South Africa: information on national emissions, population and GDP, and mitigation targets

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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!
- Include the baseline emissions for dmSSP2 in the mitigation plot (NDCs and SSPs)!
- Only plot the % cov if it is not above 99 or below 1.
- Maybe plot world maps? Emissions, population, GDP? And zoom into the country's area?

1 Emissions and socio-economic data

With national emissions of 0.5 Gt CO_2eq, South Africa contributed 1.1% 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 South Africa is estimated to emit 0.6 Gt CO_2eq in 2030. That change in emissions would constitute a substantial increase of 19.4% compared to 2017. The pathways dmSSP1–5 show a range of 0.6–0.8 Gt CO_2eq in 2030, and 0.6–1.2 Gt CO_2eq in 2050. The country's global rank in terms of total emissions per unit of GDP was 37 in 2017, and 44 regarding the per-capita emissions (27 and 38 in 2030). In terms of accumulated historical emissions, South Africa contributed to the global 1850–2017 emissions by 1.1%. When only accounting for the years 1990–2017, its contribution increases to 1.2%. 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 South Africa, 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	0.5	Gt CO_2eq	1.1%	16
	2030	0.6	Gt CO_2eq	1.1%	15
GDP	2017	0.7	Trillion 2011 GK$	0.6%	30
	2030	1.1	Trillion 2011 GK$	0.6%	32
Emissions per GDP	2017	0.8	t CO_2eq / Thousand 2011 GK$	0.7%	37
	2030	0.6	t CO_2eq / Thousand 2011 GK$	0.8%	27
Population	2017	57.0	Million Pers	0.8%	24
	2030	62.4	Million Pers	0.7%	25
Emissions per capita	2017	9.3	t CO_2eq / Pers	0.6%	44
	2030	10.2	t CO_2eq / Pers	0.7%	38

For South Africa, in 2017 the main emissions share on sectoral level (Fig. **??**) came from the Energy sector (77.5%), followed by Agriculture (9.8%) The Kyoto GHG with the highest emissions in 2017 was CO_2, constituting as much as 82.5% of the national emissions. Second largest contributor was CH_4 (11.8%) The total of F-gasesonly represented 0.6%. The total CO_2 emissions are expected to be 86.4% of the national Kyoto GHG emissions in 2030 (dmSSP2).

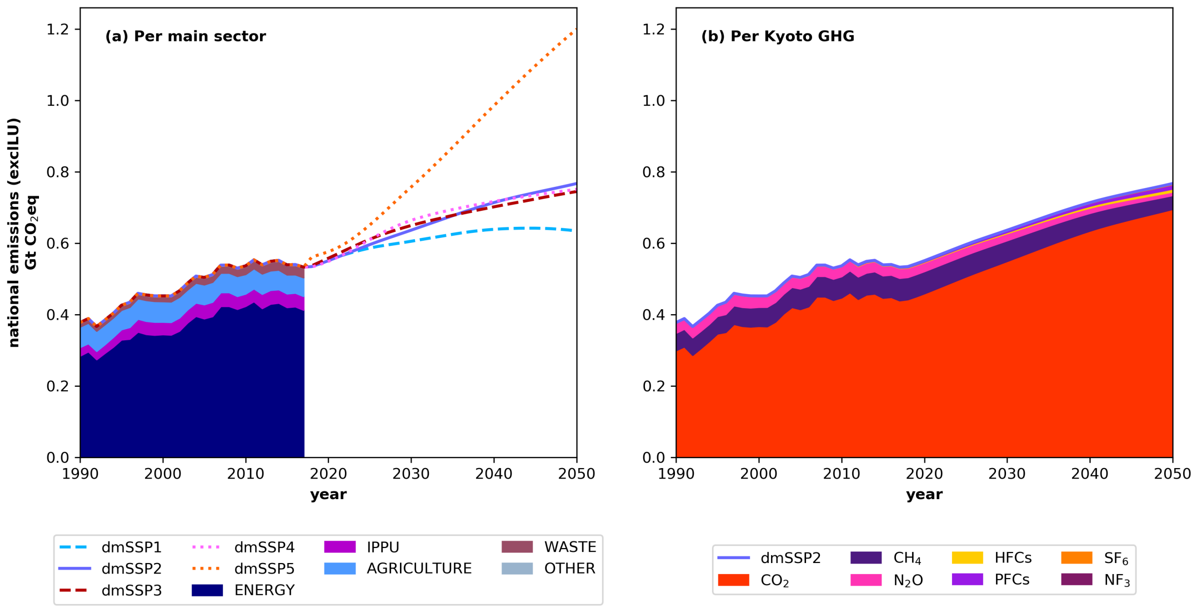

Figure 1: 'Stacked' timeseries of national emissions (exclLU) per main-sector (a) and Kyoto GHG (b). No information available on the sectoral contributions after 2017.

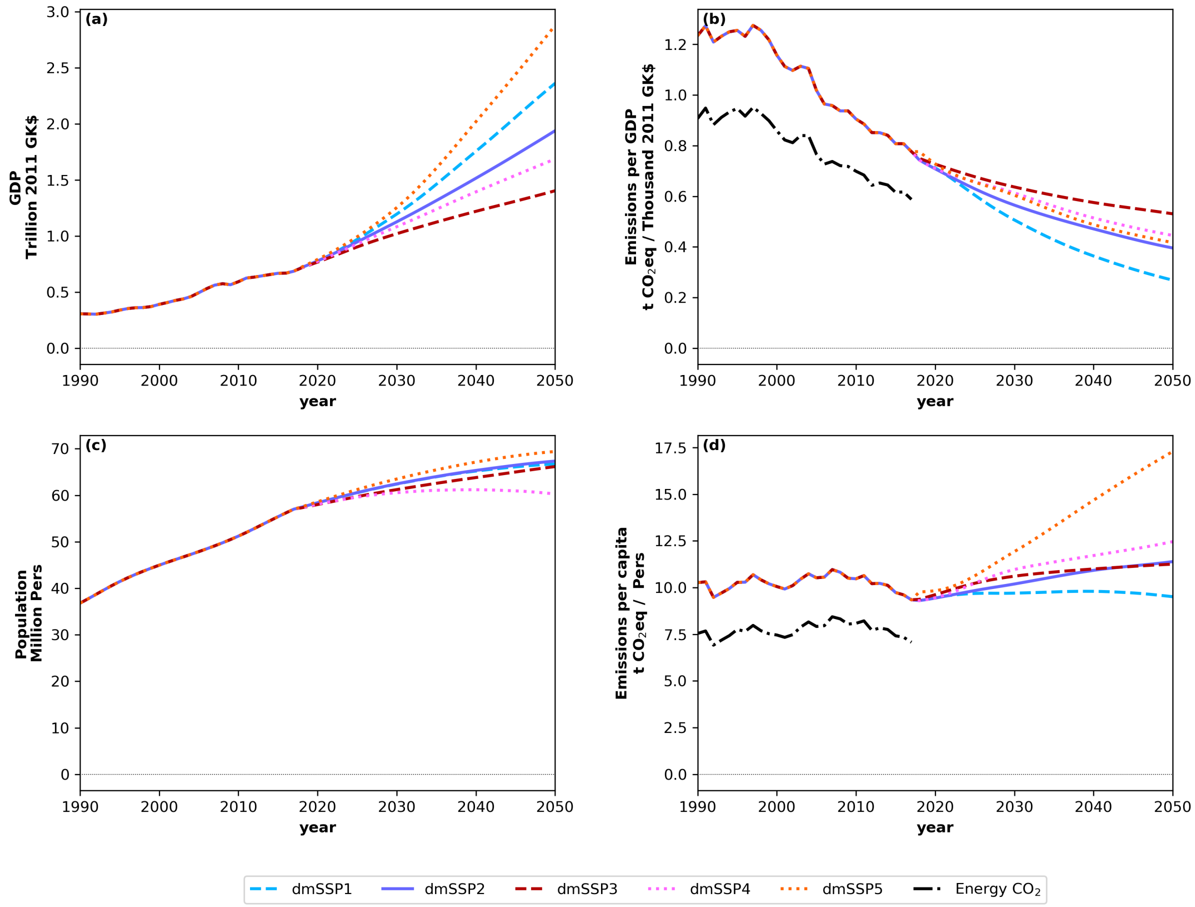

Figure 2: Timeseries of national GDP (a) and population (c), and Kyoto GHG emissions (exclLU, exclBunkers) per unit of GDP (b) or per capita (d).

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. South Africa's population is assumed to grow towards 2050, and the per capita emissions are expected to increase towards 2050.

LULUCF emissions data for South Africa are available from the following sources (Fig. **??**): BUR (2^{nd}) / 14, FAO (2019) / 28, with the number of available data points in 1990–2017 displayed additionally. Based on data from BUR (2^{nd}), for the year 2017, LULUCF is estimated to be a net sink of -0.0 Gt CO_2eq, which in absolute terms is lower than the non-LULUCF emissions of 0.5 Gt CO_2eq. The emissions range for BUR (2^{nd}) and 1990–2017 is -0.0—0.0 Gt CO_2eq.

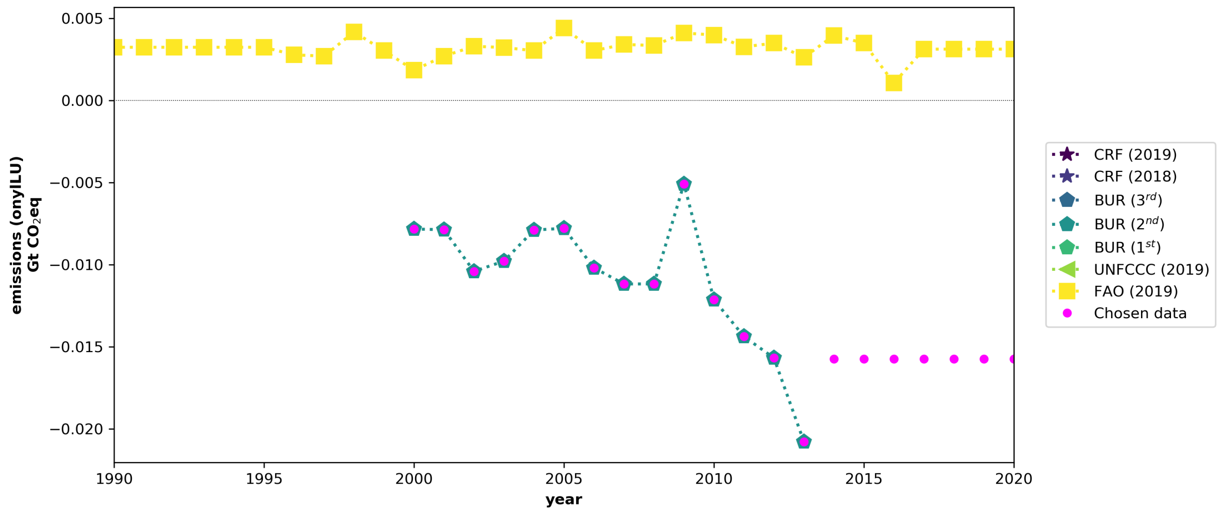

Figure 3: Timeseries of emissions from LULUCF (CO_2 plus CH_4 and N_2O) as available from different data-sources. Indicated in pink are the 'chosen' data, as used in our assessment of South Africa's NDC (if needed). The pink timeseries was inter- and / or extrapolated (interpolation: linear, extrapolation: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

2 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, for SSP2 only?).
South Africa has an NDC, with a GHG mitigation target of the type ABS (absolute emissions target; main target type). The reclassified target type equals the main target type.

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

type	**condi.**	**range**	**value**	**tarYr**	**peakYr**	**LU**
ABS	condi.	worst	614 Mt CO_2eq AR4	2025	2035	inclLU
ABS	condi.	best	398 Mt CO_2eq AR4	2025	2035	inclLU
ABS	condi.	worst	614 Mt CO_2eq AR4	2030	2035	inclLU
ABS	condi.	best	398 Mt CO_2eq AR4	2030	2035	inclLU

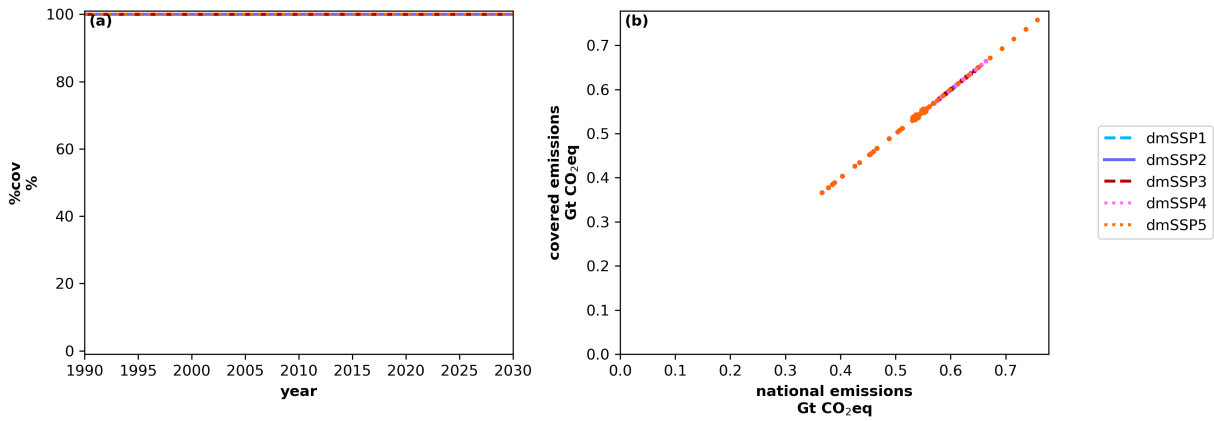

Figure 4: Timeseries of South Africa's national emissions (exclLU) and the share of emissions that is assumed to be covered by South Africa's mitigation target.

Table 3: Information on covered sectors and gases as retrieved from NDC and adapted ('Adap.': used to calculate %cov), and their shares in South Africa's 2017 emissions (exclLU, exclBunkers; total 0.5 Gt 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 -0.0 Gt 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	+	+	**75.7%**	**1.3%**	**0.4%**	/	/	/	/	77.5%
IPPU	+	+	**6.5%**	**0.01%**	**0.06%**	**0.2%**	**0.2%**	**0.08%**	/	7.2%
Agri.	+	+	**0.2%**	**5.6%**	**4.0%**	/	/	/	/	9.8%
Waste	+	+	/	**4.9%**	**0.1%**	/	/	/	/	5.0%
Other	/	+	/	/	**0.4%**	/	/	/	/	0.4%
Total			82.5%	11.8%	5.1%	0.2%	0.2%	0.08%	/	100.0%

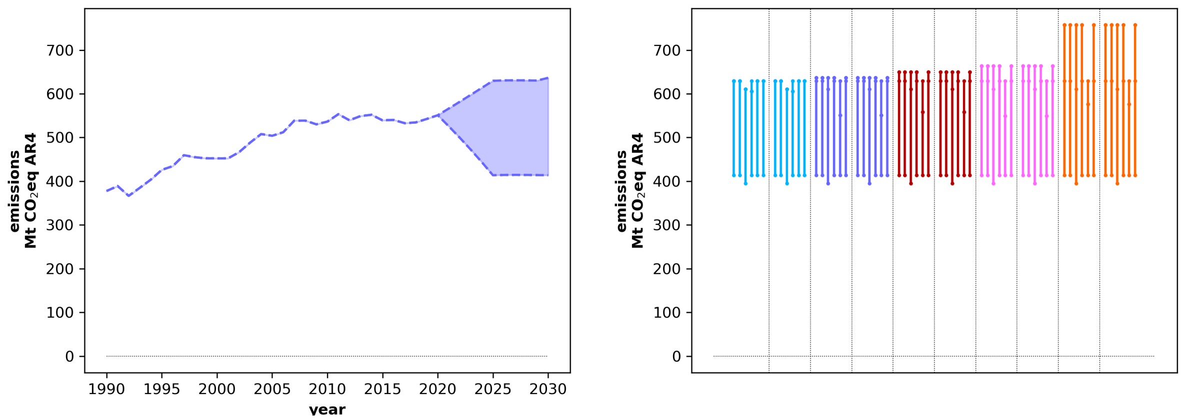

Figure 5: Quantified mitigation targets (based on different input data and calculation options). Vertical lines: conditionality / range; colour coded: dmSSP1–5; first / second set of six: prio NDCs / SSPs; set of six: coverage 100, lulucf unfccc, lulucf fao, bl uncondi, const emi, estimated coverage.

3 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 4^{th} 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.

Quantification options Different quantification options were tested.
dmSSP1–5: down-scaled SSP marker scenarios;
type_reclass: external data prioritised (PRIMAP-hist, dmSSPs);
type_main: emissions data from within NDCs were prioritised;
100% coverage & estimated coverage;

constant emi: constant emissions after last target year (instead of constant relative difference to baseline);
baseline uncondi: baseline emissions as uncond. pathways for Parties without uncond. targets, even if baseline is better than cond. targets (instead of cond. pathway as uncond. pathways in these cases).

Links to additional information:

- CLIMATE HOME NEWS
- CLIMATEWATCH
- CarbonBrief: Clear on Climate
- China's carbon neutral pledge could curb global warming by 0.3°C - researchers (23 September 2020)
- Climate Action Tracker
- Coronavirus: Climate action cannot be another Covid victim - PM (23 September 2020)
- Countries' Climate Plans (NDCs) Are Missing a Big Opportunity: Reducing Food Loss and Waste (3 July 2019)
- Country resolved combined emission and socio-economic pathways based on the RCP and SSP scenarios (February 2020)
- Few countries living up to Covid 'green recovery' pledges - analysis (23 September 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
- Is it possible to track progress of the submitted nationally determined contributions under the Paris Agreement? Overview of implicit accounting decisions in submitted NDCs and implications for the tracking of progress under the Paris agreement (1 March 2018)
- Melting Antarctic ice will raise sea level by 2.5 metres - even if Paris climate goals are met, study finds (23 September 2020)
- 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)
- Three Surprising Solutions To Climate Change (10 June 2019)
- UNFCCC (United Nations Framework Convention on Climate Change)
- WORLD RESOURCES INSTITUTE
- Why the 2020 Atlantic hurricane season has spun out of control: Extra-warm ocean waters, boosted by climate change, and La Niña are key drivers in historic season. (September 2020)
- World faces 'climate apartheid' risk, 120 more million in poverty: UN expert (25 June 2019)
- World's richest 1% cause double CO_2 emissions of poorest 50%, says Oxfam
- #showyourbudgets