuel and charcoal for domestic uses, contributing to deforestation and land degradation. Between 1995 and 2010, the use of fuelwood and charcoal increased 8% and 18%, respectively.<sup>22</sup>

## **Carbon Intensity: GHG Emissions Relative to Gross Domestic Product (GDP)**

According to WRI CAIT, Kenya's GHG emissions, excluding LUCF, increased 67% from 1990 to 2013, averaging 2.5% annually, while GDP increased 115% in the same period, averaging 3.4% annually. As of 2013, Kenya's economy emitted twice more GHGs relative to GDP than the world average, excluding LUCF, indicating potential for improvement. In its [2013-2017 National Climate Change Action Plan \(NCCAP\)](#), Kenya outlines a low emission, climate resilient development pathway that supports its economic and social development goals.

## **Climate Change Mitigation Targets and Plans**

Kenya's [2013-2017 NCCAP](#) includes mitigation options for energy, transport, industry, agriculture, forestry, and waste management. In its [Intended Nationally Determined Contribution \(INDC\)](#), Kenya commits to reducing its GHG emissions by 30% (143 MtCO<sub>2</sub>e) relative to business as usual levels by 2030, contingent on receiving international finance, investment, technology development and transfer, and capacity-building support. The INDC notes that Kenya will build upon NCCAP actions through (1) expansion of geothermal, solar, and wind energy production, (2) enhancement of energy and resource efficiency, (3) progress towards achieving tree cover of at least 10% of Kenya's land area, (4) increased use of clean energy technologies to reduce overreliance on wood fuels, (5) adoption of low carbon and efficient transport, (6) use of CSA in line with the National CSA Framework, and (7) improved waste management (e.g., waste recycling, landfill gas management). A participant in the [UN-REDD Programme](#) and the Forest Carbon Partnership Facility, Kenya has received targeted support for a feasibility study of opportunities to improved efficiency in forestry operations and forest product processing and other activities to enhance forest carbon stocks. Kenya ratified the Paris Agreement in December 2016.<sup>23</sup>

<sup>20</sup> Kenya Vision 2030 is the national long-term development policy that aims to transform Kenya into a newly industrializing, middle-income country providing a high quality of life to all its citizens by 2030 in a clean and secure environment. [Kenya Vision 2030](#), viewed on March 30, 2017.

<sup>21</sup> UNFCCC NAMA Registry. Kenya. [NS-83 - NAMA for accelerated geothermal electricity development in Kenya](#), viewed on March 30, 2017.

<sup>22</sup> Republic of Kenya. Kenya's [Second National Communication \(SNC\)](#) to the UNFCCC, 2015.

<sup>23</sup> UNFCCC, [Paris Agreement – Status of Ratification](#), viewed on March 30, 2017.