Supplementary information

Table S1. End-of-century temperature delineated by probabilistic estimate and methodology. Ranges in the Scenario Inference approach are constructed based on multiple assessments polices and pledges in (UNEP, 2020b).

	Scenario inference				Scenario Construction			
Likelihood of being below…	**16%**	**50%**	**66%**	**84%**	**16%**	**50%**	**66%**	**84%**
Current policies	NA	3.2 (3.1-3.6)	3.5 (3.4-3.9)	NA	2.1	2.9	3.1	3.9
Pledges	NA	2.9 (2.8-3.2)	3.2 (3.0-3.5)	NA	2.1	2.6	2.8	3.3
Pledges plus net zero targets	NA	2.4 (2.2-2.7)	2.5 (2.3-2.8)	NA	1.7	2.1	2.3	2.7

Net zero targets

For the Scenario Construction approach, we had to make several assumptions to assess the impact of net zero targets on the global temperature increase by 2100. These relate to (1) the emissions covered by the various targets, (2) land-use, land-use change and forestry (LULUCF) emissions by 2050, (3) the trajectory of non-CO_2 emissions and (4) the importance of 2030 targets.

Table S2 provides an overview of all 12 net zero targets assessed in detail for countries covered. **Table S3** lists all 127 net zero targets included in the modelling runs.

Emissions covered: net zero CO_2 versus net zero GHG

While most countries have set net zero GHG targets, South Africa and South Korea explicitly committed to net zero CO_2 emissions. New Zealand committed to net zero GHG emissions, with the exception of methane (CH_4) from agriculture and waste. The scope of the Chinese, Japanese and US net zero target remain somewhat unclear. While President Xi Jinping spoke of "carbon neutrality" when he addressed the UN Assembly, national experts indicate this target could cover all GHG emissions (Jiankun, 2020). Prime minister Suga of Japan has used the terms "carbon neutral" and "net zero GHG emissions" interchangeably; and president-elect Biden has used both "net zero GHG emissions" and "net zero carbon emissions". Based on communications with in-country experts, we assume that these three large emitters pledged net zero GHG emissions.

LULUCF

Net zero emissions imply that residual emissions can be balanced with removals, for example from LULUCF. We estimated the level of the LULUCF sink in the net zero target year for each country. Where available, we used national projections until 2050 (see Table 1). If only projections until 2030 were available, we assumed 2050 values to be equal to the 2030 value.

When no national projections were available, we assumed that future LULUCF emissions are equal to an historical average, based on most recent data. In our assessments of South Korea and Japan, whose LULUCF emissions have declined in the past decade, this approach led to a sink we considered unrealistically large. For those two countries, we extended the ten-year historical trend to 2030 and assumed that the 2050 value was equal to the 2030 value.

Non-CO_2 emission projections

South Korea and South Africa have committed to net zero carbon emissions by 2050. We assumed that non-CO_2 emissions will decline at a linear rate between 2030 and 2070 (South Korea) or 2080

(South Africa). The IPCC SR1.5 found that pathways leading to a temperature increase of 1.5˚C above pre-industrial levels reach net zero GHG emissions between 2060 and 2080 (IPCC, 2018b). We assumed that developed and developing countries reach net zero non-CO_2 emissions by 2070 and 2080, respectively.

To determine the amount of non-CO_2 emissions by 2030, we would ideally have used the breakdown as stated in the NDC. However, this information exists for neither South Africa nor South Korea, so we used the breakdown as projected by the current policy projection for 2030.

Importance of 2030 targets in the emission trajectory to net zero

The lower the 2030 value in the emissions trajectory, the lower global temperature increase will be. We assumed that countries achieve their most recent NDC target for 2030. Where countries have committed to an NDC range, we assumed the highest value.

Japan and South Africa are expected to overachieve their NDC targets. In this case, we have taken the maximum post-COVID current policy projection as the 2030 value.

The United States formally withdrew from the Paris Agreement in November 2020 and therefore no longer has an NDC target. We have taken the upper end of the USA post-COVID current policy projection in 2025 as the base year and assume that all GHG emissions will decline at a linear rate to net zero between 2025 and 2050, with all power sector CO_2 emissions already reaching zero by 2025 as proposed in the Biden Plan (Biden & Sanders, 2020).

With the exception of Norway and Chile, none of the countries we analysed have submitted a stronger NDC target to the UNFCCC.[1] If countries commit to and achieve more ambitious NDC targets by 2030, global temperature increase could be further limited.

Table S2: List of 12 net zero targets assessed in detail for countries covered in the Climate Action Tracker (CAT).

Country	Type of net zero target	Target year	Assumption on LULUCF	Assumptions on GHG emissions excluding LULUCF
China	Net zero GHGs	2060	We used a ten-year historical average based on GHG inventory data from 2004 to 2014. The average of LULUCF emissions in those years is -783Mt, which we assumed as a value for 2050 and 2060. This estimate is consistent with the projections of Tsinghua University (Jiankun, 2020), which show a sink of 780Mt in those years.	We apply a linear interpolation of all GHG emission between 2030 and 2050 to balance LULUCF sinks in 2050. We use the average of the NDC non-fossil fuel and the NDC peaking pledge in 2030 as the starting point.
United States	Net zero GHGs	2050	We extrapolated the trend of 1990-2018 to 2050, which resulted in a sink of -643 $MtCO_2e$ in 2050.	We assume that power sector emissions fall linearly between 2025 and 2035, when these fall to zero, and apply a linear interpolation of all remaining GHG emissions between 2025 and 2050 to balance LULUCF sinks in 2050. We use the upper limited of the *Post-COVID Current Policy Projection* in 2025 as the starting point for both trajectories.

[1] See the CAT's *Climate Target Update Tracker* for details available at: https://climateactiontracker.org/climate-target-update-tracker.

Canada	Net zero GHGs	2050	We used the 2030 projection from the 4th Biennial Report for the 2050 estimate and assumed emissions to be -10 $MtCO_2e$ (Environment and Climate Change Canada, 2020).	We assumed a linear decline in total GHGs between 2030 and 2050 to balance LULUCF emissions in 2050.
Chile	Net zero GHGs	2050	We used national projections for 2050 presented in the updated NDC and Climate Neutrality Plan of 2020 and assumed LULUCF emissions to be -61 $MtCO_2e$ (Ministerio de Energia del Gobierno de Chile, 2020).	We used national projections for all GHG emission 2050 presented in the updated NDC and Climate Neutrality Plan of 2020 to balance LULUCF sinks in 2050 (Ministerio de Energia del Gobierno de Chile, 2020).
Costa Rica	Net zero GHGs	2050	We used national projections for 2050, as provided for in the 2018 Decarbonization Strategy and assumed LULUCF emissions to be –6Mt by 2050 (Gobierno de Costa Rica, 2019).	We used national projections for 2050, as provided for in the 2018 Decarbonization Strategy, to balance LULUCF sinks in 2050 (Gobierno de Costa Rica, 2019). We use the upper limited of the NDC in 2030 as the starting point.
EU	Net zero GHGs	2050	The EU's projection for its 1.5LIFE scenario is a sink of 464 $MtCO_2$ in 2050 (European Commission, 2018)	We used the EU's own projections for 2050 excluding LULUCF, from the 1.5LIFE scenario (European Commission, 2018).
Japan	Net zero GHGs	2050	We extrapolated the 2009-2018 trend to 2030 resulting in -35 $MtCO_2e$ and assumed that the sink will be at 2030 levels by 2050.	We applied a linear interpolation of all GHG emission between 2030 and 2050 to balance LULUCF sinks in 2050. We used the upper limit of the Post-COVID Current Policy Projection in 2030 as the starting point.
South Korea	Net zero GHGs	2050	We extrapolated the 2008-2017 trend to 2030 resulting in -17 $MtCO_2e$ and assumed that the sink will be at 2030 levels by 2050.	We applied a linear interpolation of all GHG emission between 2030 and 2050 to balance LULUCF sinks in 2050. We assumed that non-CO_2 emissions will decrease at a linear rate to zero by 2070. We used the upper limit of the NDC in 2030 as the starting point.
South Africa	Net zero CO_2	2050	We used a ten-year historical average based on national inventory data from 2005-2015 resulting in -16 $MtCO_2e$.	We assumed that CO_2 emissions will decline at a linear rate between 2030 and 2050 to balance LULUCF sinks in 2050. We assume that non-CO_2 emissions will decline at a linear rate between 2030 and 2080 in line with the IPCC SR1.5 pathways. We use the upper limit of the *Post-COVID Current Policy Projection* in 2030 as the starting point.
Switzerland	Net zero GHGs	2050	We used the "with existing measures" projection for 2030 from the 4th Biennial Report (emissions of 1$MtCO_2$/yr) and assumed the same value for 2050 (Schweizerische Eidgenossenschaft, 2020)	We assumed a linear decline in total GHGs between 2030 and 2050 to balance LULUCF emissions in 2050.
New Zealand	Net zero GHG, with the	2050	We used national projection for 2050 (Ministry for the Environment of New Zealand, 2020), harmonised to	We assume that GHG emissions excluding methane from agriculture and waste and LULUCF follow a

	exception of CH4 from agriculture and waste		historical data, giving a sink in 2050 of 31 $MtCO_2$.	linear decline from 2030 to 2050, to balance LULUCF removals in 2050. We take the upper end of New Zealand's target for biogenic methane (47% reduction from 2017 levels).
Norway	GHGs reduce by 90-95%, compared to 1990. We assumed that LULUCF emissions are included in this target.	2050	We used a projection from NIBIO, which gives a sink in 2050 of 20 $MtCO_2$ (Søgaard et al., 2019).	We assume a linear decline in GHG emissions excluding LULUCF between 2030 and 2050, such that total emissions in 2050 including LULUCF are 95% below 1990 levels.

Table S3: List of all net zero targets included in the Scenario Construction approach based on the ECIU (2020) as of 23 November 2020.

****Note: All Member States of the EU27 and the United Kingdom are included in the modelling runs through EU28, not individually.***

Country	Status	Year	#1 - Modelling run incl. net zero targets of all 127 countries	#2 – Modelling run incl. net zero targets of 12 CAT countries incl. USA	#3 – Modelling run incl. net zero targets of 11 CAT countries excl. USA
Afghanistan	Under Discussion	2050	Yes	No	No
Angola	Under Discussion	2050	Yes	No	No
Antigua and Barbuda	Under Discussion	2050	Yes	No	No
Argentina	Under Discussion	2050	Yes	No	No
Armenia	Under Discussion	2050	Yes	No	No
Austria*	In Policy Document	2040	No	No	No
Bahamas (the)	Under Discussion	2050	Yes	No	No
Bangladesh	Under Discussion	2050	Yes	No	No
Barbados	Under Discussion	2050	Yes	No	No
Belgium*	Under Discussion	2050	No	No	No
Belize	Under Discussion	2050	Yes	No	No
Benin	Under Discussion	2050	Yes	No	No
Bhutan	Achieved		Yes	No	No
Bulgaria*	Under Discussion	2050	No	No	No
Burkina Faso	Under Discussion	2050	Yes	No	No
Burundi	Under Discussion	2050	Yes	No	No
Cabo Verde	Under Discussion	2050	Yes	No	No
Cambodia	Under Discussion	2050	Yes	No	No
Canada	Proposed legislation	2050	Yes	Yes	Yes

Central African Republic (the)	Under Discussion	2050	Yes	No	No
Chad	Under Discussion	2050	Yes	No	No
Chile	Proposed Legislation	2050	Yes	Yes	Yes
China	Under Discussion *(announcement by head of state)*	2060	Yes	Yes	Yes
Colombia	Under Discussion	2050	Yes	No	No
Comoros (the)	Under Discussion	2050	Yes	No	No
Congo (the Democratic Republic of the)	Under Discussion	2050	Yes	No	No
Cook Islands (the)	Under Discussion	2050	Yes	No	No
Costa Rica	In Policy Document	2050	Yes	Yes	Yes
Croatia*	Under Discussion	2050	No	No	No
Cyprus*	Under Discussion	2050	No	No	No
Czechia*	Under Discussion	2050	No	No	No
Denmark*	In Law	2050	No	No	No
Djibouti	Under Discussion	2050	Yes	No	No
Dominica	Under Discussion	2050	Yes	No	No
Dominican Republic (the)	Under Discussion	2050	Yes	No	No
Ecuador	Under Discussion	2050	Yes	No	No
Eritrea	Under Discussion	2050	Yes	No	No
Estonia*	Under Discussion	2050	No	No	No
Ethiopia	Under Discussion	2050	Yes	No	No
European Union	Proposed Legislation	2050	Yes	Yes	Yes
Fiji	Proposed Legislation	2050	Yes	No	No
Finland*	In Policy Document	2035	No	No	No
France*	In Law	2050	No	No	No
Gambia (the)	Under Discussion	2050	Yes	No	No
Germany*	In Policy Document	2050	No	No	No
Greece*	Under Discussion	2050	No	No	No
Grenada	Under Discussion	2050	Yes	No	No
Guinea	Under Discussion	2050	Yes	No	No
Guinea-Bissau	Under Discussion	2050	Yes	No	No
Guyana	Under Discussion	2050	Yes	No	No
Haiti	Under Discussion	2050	Yes	No	No
Hungary*	In Law	2050	No	No	No
Iceland	In Policy Document	2040	Yes	No	No
Ireland*	In Policy Document	2050	No	No	No
Italy*	Under Discussion	2050	No	No	No
Jamaica	Under Discussion	2050	Yes	No	No
Japan	Under Discussion *(announcement by head of state)*	2050	Yes	Yes	Yes
Kiribati	Under Discussion	2050	Yes	No	No
Korea (the Republic of)	Under Discussion *(announcement by head of state)*	2050	Yes	Yes	Yes

Lao People's Democratic Republic (the)	Under Discussion	2050	Yes	No	No
Latvia*	Under Discussion	2050	No	No	No
Lebanon	Under Discussion	2050	Yes	No	No
Lesotho	Under Discussion	2050	Yes	No	No
Liberia	Under Discussion	2050	Yes	No	No
Lithuania*	Under Discussion	2050	No	No	No
Luxembourg*	Under Discussion	2050	No	No	No
Madagascar	Under Discussion	2050	Yes	No	No
Malawi	Under Discussion	2050	Yes	No	No
Maldives	Under Discussion	2050	Yes	No	No
Mali	Under Discussion	2050	Yes	No	No
Malta*	Under Discussion	2050	No	No	No
Marshall Islands (the)	In Policy Document	2050	Yes	No	No
Mauritania	Under Discussion	2050	Yes	No	No
Mauritius	Under Discussion	2050	Yes	No	No
Mexico	Under Discussion	2050	Yes	No	No
Micronesia (Federated States of)	Under Discussion	2050	Yes	No	No
Monaco	Under Discussion	2050	Yes	No	No
Mozambique	Under Discussion	2050	Yes	No	No
Myanmar	Under Discussion	2050	Yes	No	No
Namibia	Under Discussion	2050	Yes	No	No
Nauru	Under Discussion	2050	Yes	No	No
Nepal	Under Discussion	2050	Yes	No	No
Netherlands (the)*	Under Discussion	2050	No	No	No
New Zealand	In Law	2050	Yes	Yes	Yes
Nicaragua	Under Discussion	2050	Yes	No	No
Niger (the)	Under Discussion	2050	Yes	No	No
Niue	Under Discussion	2050	Yes	No	No
Norway	In Policy Document	2050	Yes	Yes	Yes
Pakistan	Under Discussion	2050	Yes	No	No
Palau	Under Discussion	2050	Yes	No	No
Papua New Guinea	Under Discussion	2050	Yes	No	No
Peru	Under Discussion	2050	Yes	No	No
Portugal*	In Policy Document	2050	No	No	No
Romania*	Under Discussion	2050	No	No	No
Rwanda	Under Discussion	2050	Yes	No	No
Saint Kitts and Nevis	Under Discussion	2050	Yes	No	No
Saint Lucia	Under Discussion	2050	Yes	No	No
Saint Vincent and the Grenadines	Under Discussion	2050	Yes	No	No
Samoa	Under Discussion	2050	Yes	No	No
Sao Tome and Principe	Under Discussion	2050	Yes	No	No
Senegal	Under Discussion	2050	Yes	No	No
Seychelles	Under Discussion	2050	Yes	No	No
Sierra Leone	Under Discussion	2050	Yes	No	No
Slovakia*	Under Discussion	2050	No	No	No

Slovenia*	In Policy Document	2050	No	No	No
Solomon Islands	Under Discussion	2050	Yes	No	No
Somalia	Under Discussion	2050	Yes	No	No
South Africa	In Policy Document	2050	Yes	Yes	Yes
South Sudan	Under Discussion	2050	Yes	No	No
Spain*	Proposed Legislation	2050	No	No	No
Sudan (the)	Under Discussion	2050	Yes	No	No
Suriname	Achieved		Yes	No	No
Sweden*	In Law	2045	No	No	No
Switzerland	In Policy Document	2050	Yes	Yes	Yes
Tanzania, United Republic of	Under Discussion	2050	Yes	No	No
Timor-Leste	Under Discussion	2050	Yes	No	No
Togo	Under Discussion	2050	Yes	No	No
Tonga	Under Discussion	2050	Yes	No	No
Trinidad and Tobago	Under Discussion	2050	Yes	No	No
Tuvalu	Under Discussion	2050	Yes	No	No
Uganda	Under Discussion	2050	Yes	No	No
United Kingdom of Great Britain and Northern Ireland (the)*	In Law	2050	No	No	No
United States of America (the)	Under Discussion *('Biden Plan' by President-Elect)*	2050	Yes	Yes	No
Uruguay	Under Discussion	2030	Yes	No	No
Vanuatu	Under Discussion	2050	Yes	No	No
Yemen	Under Discussion	2050	Yes	No	No
Zambia	Under Discussion	2050	Yes	No	No