To: Earth Justice and Centre for Environmental Rights

From: Climate Equity Reference Project

Date: Sunday, April 25, 2021

Re: Comparison of South Africa's draft updated mitigation NDC to its mitigation fair share

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In this brief memo, we compare the 2030 mitigation targets in South Africa's draft updated NDC to its fair share of the global mitigation effort to limit climate change.

- South Africa's current official NDC is to limit emissions to between 398 and 614 $MtCO_2eq$ in 2030, including LULUCF. The draft updated NDC proposes to limit emissions to between 398 and 440 $MtCO_2eq$ in 2030, including LULUCF.

- The fair share is calculated as per the Climate Equity Reference Framework[1], which is also referenced by the revised updated NDC document[2] released by the Government of South Africa in its explanation of "(a) How the Party considers that its nationally determined contribution is fair and ambitious in the light of its national circumstances" (p.23). The Climate Equity Reference Framework calculates each country's fair share based on its share of the global responsibility for causing the climate problem (i.e. its historical and ongoing emissions) and its share of the global capacity to address the problem (i.e. its financial capacity, with exemptions for the incomes of the poorest which are reserved for poverty eradication and other sustainable development priorities).

- Here, we follow an approach in which each country's fair share is expressed as an equity range with an upper and lower bound. This range is defined by two specific benchmarks that reflect the broad range of equity perspectives that the diverse, global Civil Society Equity Review Coalition members accepted as fair and equitable. Details can be found in the reports issued each year since the Paris COP in 2015[3] and in Holz et al. 2018 (note 1).

- This fair share range – for South Africa – amounts to between 0.46% and 0.70% of the global effort in 2030 (see table 2 in the Annex).

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[1] The Climate Equity Reference Framework and the specific equity benchmarks used in this memo are described in Holz, Christian, Sivan Kartha, and Tom Athanasiou (2018) "Fairly Sharing 1.5 – National Fair Shares of a 1.5°C-Compliant Global Mitigation Effort." *International Environmental Agreements: Politics, Law and Economics* 18 (Special Issue: Achieving 1.5°C and Climate Justice): 117–34. doi: 10.1007/s10784-017-9371-z.
For the Climate Equity Reference Calculator tool (available at https://calculator.climateequityreference.org), see Holz, Christian, Eric Kemp-Benedict, Tom Athanasiou and Sivan Kartha (2019) "The Climate Equity Reference Calculator." *Journal of Open Source Software* 4 (35): 1273. doi: 10.21105/joss.01273.

[2] *Proposed updated Nationally Determined Contribution: South Africa's First Nationally Determined Contribution under the Paris Agreement*, 2021.
https://www.environment.gov.za/event/deptactivity/cop26indc_stakeholderconsultations

[3] See http://civilsocietyreview.org for details, as well as their annual NDC assessments, including results for a wide range of countries.

- The fair share is calculated for both a 1.5°C pathway and a 2°C pathway.[4] (Note, the 2°C pathway should not be considered consistent with the "*well below* 2°C" provision of the Paris Agreement.) The former requires about 1½ times as much mitigation effort globally in 2030 (31 $GtCO_2eq$) as the latter (21 $GtCO_2eq$) below a baseline of 57 $GtCO_2eq$ (excluding LULUCF).[5] Global mitigation effort is conceptualized as mitigation below global baseline projections.[6]

- South Africa's share (0.46% - 0.70%) of this global mitigation effort in 2030 is 146-223 $MtCO_2eq$ below baseline projections for the 1.5°C pathway, and 96-148 $MtCO_2eq$ for the 2°C pathway (excluding LULUCF). See Annex for charts and tables with detailed results.

- Given our projection of a South African baseline of 509 $MtCO_2eq$ in 2030 and the mitigation shares cited immediately above, we derive the results – expressed as 2030 emissions targets – as shown in Table 1 below. To make the results of the fair share calculations (which exclude LULUCF) directly comparable with the draft updated NDC range (which includes LULUCF), we are also presenting the fair share results adjusted for LULUCF, under the assumption of a 12 $MtCO_2$ LULUCF sink in 2030.

Table 1. South Africa NDC range compared to fair share of 1.5°C and 2°C global pathways.

	South Africa NDC (2030)	
	official NDC ($MtCO_2eq$)	**draft updated NDC ($MtCO_2eq$)**
	including LULUCF	
NDC range (lower)	398	398
NDC range (upper)	614	440

	Fair Share (2030)	
	1.5°C ($MtCO_2eq$)	**2.0°C ($MtCO_2eq$)**
	excluding LULUCF	
CSO equity range (lower)	286	362
CSO equity range (upper)	364	413
	*including LULUCF **	
CSO equity range (lower)	274	350
CSO equity range (upper)	352	401

* assumes a 12Mt LULUCF sink as part of the LULUCF-inclusive Fair Share Range

- The entire draft updated NDC range for 2030 (including its more ambitious end – 398 $MtCO_2eq$, including LULUCF) **does not satisfy the fair share target range for the 1.5°C pathway** (274 -

[4] Specifically, the 1.5°C pathway used here is the Low Energy Demand pathways, developed by IIASA and highlighted as the P1 illustrative pathway in the Summary for Policy Makers of the IPCC's Special Report on 1.5°C. The 2°C pathway is based on the 2°C pathway published by Climate Action Tracker, which in turn is based on the median of the scenarios reported in the IPCC's Fifth Assessment Report (WGIII) that have at least a 66% probability of staying below 2°C. This pathway takes into account the near-term climate feedbacks and the reduced sulphur aerosol cooling associated with declining fossil fuel consumption.

[5] Due to large uncertainty in global national-level LULUCF data sets, the Climate Equity Reference Calculator calculates fair shares of the global mitigation effort excluding LULUCF. Since the targets in the South African NDC and draft updated NDC are expressed inclusive of LULUCF, we adjust these targets by removing an assumed 12 $MtCO_2$ LULUCF sink contribution from the target figures.

[6] Global baseline projections in the Climate Equity Reference Calculator are based on national baseline projections for the 195 countries included in the Calculator. The calculator database version used for the calculations in this memo is v7.3.0. See the technical note below for more details.

352 $MtCO_2eq$). (The gap between amounts to a shortfall of effort of at least 46 $MtCO_2eq$ compared to a fair share effort of 146 - 223 $MtCO_2eq$.)

- Most of the draft updated NDC range for 2030 (410 - 452 $MtCO_2eq$, excluding LULUCF) **does not satisfy the fair share target range for the 2.0°C pathway** (362 - 413 $MtCO_2eq$); only the lower bound of the NDC range satisfies the upper bound of the fair share target range for 2.0°C.

Technical Notes:

- The Climate Equity Reference Calculator version used in this memo utilized version 7.3.0 of the calculator core database. This version is not yet publicly available (but access can be arranged upon request) and the public version of the Calculator (calculator.climateequityreference.org) is utilizing version 7.2.0. The main differences between version 7.3.0 and 7.2.0 is that the former accounts for updated GDP data and GDP growth projections that are a result of the Covid-19 pandemic. GDP data and projections, in turn, strongly impact the baseline projections of the Calculator for all countries, and the world, including South Africa. The Annex provides a comparison between the global and South African annual GDP growth rates for the 2015-2030 period for both v7.2.0 (current public version) and v7.3.0 (updated version used here) of the calculator database as well as those of two reference scenarios obtained with the SATIMGE model of the Energy Systems Research Group, University of Cape Town.
- GDP growth rates for South Africa in v7.2.0 of the calculator database for the 2023-2030 period are based on the median GDP growth rates across the models in the EMF27-Base-FullTech baseline scenario ensemble as reported in the IPCC AR5 scenario database that are available for the five IPCC world regions, in South Africa's case the Middle East and Africa region. This approach was chosen due to the absence of detailed long-range GDP projections with national spatial resolution and likely led to an overestimation of South Africa's GHG emissions baseline in v7.2.0 of the calculator database.
- Detailed database documentation for v7.3.0 is under currently preparation and generally follows the approach described for v.7.2.0 (Holz, Christian, Sivan Kartha, and Tom Athanasiou (2018) "CERP Core Database v7.2.0 Documentation." in Climate Equity Reference Calculator Database, version 7.2.0 (Sep 2018). *Harvard Dataverse*. doi: 10.7910/DVN/O3H22Z/FBXUWU) with the following main differences: i. updated historical data: PRIMAP-hist for GHG emissions (to 2018) and Worldbank for GDP (to 2019); ii. updated population data: 2019 Revision of UN population prospects. Medium variant; iii. updated GDP projections: IMF WEO from 2020 to 2026; iv. changed methodology: keep 2026 growth rate from IMF WEO constant through 2030; v: changed methodology: no calibration of global baseline to baseline from UNEP Emissions Gap Report (which has not yet been updated to account for Covid-19 impacts).
- The Annex includes (Table 4) results of the fair share analysis undertaken with growth projections alternative to our default case. Those are taken from UCT 2020 and have been obtained with the SATIMGE model of the Energy Systems Research Group, University of Cape Town. The sensitivity shows that under default SATIMGE growth assumptions, the fair share results are only somewhat different from the default case. For this sensitivity analysis we have only replaced our default growth rates for South Africa while leaving those of the rest of the world unchanged, for this reason they should be interpreted with the appropriate level of caution.

Annex: charts and results tables

Figure 2: Fair Share Results

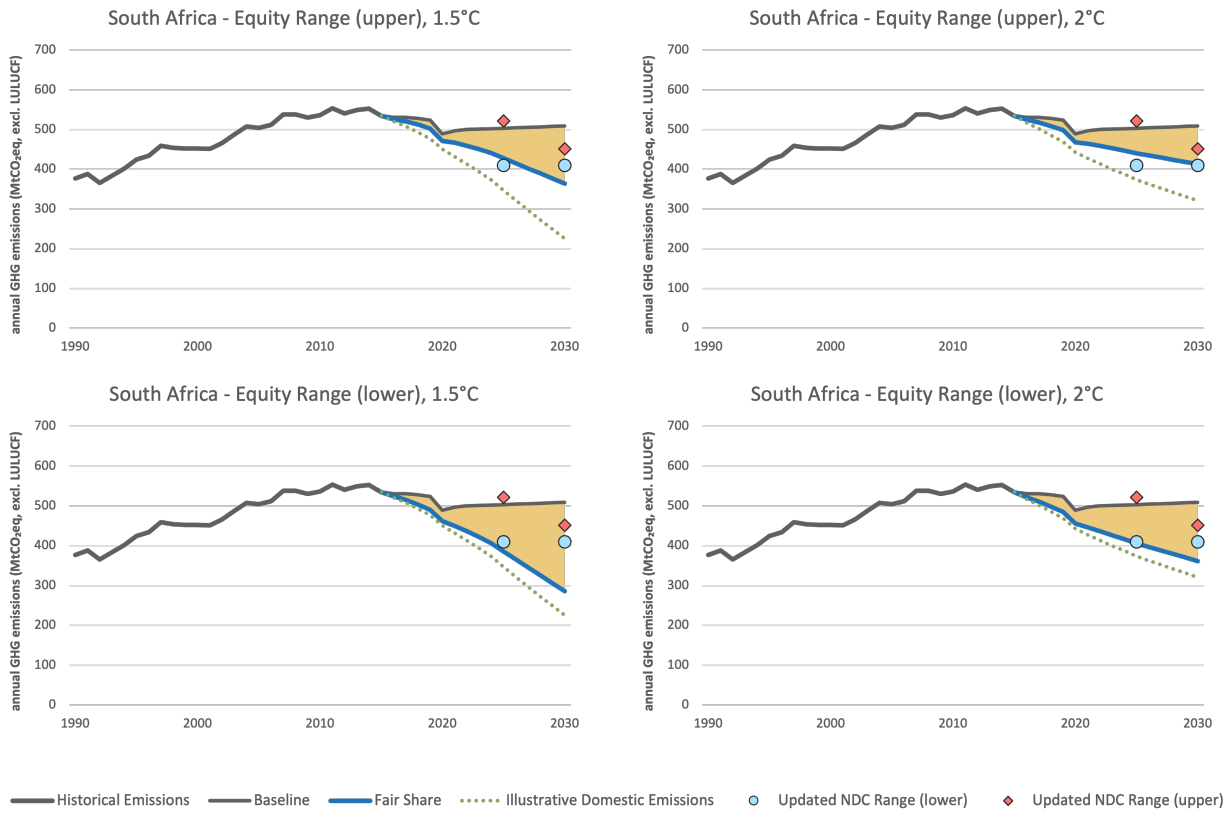


Table 2. Key metrics for calculating fair share range for both 1.5°C and 2°C global pathways

		Fair Share Scenarios			
		1.5°C lower	**1.5°C upper**	**2.0°C lower**	**2.0°C upper**
South Africa baseline emissions, projected to 2030, in $MtCO_2eq$	A	509	509	509	509
Global Mitigation requirement below baseline in 2030, in $MtCO_2eq$	B	31,707	31,707	21,003	21,003
South Africa share of Global Responsibility and Capacity, to 2030	RCI	0.70%	0.46%	0.70%	0.46%
South Africa mitigation fair share, projected to 2030, in $MtCO_2eq$ below baseline	C = B x RCI	223	146	148	96
South Africa Fair Share Allocation, in 2030, in $MtCO_2eq$	D = A - C	286	364	362	413

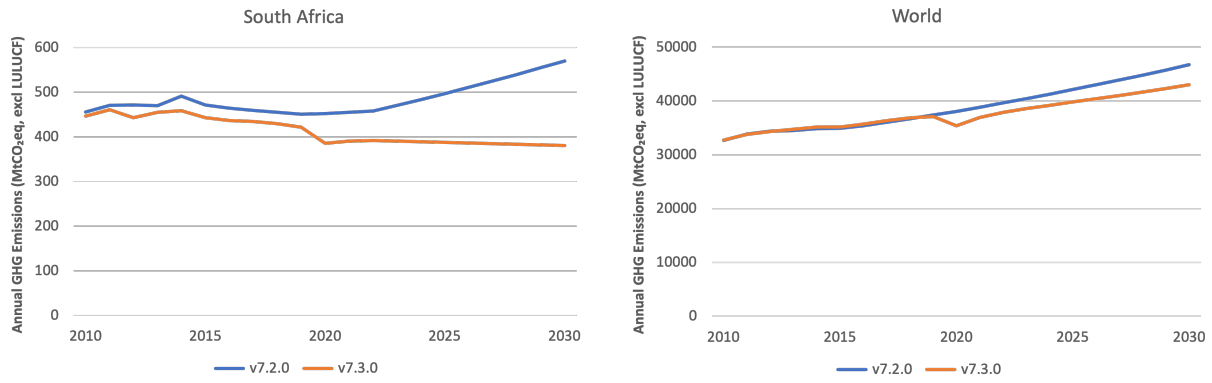
** all figures without LULUCF*

Table 3: South Africa and World GDP annual rate of change

		2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
CERC v7.2.0	South Africa	1.3	0.3	0.7	0.9	0.9	2.2	2.2	2.2	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
CERC v7.3.0	South Africa	1.2	0.4	1.4	0.8	0.2	-7.0	3.1	2.0	1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.3
SATIMGE Reference	South Africa						-7.1	2.4	2.1	2.3	2.2	2.2	2.2	2.1	2.0	2.4	2.3
SATIMGE High growth	South Africa						-7.1	3.6	2.6	2.7	2.7	3.6	3.8	3.9	4.0	4.2	4.3
CERC v7.2.0	World	2.8	2.4	2.9	3.1	3.1	2.9	2.9	2.9	3.1	3.2	3.2	3.2	3.2	3.2	3.3	3.3
CERC v7.3.0	World	2.8	2.5	3.2	2.9	2.2	-3.8	5.6	4.1	2.9	2.7	2.7	2.6	2.7	2.7	2.7	2.8

Assumed annual rates of GDP change. Values in the rows labeled "CERC v7.3.0" are used in this memo, and are taken from the International Monetary Fund *World Economic Outlook*, 2021 up to including 2026 and held constant at 2026 levels afterwards. Values in the rows labeled "CERC v7.2.0" show GDP growth rates in the previous CERC core database (which is the version still used in the public version of the Calculator as of this writing) – see technical notes above for sourcing. Rows labeled "SATIMGE Reference" and "SATIMGE High Growth" are taken from UCT 2020 (the technical analysis utilized during the NDC update) and are used in the sensitivity analysis below.

Figure 3: South Africa and World GDP baseline comparison v7.2.0 – v7.3.0



The figure shows the South African and global baseline driven by the different rates of GDP change of calculator database versions 7.2.0 ('pre-covid') and 7.3.0 ('post-covid') as reported in table 1.

Table 4: Sensitivity Analysis with GDP growth rates from SATIMGE

	South Africa NDC			DEFAULT (v7.3.0)		Sensitivity			
						SATIMGE Reference		SATIMGE High growth	
				Fair Share		Fair Share		Fair Share	
	official NDC ($MtCO_2eq$)	draft updated NDC ($MtCO_2eq$)		1.5°C ($MtCO_2eq$)	2.0°C ($MtCO_2eq$)	1.5°C ($MtCO_2eq$)	2.0°C ($MtCO_2eq$)	1.5°C ($MtCO_2eq$)	2.0°C ($MtCO_2eq$)
				excluding LULUCF		*excluding LULUCF*		*excluding LULUCF*	
			CSO equity range (lower)	286	362	299	375	327	404
			CSO equity range (upper)	364	413	377	427	406	456
including LULUCF				*including LULUCF **		*including LULUCF **		*including LULUCF **	
NDC range (lower)	398	398	**CSO equity range (lower)**	274	350	287	363	315	392
NDC range (upper)	614	440	**CSO equity range (upper)**	352	401	365	415	394	444

* assumes a 12Mt LULUCF sink as part of the LULUCF-inclusive Fair Share Range