



Greenhouse Gas Emissions in East Africa

Numbers at a Glance (2011)¹

Country	Total GHG Emissions (MtCO ₂ e) ²	% of global emissions	Population (thousands)	tCO ₂ e per capita	GDP (Million US\$) ³	tCO ₂ e/ million US\$ GDP	Change in GHG emissions (1990–2011) (MtCO ₂ e)
Burundi	7	0.01%	9,540	0.70	1,450	4,608	-5 (-40%)
Central African Republic	64	0.14%	4,436	14.39	1,958	32,593	+12 (+23%)
Democratic Republic of Congo	208	0.44%	63,932	3.26	16,747	12,441	+6 (+3%)
Djibouti	1	0.003%	847	1.47	954	1,301	+0.29 (+31%)
Ethiopia ⁴	141	0.30%	89,393	1.58	23,107	6,108	+65 (+86%)
Kenya	70	0.15%	42,028	1.67	25,394	2,761	+25 (+56%)
Rwanda	6	0.01%	11,144	0.49	4,149	1,329	-8 (-60%)
Somalia ⁵	N/A	N/A	9,807	N/A	N/A	N/A	N/A
South Sudan ⁶	N/A	N/A	10,510	N/A	N/A	N/A	N/A
Tanzania	172	0.37%	46,355	3.70	20,658	8,310	+25 (+17%)
Regional Total	669	1.43%	287,991	2.50 (weighted average)	94,417	7,081 (weighted average)	+121 (+42%)
World	46,906	100%	6,964,618	6.73	\$54,034	868	+12,969 (+38%)

Of the ten countries included in the East Africa Regional mission, GHG emissions data are available for eight countries. Excluding Somalia and South Sudan, for which GHG emissions data are not available, the Democratic Republic of Congo (DRC) has the highest total greenhouse gas (GHG) emissions, followed by Tanzania, Ethiopia, Kenya, Central African

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¹ World Resources Institute Climate Analysis Indicators Tool (WRI CAIT) 2.0, 2015. Emissions including Land-Use Change and Forestry.

² Million metric tons of carbon dioxide equivalent.

³ Gross Domestic Product (GDP) in constant 2005 US\$.

⁴ Data on total GHG emissions and emissions for the energy, agriculture, and land-use change and forestry sectors for Ethiopia for 1990-1992 are not available. Change in GHG emissions are calculated for GHG emissions between 1993-2011.

⁵ GHG emissions data for Somalia are not available; there are generally inadequate emissions data for the country. Population statistic for the country is from the World Bank Development Indicators, accessed November 24, 2015, but GDP statistic is not available.

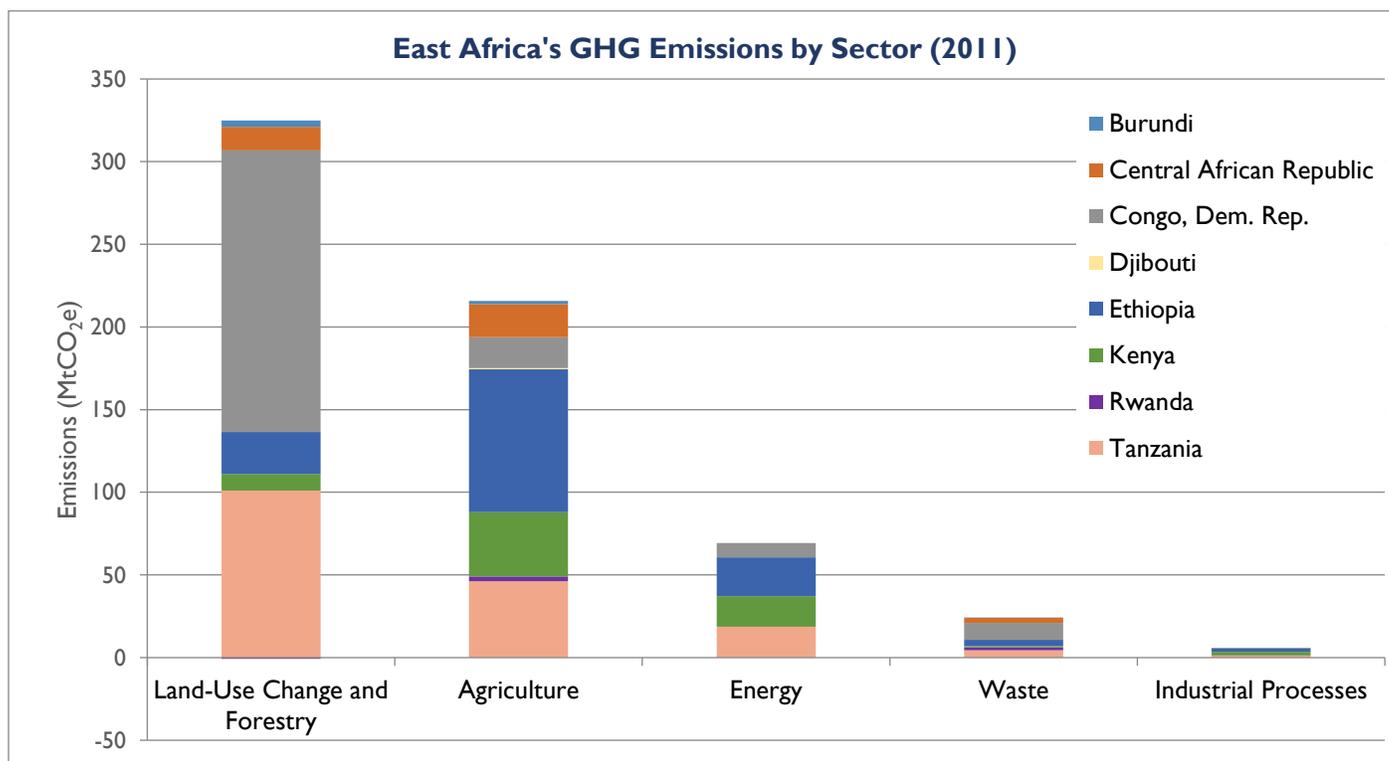
⁶ GHG emissions data for South Sudan are not available; there are generally inadequate emissions data for the country. Population statistic for the country is from the World Bank Development Indicators, accessed November 24, 2015, but GDP statistic is not available.

Republic (CAR), Burundi, Rwanda, and Djibouti. Together, these eight countries in East Africa are responsible for 1.43% of global emissions. On a per capita basis, the region's emissions are 2.5 times below the world average. The exception is the CAR where per capita emissions are more than twice the world average. In all countries, GHG emissions relative to GDP are very high, ranging from 1.5 times the world average in Djibouti and Rwanda to 37.5 times in the CAR. This results in the high regional GDP carbon intensity, which for East Africa is eight times the world average. Within the region, total GHG emissions since 1990 have increased most rapidly in Ethiopia, where emissions have grown 86%, driven by the increase in agriculture sector emissions due to livestock-related activities (Ethiopia's SNC). GHG emissions have decreased in Burundi and Rwanda by 40% and 60% respectively. For both Burundi and Rwanda, WRI CAIT data show that activities in the LUCF sector drive this decrease. According to Burundi's Second National Communication (SNC) to the UNFCCC, the government prohibits bush fires and has begun to implement a national reforestation policy. In Rwanda, according to its SNC, nature reserves and park areas have been preserved and the area of managed forest plantation increased 30% from 2000-2006.

The region's GHG emissions by sector, change in GHG emissions over time, and the drivers of emissions are described below, followed by an outline of key national climate change commitments and policies as described in the countries' Intended Nationally Determined Contributions (INDCs).

GHG Emissions by Sector (2011)⁷

GHG emissions in the East Africa region, from the countries for which data are available, are primarily from the land-use change and forestry (LUCF) and agriculture sectors. Together, regional emissions from these two sectors are responsible for 81% (540 MtCO_{2e}) of total regional GHG emissions (669 MtCO_{2e}), with LUCF responsible for nearly half (324 MtCO_{2e}) and agriculture nearly a third (216 MtCO_{2e}). Energy sector GHG data is not available for the CAR, Djibouti, and Rwanda; excluding their emissions, energy is the region's third highest emitting sector and is the source of 10% of the region's emissions (69 MtCO_{2e}). GHG emissions from the LUCF, agriculture, and the energy sector combined account for 91% of total regional emissions. Emissions from waste and industrial processes (IP) are relatively insignificant.

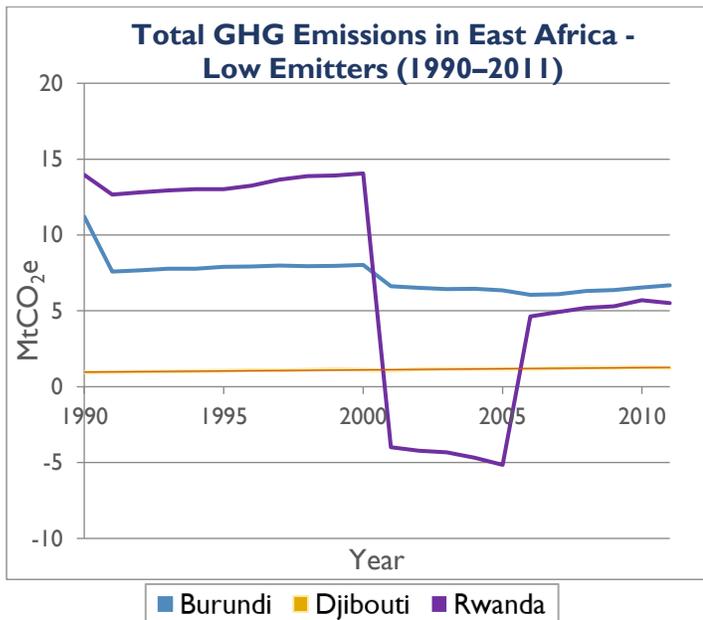


Source: WRI CAIT 2.0, 2015

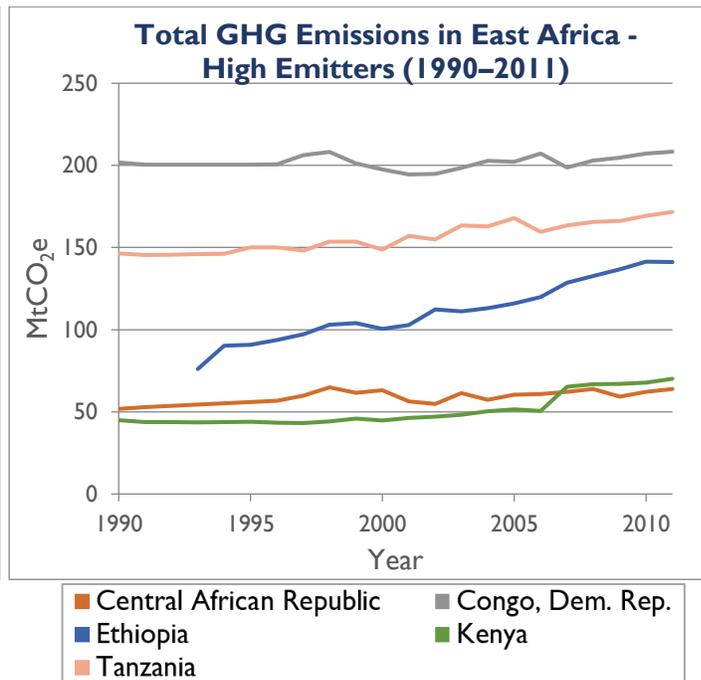
⁷ WRI CAIT. GHG emissions data are not available for Somalia and South Sudan.

Change in GHG Emissions in East Africa (1990-2011)

The total GHG emissions of the countries in the East Africa region increased 42% from 1990 to 2011. Country total emissions are presented in the two graphs below, with low emitters (Djibouti, Rwanda, Burundi) and high emitters (CAR, Kenya, Ethiopia, Tanzania, and DRC) shown separately.

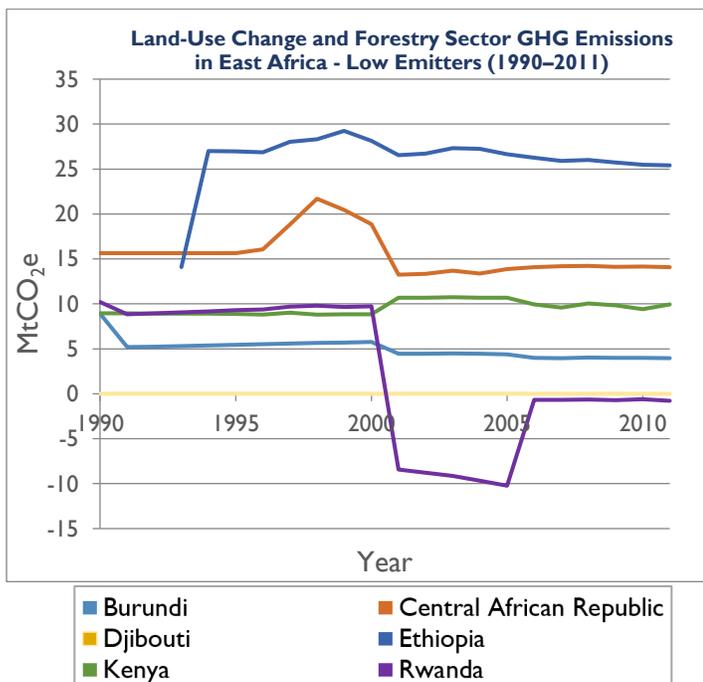


Source: WRI CAIT 2.0, 2015

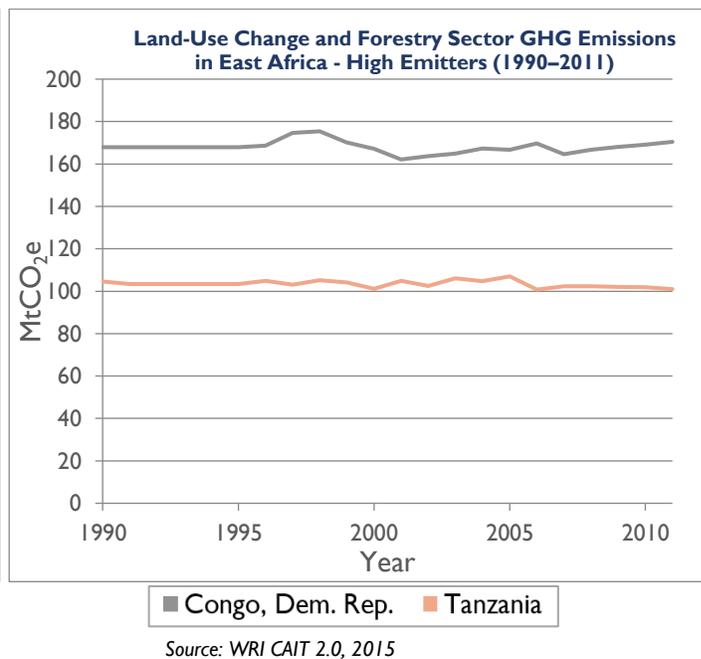


Source: WRI CAIT 2.0, 2015

Land-Use Change and Forestry (LUCF)⁸ – LUCF is the leading source of GHG emissions in Burundi, the DRC, and Tanzania. Their combined emissions represent 85% of the region's LUCF GHG emissions, of which the DRC and Tanzania are responsible for 84%. LUCF sector emissions for countries in the region are shown below.



Source: WRI CAIT 2.0, 2015

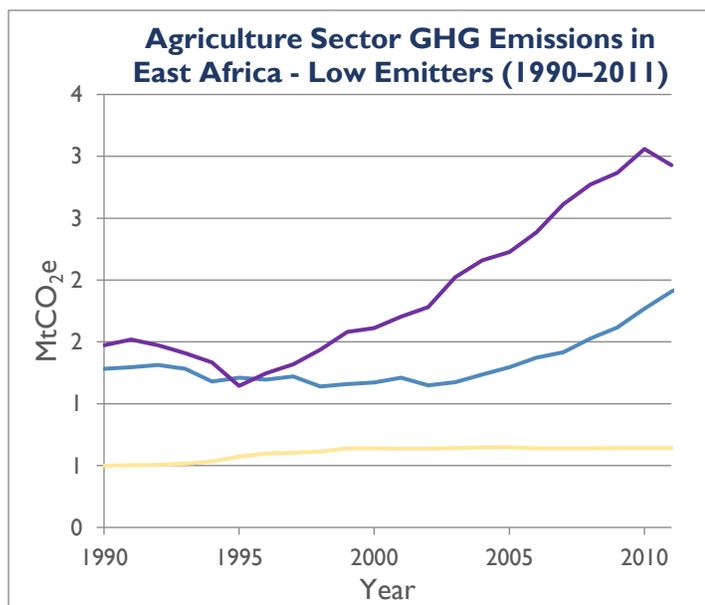


Source: WRI CAIT 2.0, 2015

⁸Information on LUCF is from the following sources: WRI CAIT 2.0, 2011, [Food and Agriculture Organization of the United Nations Statistics Division \(FAOSTAT\)](#), viewed December 30, 2015; REDD Desk, [Tanzania country profile](#) and REDD Desk, [DRC country profile](#), viewed December 30, 2015; [CIFOR DRC Profile](#) and [2015 Global Climate Legislation Study – Democratic Republic of the Congo](#); and [2015 Global Climate Legislation Study -- Tanzania](#).

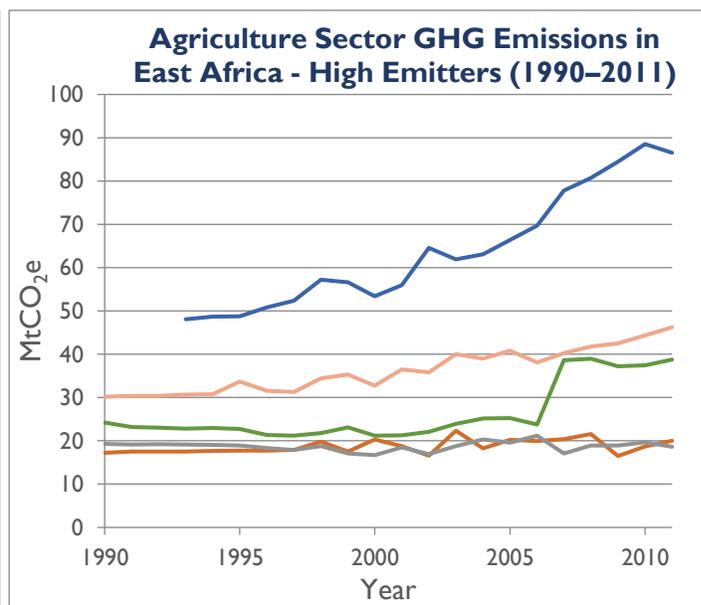
Changes in the region's LUCF emissions are driven by LUCF activities in the DRC and Tanzania. Approximately 65% to 68% of the DRC's land is forested. The country has a historically low rate of deforestation of 0.2% for the decade from 2000 to 2010. This is attributed to underdeveloped infrastructure that renders forests inaccessible, low population density and the low population growth rate, and availability of large swathes of non-forestland that are easier to convert for human settlements. Having over 100 million hectares of forests, which qualifies the DRC as having the world's second largest forest by area, even a relatively low rate of deforestation equates to a substantial source of GHG emissions. Deforestation in the DRC is driven by infrastructure development (roads for commercial logging and mining), agricultural expansion including shifting cultivation and livestock grazing, the development of bioenergy such as firewood and charcoal, and the activities of extractive industries related to mining, gas, and oil. Illegal logging, in particular in the south, also drives deforestation. In contrast, in Tanzania, the amount of land that is reported to be forested land is lower, ranging from 40% to 54%, but deforestation rates are considered quite high. Between 1990 and 2005 an estimated 412,000 hectares per annum were cleared, which is equivalent to about 1.1% of the total forest area. The main causes of deforestation in Tanzania include expansion of agricultural land from the lowlands towards the mountains, rapidly rising energy needs that are met by harvesting forest products for firewood and charcoal, and commercial logging.

Agriculture⁹ – The agriculture sector is the region's second highest GHG emitting sector. It is the leading source of emissions in five countries: the CAR, Djibouti, Ethiopia, Kenya, and Rwanda. Their combined emissions represent 69% of the region's agriculture sector emissions. In terms of emissions volume, the key countries are Ethiopia, Tanzania, Kenya, the CAR, and the DRC, whose emissions make up 89% of the region's agriculture GHG emissions. Their emissions are shown below.



■ Burundi ■ Djibouti ■ Rwanda

Source: WRI CAIT 2.0, 2015



■ Central African Republic ■ Congo, Dem. Rep.
■ Ethiopia ■ Kenya
■ Tanzania

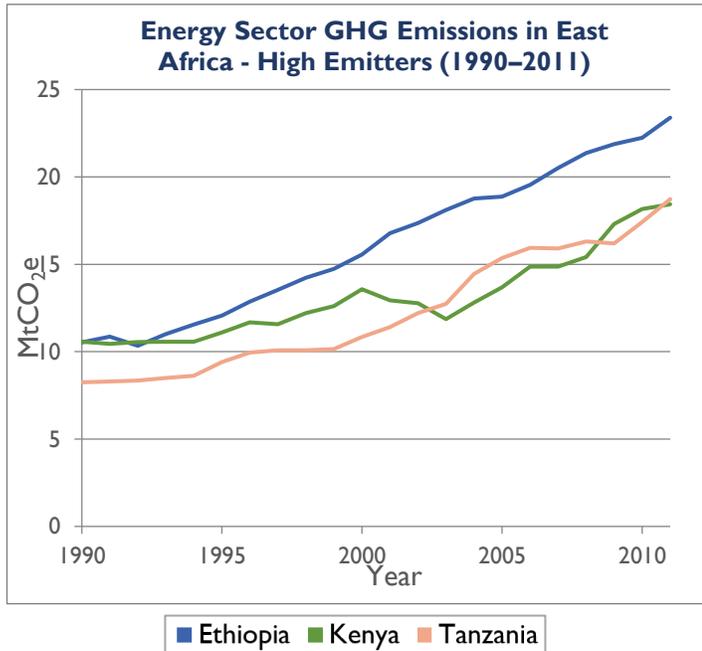
Source: WRI CAIT 2.0, 2015

In Ethiopia, Tanzania, and Kenya, enteric fermentation is the top emitting agriculture subsector, which also ranks among the top three sources of agriculture emissions in the CAR and DRC. In the CAR and DRC, the top emitting subsector is savanna burning, which is also a key source of GHGs in Tanzania. Manure left on pasture is among the top three emitting agriculture subsectors for all five countries. The agricultural sector is the primary source of livelihood and the most important economic sector for Ethiopia and Tanzania, with agriculture accounting for around 50% of the GDP. Agriculture accounts for roughly 25% of the GDP in Kenya. Countries have identified a range of needs to reduce emissions, including implementation of mixed farming, strategic supplementation, and manure management (Ethiopia);

⁹ Information on the agriculture sector is from the following sources: WRI CAIT 2.0, 2015, [Food and Agriculture Organization of the United Nations Statistics Division \(FAOSTAT\)](#), viewed December 30, 2015; [Initial National Communication of Ethiopia](#) to the United Nations Framework Convention on Climate Change; [Tanzania's Initial National Communication under the United Nations Framework Convention on Climate Change](#); [Kenya's Second National Communication to the United Nations Framework Convention on Climate Change](#); [Intended Nationally Determined Contribution, Central African Republic](#).

reduction of methane emission in crop and livestock production, switching to drought resistant crops, and improvement of traditional irrigation schemes (Tanzania); and promoting climate smart agriculture and livestock development (Kenya).

Energy¹⁰ – Energy sector GHG missions are not available for all countries across the 1990-2011 time series from WRI CAIT or other sources. Based on available data, energy activities are not the leading cause of GHG emissions in any of the East African countries for which energy sector GHG emissions are available. In order of lowest to highest, emitters are DRC (9 MtCO₂e), Kenya (18 MtCO₂e), Tanzania (19 MtCO₂e), and Ethiopia (23 MtCO₂e). The energy sector is Ethiopia’s and Tanzania’s third highest source of GHG emissions. Ethiopia, Tanzania’s and Kenya’s energy emissions combined are responsible for 87% of the region’s total energy sector GHG emissions. Their emissions are shown below.



Source: WRI CAIT 2.0, 2015. Energy sector GHG emissions are not available for Burundi, Central African Republic, Djibouti, and Rwanda.

In all three countries, energy consumption doubled over the period from 1990 to 2013, on par with the overall Africa region’s doubling of energy consumption. Transportation consumption during this time grew faster than either residential or industrial consumption, expanding nearly eight-fold in Tanzania, more than quadrupling in Ethiopia, and doubling in Kenya. In terms of overall consumption however, the residential sector remains by far the most significant source of demand in all three countries, where residential needs are substantially met through traditional biomass fuel in the form of wood fuel and charcoal. Crop residue and manure are also used for some household needs such as heating and cooking.

Only about one quarter of the population have access to electricity. In Ethiopia, 27% of the population had access to electricity as of 2012, where 23% of Kenyans and 15.3% of Tanzanians had electricity access. Within countries, the urban population is far better served, with about half of Kenyans in urban areas connected to the grid, but only about 5% in rural areas. In Tanzania, only about 3% in rural areas have access to electricity; among all grid-connected consumers in Tanzania, many have electricity for only a few hours per day. In Tanzania, the majority of electricity generation comes from natural gas, while in Ethiopia and Kenya, electricity generation is dominated by hydropower.

¹⁰ Information on the energy sector is from the following sources: [IEA Statistics, Non-member Countries](#), viewed December 30, 2015; [EIA Analysis](#), viewed December 30, 2015; [REEGLE](#), viewed December 30, 2015; [World Bank World Development Indicators, Access to electricity \(% of population\)](#); [Kenya’s Second National Communication to the United Nations Framework Convention on Climate Change](#); [Tanzania’s Initial National Communication under the United Nations Framework Convention on Climate Change](#).

Key National Climate Change Commitments and Policies

All ten of the countries in the region submitted an Intended Nationally Determined Contribution (INDC) prior to the UN climate conference (COP 21) that culminated in the Paris Agreement. The commitments are summarized in the table below, which indicates whether the commitments were put forth to be achieved unconditionally, or if they are conditioned upon the receipt of international support, if this distinction was communicated in the INDC. The sectors in which GHG mitigation actions are expected to be achieved are also identified.

Country	Commitment	Sectors for mitigation and enhanced removals
<u>Burundi</u>	<p>Unconditional – Reduce GHG emissions by 3% (1,958 Gigagrams of CO₂e) compared to the BAU scenario for 2030.</p> <p>Conditional – Reduce GHG emissions by 20% (14,897 Gigagrams of CO₂e), starting in 2016, compared to the BAU scenario for 2030.</p>	<ul style="list-style-type: none"> • Forestry • Energy • Agriculture
<u>Central African Republic</u>	<p>Unconditional – GHG mitigation measures within ongoing national measures, including reforestation, outreach about slash-and-burn agriculture and burning of agricultural waste, energy conservation, and improved cook stoves.</p> <p>Conditional – Reduce emissions by 5% (5,498.3 kilotons of CO₂e) at the 2030 horizon and 25% (33,076.1 kilotons of CO₂e) at the 2050 horizon compared to the BAU reference level, and increase the potential of the country's forestry sector to absorb CO₂.</p>	<ul style="list-style-type: none"> • LUCF • Energy • Agriculture • Industrial processes • Waste
<u>Democratic Republic of Congo</u>	<p>Conditional – Reduce GHG emissions by 17% from BAU levels (430 Mt CO₂e) by 2030.</p>	<ul style="list-style-type: none"> • LULUCF • Agriculture • Energy
<u>Djibouti</u>	<p>Unconditional – Reduce GHG emissions by 40% (1.8 Mt CO₂e) by the year 2030, compared to BAU projections for that year.</p> <p>Conditional – Further reduction of GHG emissions by 20% (0.9 Mt CO₂e) by 2030 compared to BAU levels.</p> <p>The total mitigation efforts, under both the unconditional and conditional scenarios, would essentially maintain the country's emissions at roughly its level in 2010.</p>	<ul style="list-style-type: none"> • Energy • Agroforestry • Transportation

<u>Ethiopia</u>	Conditional – Limit GHG emissions to 145 MtCO ₂ e or lower by 2030, representing a 255 MtCO ₂ e or 64% reduction from the projected BAU emissions.	<ul style="list-style-type: none"> • Agriculture (livestock and soil) • Forestry • Transport • Electric power • Industry (including mining) • Buildings
<u>Kenya</u>	Conditional – Reduce GHG emissions by 30% from BAU levels (143 MtCO ₂ e) by 2030.	<ul style="list-style-type: none"> • Energy (expansion in renewable energy production; energy efficiency) • Transportation • Industrial processes • AFOLU (tree cover of at least 10% of land area; climate smart agriculture) • Waste (sustainable waste management)
<u>Rwanda</u>	The GHG emissions reduction estimate will be informed by the Third National Communication Report which will be completed by 2017. Emission reductions for 2030 are conditional.	<ul style="list-style-type: none"> • Energy • Transport • Industry • Waste • Forestry
<u>Somalia</u>	INDC includes profiles of potential GHG mitigation projects including renewable energy, sustainable land management, efficient kilns and stoves, and reforestation.	<ul style="list-style-type: none"> • Energy • Agriculture and land use change and forestry
<u>South Sudan</u>	Commits to undertake a national GHG inventory, as part of its Initial National Communication, in 2016. This will allow a better assessment of potential for mitigation and quantify the emission reductions from specific conditional mitigation actions that were identified.	<ul style="list-style-type: none"> • Energy generation and use • Land use and land use change • Transport
<u>Tanzania</u>	Reduce GHG emissions between 10-20% by 2030 relative to the BAU scenario of 138 - 153 MtCO ₂ e, depending on the baseline efficiency improvements, consistent with its sustainable development agenda. The emissions reduction is subject to review after the first Biennial Update Report (BUR). Continue to enhance carbon sinks through forest conservation, afforestation, and reforestation.	<ul style="list-style-type: none"> • Energy • Transport • Forestry • Waste management

Many countries in the region have a national climate change policy, or a draft that is pending approval or in progress. These are briefly listed below to provide additional context:

- Burundi – [Politique nationale sur le changement climatique](#) (National Climate Change Policy) (2013), [Stratégie Nationale et Plan d'Actions sur le changement climatique](#) (National Strategy and Action Plan on Climate Change) (2013)
- CAR – The CAR does not have a national climate change policy. However, the [Second National Communication to the UNFCCC](#) states that the government is integrating climate change-related concerns into national development policy, and mentions a 2008 Forestry Code, 2007 Environment Code, and integration of environmental issues in a Strategy Document on Poverty Reduction for the period 2011-2015.
- DRC – Low Carbon Development Strategy (2012)
- Djibouti – Green economy strategy and national strategy on climate change (under development)
- Ethiopia – [Climate Resilient Green Economy Vision and Strategy](#) (2011)
- Kenya – [National Climate Change Response Strategy](#) (2010). [National Climate Change Action Plan 2013-2017](#) (2012)
- Rwanda – [Green Growth and Climate Resilience: National Strategy for Climate Change and Low Carbon Development](#) (2011)
- Somalia – The [National Adaptation Programme of Action \(2013\)](#) aligns with mitigation and adaptation actions identified in the INDC
- South Sudan – National Environment Policy (2012)
- Tanzania – [National Climate Change Strategy](#) (2012)