Kenya: information on national emissions, population and GDP, and mitigation targets

September 23, 2020

Authors:

Annika Guenther[1]

Johannes Guetschow[1]

Affiliations:

1. Potsdam Institute for Climate Impact Research, Germany

TODO

- Table with info on target (main and reclass; emissions from NDC; target quantis + plot).

- GWP: NDC emissions coverted from AR2 to AR4 by national conversion factor (2010–2017, PRIMAP-hist v2.1).

- References!

1 Non-LULUCF emissions and socio-economic data

With national emissions of 71.5 Mt CO_2eq, Kenya contributed 0.1% to global emissions in 2017, and in 2030 its share is estimated to stay at a similar level (Table **??**). The estimates for 2030 are based on the downscaled SSP2 Middle of the Road marker scenario (dmSSP2), in which Kenya is estimated to emit 91.1 Mt CO_2eq in 2030. That change in emissions would constitute a substantial increase of 27.4% compared to 2017. The pathways dmSSP1–5 show a range of 89.9–130.2 Mt CO_2eq in 2030, and 137.9–387.6 Mt CO_2eq in 2050. The country's global rank in terms of total emissions per unit of GDP was 83 in 2017, and 185 regarding the per-capita emissions (105 and 185 in 2030). In terms of accumulated historical emissions, Kenya contributed to the global 1850–2017 emissions by 0.1%. When only accounting for the years 1990–2017, its contribution stays the same to 0.1%. All of the emissions are presented following GWP AR4, and exclude emissions from LULUCF (exclLU), and bunkers fuels emissions (exclBunkers).

Table 1: National emissions (dmSSP2), GDP and population for Kenya, together with the emissions per unit of GDP and per capita emissions (all for 2017 and 2030). Additionally, the global share and its rank are displayed.

	Year	Total	Unit	Glob. share	Rank
Emissions	2017	71.5	Mt CO_2eq	0.1%	68
	2030	91.1	Mt CO_2eq	0.1%	61
GDP	2017	147.0	Billion 2011 GK\$	0.1%	71
	2030	302.3	Billion 2011 GK\$	0.1%	68
Emissions per GDP	2017	486.6	t CO_2eq / Million 2011 GK\$	0.4%	83
	2030	301.4	t CO_2eq / Million 2011 GK\$	0.4%	105
Population	2017	50.2	Million Pers	0.7%	28
	2030	63.9	Million Pers	0.8%	24
Emissions per capita	2017	1.4	t CO_2eq / Pers	0.09%	185
	2030	1.4	t CO_2eq / Pers	0.09%	185

For Kenya, in 2017 the main emissions share on sectoral level (Fig. **??**) came from the Agriculture sector (48.0%), followed by Energy (41.7%) The Kyoto GHG with the highest emissions in 2017 was CH_4, constituting 53.1% of the national emissions. Second largest contributor was CO_2 (26.5%) The total of F-gasesonly represented 0.1%. The trend in total emissions is mostly driven by CH_4 emissions from the Agriculture and Energy sectors, which contributed 30.6% and 20.0% to Kenya's 2017 emissions.[1] The total CO_2 emissions are expected to be 39.4% of the national Kyoto GHG emissions in 2030 (dmSSP2).

---

[1]Analysis based on the correlations between total national emissions (exclLU) versus the emissions of the combinations of main-sectors & the gases CO_2, CH_4, N_2O and F-gases. Only data from 2010 to 2017 are assessed. The (up to) three gas & sector combinations are chosen for which the slope of the regression line to the correlated values exceeds 0.2.
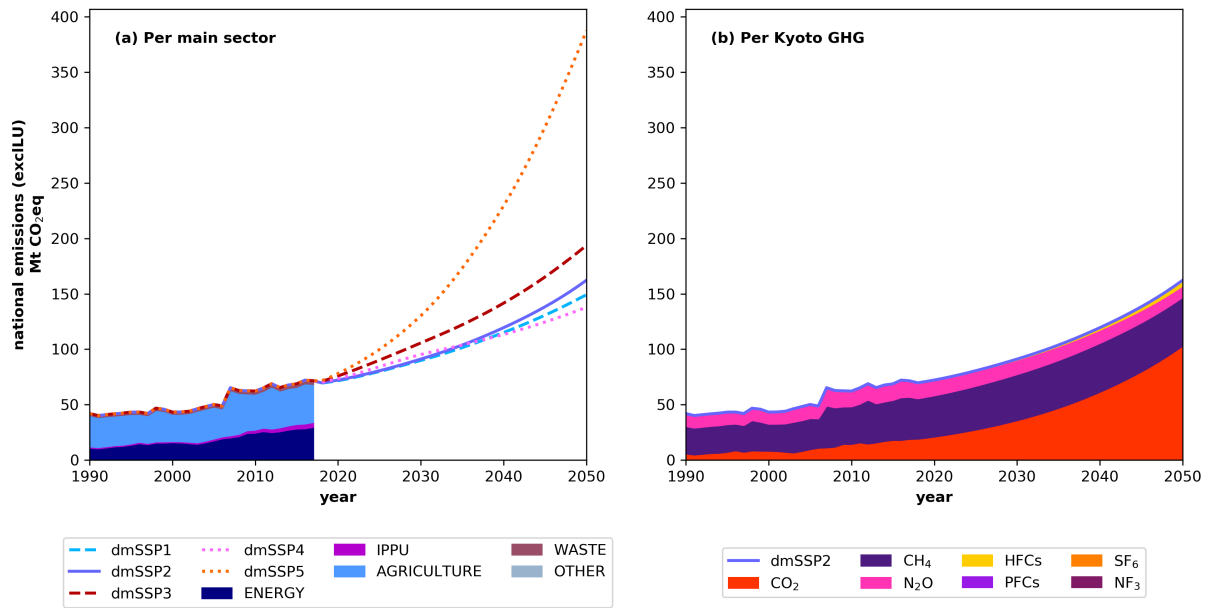
Figure 1: 'Stacked' timeseries of national emissions (exclLU) per main-sector (a) and Kyoto GHG (b). No information available on the sectoral contributions after 2017.
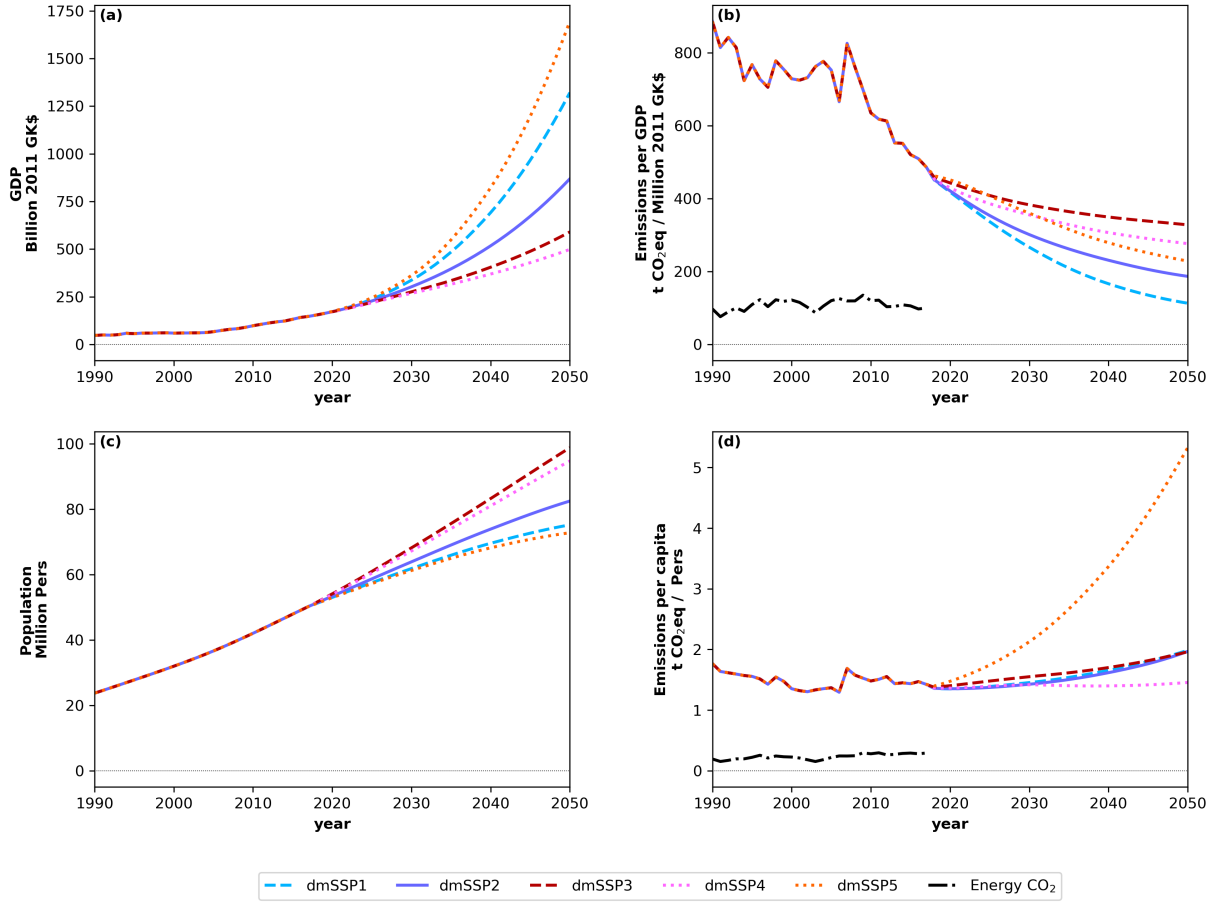
Figure 2: Timeseries of national GDP (a) and population (c), and Kyoto GHG emissions (exclLU, exclBunkers) per unit of GDP (b) or per capita (d).

The national GDP increased in recent years, and the emissions per unit of GDP had an opposite trend (Fig. **??**). The population increased, while the per capita emissions dropped. Following dmSSP2, the GDP is projected to increase towards 2050. The emissions per GDP are estimated to decrease towars 2050. Kenya's population is assumed to grow towards 2050, and the per capita emissions are expected to increase towards 2050.

2 LULUCF emissions

LULUCF emissions data for Kenya are available from the following sources (Fig. **??**): UNFCCC (2019), FAO (2019).

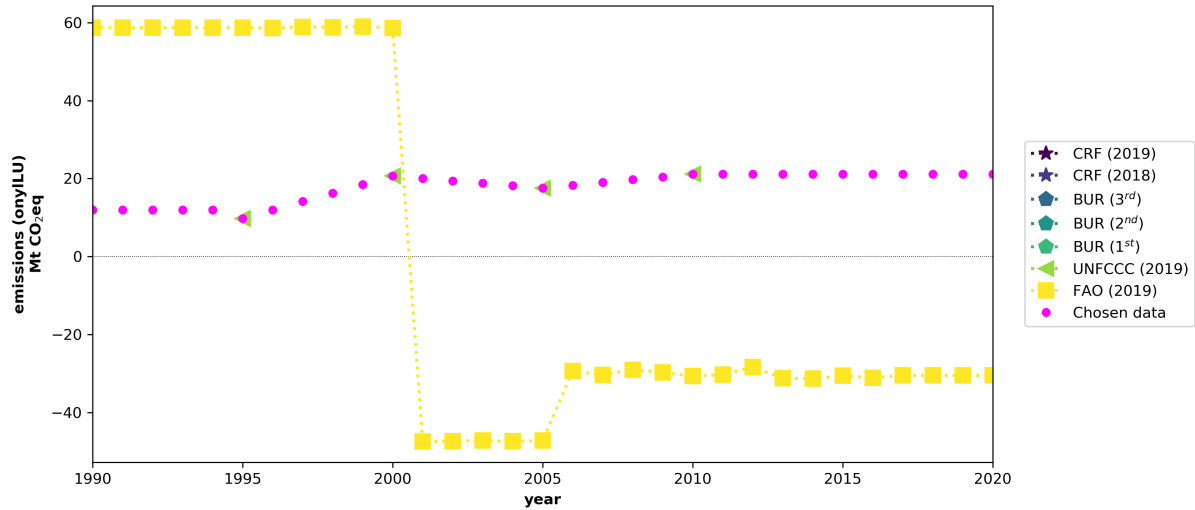**High fluctuations? Data gaps? Difference between sources?**

Figure 3: Timeseries of emissions from LULUCF (CO_2 plus CH_4 and N_2O) as available from different data-sources. Indicated in pink are the 'chosen' data, as used in our assessment of Kenya's NDC (if needed). The pink timeseries was inter- and / or extrapolated (interpolation: linear, extrapolation: constant).

3 Mitigation targets (NDC)

 Give the %cov for the base and target year (and 2017). Global share for 2030 for the mitigated pathways and % reduction relative to 1990 and 2017. Table with the 'input' data and the resulting targets (like ndcs_targets.csv). Kenya has an NDC, with a GHG mitigation target of the type RBU (relative reduction compared to Business-As-Usual; main target type). The reclassified target type is ABS (absolute emissions target).

Table 2: Information on Kenya's GHG mitigation target(s).

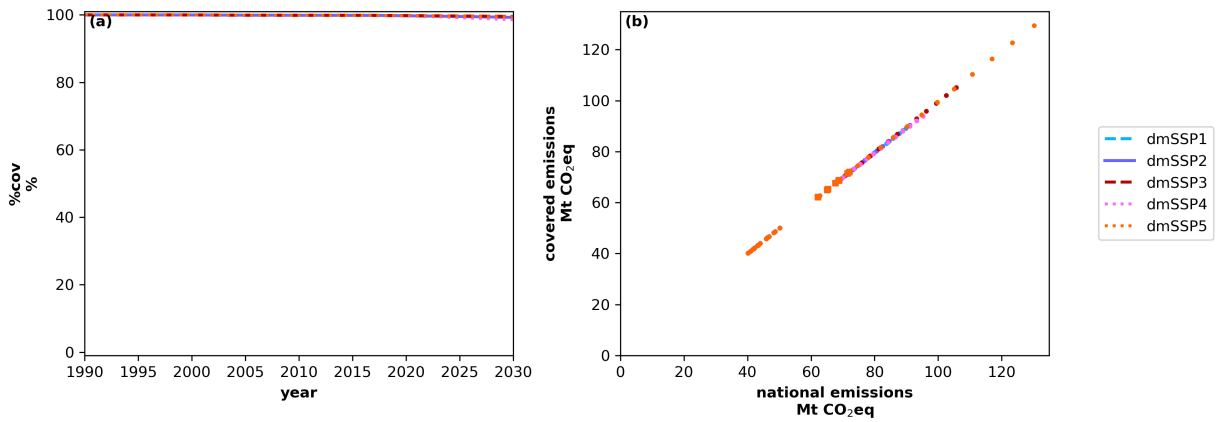| type	condi.	range	value	tarYr	LU
RBU	condi.	best	-30%	2030	inclLU
ABS	condi.	best	100.099 Mt CO_2eq SAR	2030	inclLU

Figure 4: Timeseries of Kenya's national emissions (exclLU) and the share of emissions that is assumed to be covered by Kenya's mitigation target.

Table 3: Information on covered sectors and gases as retrieved from NDC and adapted ('Adap.': used to calculate %cov), and their shares in Kenya's 2017 emissions (exclLU, exclBunkers; total 71.5 Mt CO_2eq). If either the sector or gas is assessed as 'not-covered', the emissions from this sector-gas combination are counted as not-covered ($-$). Else the emissions are counted as covered ($+$; covered shares given in bold). (/) means that no information is available. LULUCF: NDC '+' and adapted '+' (estimated as a net source of 21.2 Mt CO_2eq in 2017; based on the 'chosen' LULUCF emissions).

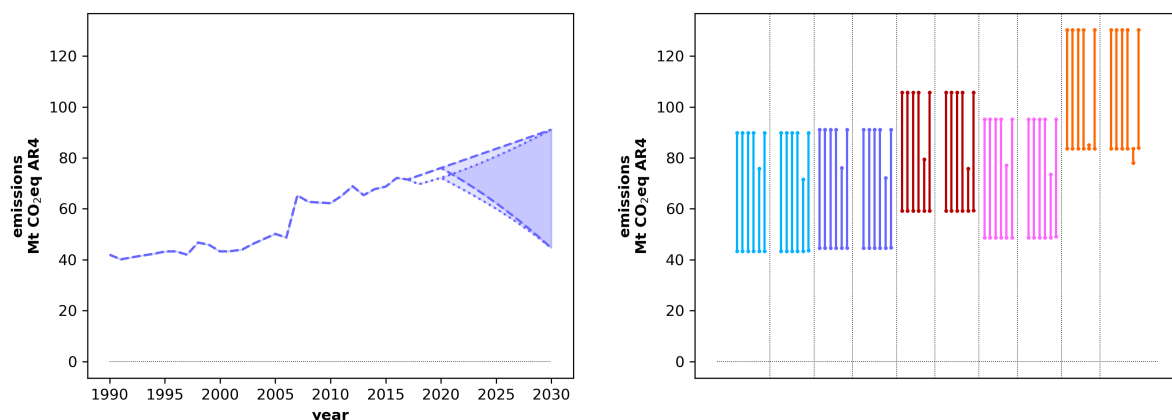|	NDCs	Adap.	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Total
NDCs			+	+	+	/	/	/	/	
Adap.			+	+	+	$-$	$-$	$-$	$-$	
Energy	+	+	**20.5%**	**20.0%**	**1.2%**	/	/	/	/	41.7%
IPPU	+	+	**6.0%**	/	**0.0%**	0.1%	0.0%	/	/	6.1%
Agri.	+	+	**0.06%**	**30.6%**	**17.3%**	/	/	/	/	48.0%
Waste	+	+	**0.01%**	**2.5%**	**1.1%**	/	/	/	/	3.6%
Other	/	+	/	/	**0.6%**	/	/	/	/	0.6%
Total			26.5%	53.1%	20.2%	0.1%	0.0%	/	/	100.0%

Figure 5: Quantified mitigation targets (based on different input data and calculation options). Vertical lines: conditionality / range; colour coded: dmSSP1–5; first / second set of six: prio NDCs / SSPs; set of six: coverage 100, lulucf unfccc, lulucf fao, bl uncondi, const emi, estimated coverage.

4 Data sources, additional information and references

PRIMAP-hist v2.1: emissions from PRIMAP-hist are data from the country reported data priority scenario (HISTCR).
dmSSPs: emissions, population and GDP data are PMSSPBIE data for the five marker scenarios.

SSPs Shared Socio-economic Pathways. Narratives and challenges to mitigation and adaptation: SSP1: Sustainability, Taking the Green Road (low / low); SSP2: Middle of the Road (medium / medium); SSP3: Regional Rivalry, A Rocky Road (high / high); SSP4: Inequality, A Road Divided (low / high); and SSP5: Fossil-fuelled Development, Taking the Highway (high / low).

GDP Gross Domestic Product. Throughout this document the GDP is given as GDP PPP, with PPP being the Purchasing Power Parity.

GWP Global Warming Potential. we use GWP values from the IPCC 4th Assessment Report (AR4). They reflect the forcing potential of one kilogram of a gas' emissions in comparison to one kilogram of CO_2 ($GWP_{CO2} = 1$). The GWPs correspond to a 100-yr period and are for CH_4: 25, for N_2O: 298, for SF_6: 22800, and for NF_3: 17200. For the basket of HFC-gases the GWPs from AR4 are in the range 4–14800, and for PFCs 7190–12200. To assess emissions of several GHGs, their emissions are weighted by their respective GWPs and presented in CO_2 equivalents (CO_2eq).

LULUCF Land Use, Land-Use Change and Forestry. Emissions from LULUCF are excluded throughout the document, unless stated otherwise.

Bunkers fuels Emissions from international aviation and shipping.

Kyoto GHG Kyoto GHG (Greenhouse Gas) basket: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), and nitrogen trifluoride (NF_3).

F-gases Fluorinated gases.Basket of HFCs, PFCs, and the gases SF_6 and NF_3. Some F-gases have very long atmospheric lifetimes and high Global Warming Potentials.

Target reclassification When a country has, e.g., an RBU target (relative reduction compared to Business-As-Usual), and the BAU emissions are provided, it can be quantified based on the given emissions, and is reclassified from type_main RBU to type_reclass ABS (absolute emissions target). Additionally, 'NGT' targets can be reclassified as 'ABU' (absolute reduction compared to Business-As-Usual) if absolute mitigation effects due to planned policies and measures are provided.

Links to additional information:

- CLIMATEWATCH
- CarbonBrief: Clear on Climate
- Climate Action Tracker
- Country resolved combined emission and socio-economic pathways based on the RCP and SSP scenarios (February 2020)
- Guest post: Calculating the true climate impact of aviation emissions (September 2020)
- IGES NDC Database

- IPCC (The Intergovernmental Panel on Climate Change)
- IPCC Special Report: Global Warming of 1.5° (2018)
- ISIMIP / ISIpedia
- NDC Explorer
- NDC PARTNERSHIP
- PBL Climate Pledge NDC tool
- SSP Database (Shared Socioeconomic Pathways) - Version 2.0 (December 2018)
- The PRIMAP-hist national historical emissions time series (1850-2017) (2019)
- UNFCCC (United Nations Framework Convention on Climate Change)
- World's richest 1% cause double CO_2 emissions of poorest 50%, says Oxfam
- #showyourbudgets