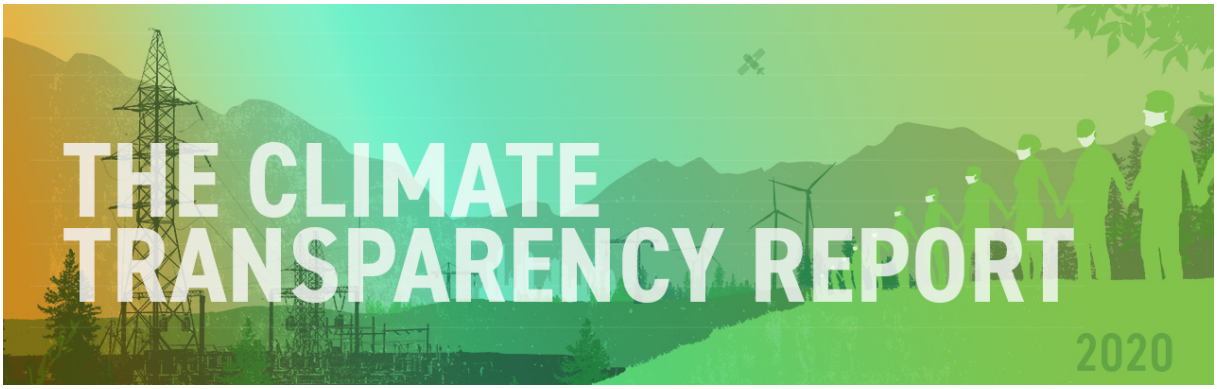

The Climate Transparency Report – which includes the twenty G20 country profiles and summary report - assesses the G20 countries' past, present and indications of future performance towards a low-carbon and climate-resilient economy by evaluating mitigation, adaptation and climate-related finance.

Country-specific references are included in the bibliographies which can be found on pages 19 and 20 of each profile. Where Partners have provided alternatives to Enerdata data, these are recorded in the profiles and therefore also in the bibliographies.

As references and sources are recorded in the country profiles, this technical note provides, only where necessary, background information or further explanation on calculation methods.

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GHG emissions (including land use) per capita

PRIMAP-hist combines several published datasets to create a comprehensive set of GHG emissions pathways for every country and all Kyoto gases covering the years 1850 to 2016. The data resolves the main International Panel on Climate Change (IPCC) 2006 categories (Energy, Industrial Processes, Solvent and Other Product Use, Agriculture, Land-Use Change and Forestry, and Waste). Data presented in the Climate Transparency Report 2020 is for 2017.

'Land use' emissions here to refer to land use, land use change and forestry (LULUCF). The Climate Action Tracker (CAT) derives historical LULUCF emissions from the UNFCCC Common Reporting Format (CRF) reporting tables data converted to the categories from the IPCC 1996 guidelines, in particular separating Agriculture from Land use, land use change and forestry (LULUCF), which under the new IPCC 2006 Guidelines is integrated into Agriculture, Forestry, and Other Land Use (AFOLU).

- Enerdata. (2020). *Global Energy and CO_2 data*. Grenoble, France. https://www.enerdata.net/research/energymarket-data-co2-emissions-database.html
- United Nations Department of Economic and Social Affairs, Population Division (2020) *World Population Prospects 2019 Highlights*. www.un.org.development.desa.pd/files/files/documents/2020/Jan/ wpp2019_highlights.pdf
- Gütschow, J. et al. (2019). The PRIMAP-hist national historical emissions time series (1850-2017). V.2.1. GFZ Data Services. https://doi.org/10.5880/PIK.2019.018

Not / On track for a 1.5°C world

For a short description of the Climate Action Tracker's 1.5°C 'fair-share' methodology see the description under *GHG emissions across sectors and CAT 1.5°C 'fair-share' range (MtCO2e/year)* below or refer to https://climateactiontracker.org/methodology/comparability-of-effort/

As EU member states, France, Germany and Italy committed to contributing to the EU's NDC. 'Fair-share' pathways and ratings for individual EU member states are not provided due to the intricacies and inter-linkages of the internal burden sharing system. As an EU member state in 2019 - the period covered by the Climate Transparency Report 2020 - the UK was committed to contributing to the EU NDC. Given its withdrawal from the European Union on 31 January 2020 the UK must submit its own NDC, which it had not done at the point of publication and therefore there is no 1.5°C 'fair-share' compatibility analysis or rating of an UK NDC.

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Socio-economic context

Human Development Index

The Human Development Index (HDI) is a composite index published by the United Nations Development Programme (UNDP). It is a summary measure of average achievement in key dimensions of human development with 1.0 being the highest possible score. A country scores higher when the lifespan is higher, the education level is higher, and GDP per capita is higher. Data presented in the Climate Transparency Report 2020 is for 2018.

- United Nations Development Programme (UNDP). (2019). Human Development Index Ranking | Human Development Reports. New York, USA: UNDP. http://hdr.undp.org/en/content/2019-human-development-indexranking
- EU data is the calculated weighted average of EU countries.

Population and urbanisation projections

Total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship. Population estimates are usually based on national population censuses. Population projections, starting from a base year, are projected forward using assumptions of mortality, fertility, and migration by age and sex through 2050, based on the UN Population Division's World Population Prospects database medium variant.
The proportion of urban (and rural) population is estimated from the most recently available census or official population estimate of each country. If this estimate is only available for some period in the past, the proportion urban is extrapolated to the base year. In the *2018 Revision* of the *World Urbanization Prospects* the base year is 2018.

- United Nations. (2018). World Urbanisation Prospects. Geneva: The Population Division of the Department of Economic and Social Affairs of the United Nations. https://population.un.org/wup
- The World Bank. (2019) Population, total. Washington, DC: USA. https://data.worldbank.org/indicator/SP.POP.TOTL
- United Nations Department of Economic and Social Affairs, Population Division. (2020). World Population Prospects, 2019 Highlights. https://population.un.org/wpp/Publications/Files/WPP2019_Highlights.pdf

GDP per capita

Gross Domestic Product (GDP) is the value of all final goods and services produced within a country in a given year. GDP per capita is calculated by dividing the GDP of a country with midyear population figures. The Climate Transparency Report 2020 uses GDP figures at purchasing power parity (PPP) from 2015. The PPP constant 2015 international USD figures were employed in order to bring the GDP per capita numbers into alignment with the 1.5°C degree projections and modelling which still use 2015 values in their calculations.

- The World Bank. (2020). GDP, PPP (current international $). Washington, DC: USA. https://data.worldbank.org/indicator/NY.GDP.MKTP.PP.CD
- The World Bank. (2019). Population, total. Washington, DC: USA. https://data.worldbank.org/indicator/SP.POP.TOTL

Death rate attributable to air pollution

The burden of disease attributable to ambient air pollution expressed as a death rate (both crude and age-standardized). Ambient air pollution results from emissions from industrial activity, households, cars and trucks. Data presented in the Climate Transparency Report 2020 is for 2016 as there were no updates of the source data available at the time of writing.

- WHO (2018). Global Health Observatory data repository. Retrieved from: http://apps.who.int/gho/data/view.main.BODAMBIENTAIRDALYS

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1. ADAPTATION
ADDRESSING AND REDUCING VULNERABILITY TO CLIMATE CHANGE

Climate Risk Index

The Germanwatch Climate Risk Index 2020 is the 15th edition of the annual analysis. The index analyses the extent to which countries and regions have been affected by impacts of weather-related loss events (storms, floods, heat waves etc.).

The Climate Risk Index for 1999 to 2018 was used as the basis for this indicator, the numbers presented are average figures for this 20-year period of

- annual average fatalities (absolute numbers and per 100 000 inhabitants) and the rank of each country in relation to the other G20 countries
- annual average loss in USD million PPP and per unit GDP (%) and the rank of each country in relation to the other G20 countries

- Germanwatch. (2019). Global Climate Risk Index 2020. Who Suffers Most from Extreme Weather Events? Bonn, Germany. http://www.germanwatch.org/

Exposure to future impacts at 1.5°C, 2°C, and 4°C

Country-level data describing the impacts of climate change at different levels of global temperature increase for the G20 countries were used for these indicators. It uses the same data, methodology and indicators (with minor exceptions noted below) as used in Arnell et al. (2019). Arnell et al. (2019) focuses on the global and regional scales. All the indicators characterise physical hazard and natural resources, and are calculated at the $0.5x0.5^{0}$ scale. The indicators are weighted by area, rather than calculated just over grid cells with more than 1000 people as it is described in Arnell et al. (2019). The number of days with maximum temperatures greater than 35°C was not included in Arnell but were provided for the CTR report.

These indicators are national scale results, weighted by area and based on global data sets. They are designed to allow comparison between regions and countries and, therefore, entail simplifications. They do not reflect local impacts within the country. Please see technical note for further information.

These are even more significant at the national scale: (i) the indicators are designed to allow comparisons between regions and countries and therefore entail simplifications. More appropriate indicators may/should be used at the national scale; (ii) the indicators are calculated using global data sets, which may differ from national data sets and could therefore contain uncertainties. The hydrological indicators (change in runoff, flood and drought) only represent changes within a country, and do not incorporate the effects of changes in upstream countries. There are some caveats with the results (summarised in Arnell et al., 2019).

Summary of the proxy impact indicators used in the country profiles

Indicator	Description
WATER	
% of area with increase in water scarcity	% of region with a decrease / increase in average annual runoff more than twice the standard deviation of 30-year average runoff
% of time in drought conditions	Proportion of time spent in hydrological drought (Standardised Runoff Index: Shuckla & Wood, 2008)
ENERGY DEMAND	
Cooling degree days	Cooling degree days, using a threshold of 18°C
Heating degree days	Heating degree days, using a threshold of 18°C
HEAT & HEALTH	
Heatwave frequency	Likelihood (%) that a year will contain a heatwave, with maximum temperature greater than the 98th percentile of the warm season temperatures for at least two days
Days above 35°C	Average annual number of days with maximum temperature greater than 35°C
AGRICULTURE	
Reduction in crop duration	Average annual change in crop growth duration. Crop growth duration is based on the time taken to accumulate the reference period average growing season accumulated thermal time (ATT: Challinor et al., 2016). Weighted by maize, winter wheat, spring wheat, soybean and rice area
Hot spell frequency	Likelihood (%) that a year will contain a damaging hot spell, defined as at least five days during the 30-day reproductive phase with temperatures above a threshold: maize 36^{O}C, wheat 34^{O}C, soybean 39^{O}C and rice 36^{O}C (thresholds from Challinor et al., 2016 and Lou, 2011). Weighted by maize, winter wheat, spring wheat, soybean and rice area
Reduction in rainfall	Likelihood (%) that growing season rainfall is less than the standard deviation of growing season rainfall. Weighted by maize, winter wheat, spring wheat, soybean and rice area

For the Climate Transparency report, the data was normalized across world minimum and maximum values for each indicator. To determine the ranking scale, equal quantile distribution was applied to get the ranges for all five categories (very low, low, medium, high, very high).

WATER

Runoff decreases

Very low	Low	Medium	High	Very high
≥ 0	≥ 0.015789	≥ 0.068421	≥ 0.140789	≥ 0.393421

Hydrological drought

Very low	Low	Medium	High	Very high
≥ -0.047782	≥ 0.027304	≥ 0.112628	≥ 0.201365	≥ 0.365188

HEAT & HEALTH

Heatwaves frequency

Very low	Low	Medium	High	Very high
≥ 0.195089	≥ 0.549795	≥ 0.731241	≥ 0.856753	≥ 0.956344

Note: Based on this scale and the definition of 'heatwave frequency' used by Arnell et al. (2019) (see table above), this indicator should be interpreted as 'extreme topical heatwave frequency'.

Days above 35°C

Very low	Low	Medium	High	Very high
≥ 0	≥ 0.005203	≥ 0.027055	≥ 0.120708	≥ 0.417274

AGRICULTURE

Reduction in crop duration: Maize

Very low	Low	Medium	High	Very high
≥ 0.897426	≥ 0.776838	≥ 0.720221	≥ 0.6125	≥ 0.430515

Hot spell frequency: Maize

Very low	Low	Medium	High	Very high
≥ 0	≥ 0.010101	≥ 0.088023	≥ 0.252525	≥ 0.375180

Rain reduction: Maize

Very low	Low	Medium	High	Very high
≥ 1.296748	≥ 0.703252	≥ 0.703252	≥ 0.471545	≥ 0.369919

Reduction in crop duration: Rice

Very low	Low	Medium	High	Very high
≥ 0.996178	≥ 0.941529	≥ 0.912994	≥ 0.883185	≥ 0.796051

Hot spell frequency: Rice

Very low	Low	Medium	High	Very high
≥ 0	≥ 0	≥ 0.000553	≥ 0.029867	≥ 0.819690

Rain reduction: Rice

Very low	Low	Medium	High	Very high
≥ 0.387097	≥ 0.480287	≥ 0.577061	≥ 0.602151	≥ 0.706093

Reduction in crop duration: Soybean

Very low	Low	Medium	High	Very high
≥ -0.059322	≥ -0.251271	≥ -0.369915	≥ -0.516525	≥ -0.815678

Hot spell frequency: Soybean

Very low	Low	Medium	High	Very high
≥ 0	≥ 0	≥ 0	≥ 0.0018801	≥ 0.242257

Rain reduction: Soybean

Very low	Low	Medium	High	Very high
≥ -0.059322	≥ 0.224576	≥ 0.449153	≥ 0.618644	≥ 0.665254

Reduction in crop duration: Wheat

Very low	Low	Medium	High	Very high
≥ -0.101132	≥ -0.217925	≥ -0.304717	≥ -0.365472	≥ -0.605472

Hot spell frequency: Wheat

Very low	Low	Medium	High	Very high
≥ 0	≥ 0.0095	≥ 0.035	≥ 0.11655	≥ 0.385

Rain reduction: Wheat

Very low	Low	Medium	High	Very high
≥ 0.173585	≥ 0.469811	≥ 0.5471670	≥ 0.590566	≥ 0.683019

- Arnell, N. W. et al. (2019). "Global and Regional Impacts of Climate Change at Different Levels of Global Temperature Increase", Climatic Change. Springer Netherlands, 155(3), pp. 377-391.

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Adaptation readiness

This indicator shows 2000-2015 observed data from the ND-GAIN Index overlaid with projected Shared Socioeconomic Pathways (SSPs) from 2015-2060. The readiness component of the Index created by the Notre Dame Global Adaptation Initiative (ND-GAIN) encompasses social economic and governance indicators to assess a country's readiness to deploy private and public investments in aid of adaptation. The index ranges from 0 (low readiness) to 1 (high readiness).

The overlaid SSPs are qualitative and quantitative representations of a range of possible futures. The three scenarios shown here in dotted lines are qualitatively described as a sustainable development-compatible scenario (SSP1), a middle-of-the-road (SSP2) and a 'Regional Rivalry' (SSP3) scenario.

- Andrijevic, M. et al. (2020) 'Governance in socioeconomic pathways and its role for future adaptive capacity', Nature Sustainability. Springer US, 3(1), pp. 35–41.

National Adaptation Strategies

The national adaptation strategies of the G20 countries were retrieved mainly through national websites. The Climate legislation and litigation database from the LSE and the Grantham Research Institute on Climate Change and the Environment (http://www.lse.ac.uk/GranthamInstitute/countries/) and the Climate-ADAPT platform (https://climate-adapt.eea.europa.eu/) served as initial sources of information which were then complemented by additional google searches.

- Sources of individual countries' policies are included in the bibliography of each country profile.

Nationally Determined Contribution (NDC): Adaptation

Adaptation-related aspects of each country's Nationally Determined Contribution were extracted from the NDCs submitted to the UNFCCC registry.

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2. MITIGATION
REDUCING EMISSIONS TO LIMIT GLOBAL TEMPERATURE INCREASE

Woven through the mitigation section there are ratings of decarbonisation efforts and assessments of countries policies.

Ratings of decarbonisation efforts

The Climate Transparency Report provides ratings for different decarbonisation indicators. These ratings assess each country's performance relative to the other G20 countries. The lowest and highest data points (countries) for each indicator form each end of a range along which the 5 quintiles are delineated to create the ratings of 'very low', 'low', 'medium', 'high' and 'very high'. Outliers were eliminated to allow for a more accurate representation of the relative performance of each country.

This is a different methodology from that employed in the 2019 report and therefore some ratings have changed (up or down). A high scoring reflects a relatively good effort from a **climate protection perspective** but is not necessarily 1.5°C compatible. This rating does not take account of other socio-economic aspects, but rates the indicators on their climate impact. The ratings assess both the current level (2019) and recent developments to take into account the different starting points of different G20 countries. The recent developments ratings compare the development of the last 5 available years - 2014 to 2019 - for most, but not all, indicators.

Policy assessments

The policies evaluated were agreed by the Partners in early 2019 and based on their relevance for global decarbonisation and data availability across all G20 countries. The criteria for rating were also decided by consensus in the Partnership.

	Low	Medium	High	Frontrunner
Renewable energy in power sector	No policy to increase the share of renewables	Some policies	Policies and longer-term strategy/ target to significantly increase the share of renewables	Short-term policies + long-term strategy for 100% renewables in the power sector by 2050 in place
Coal phase-out in power sector	No target or policy in place for reducing coal	Some policies	Policies + coal phase-out decided	Policies + coal phase-out date before 2030 (OECD and EU28) or 2040 (rest of the world)
Phase out fossil fuel cars	No policy for reducing emissions from light-duty vehicles	Some policies (e.g. energy/emissions performance standards or bonus/ malus support)	Policies + national target to phase out fossil fuel light-duty vehicles	Policies + ban on new fossil based light-duty vehicles by 2035 worldwide
Phase out fossil fuel heavy-duty vehicles	No policy	Some policies (e.g. energy/emissions performance standards or support)	Policies + strategy to reduce absolute emissions from freight transport	Policies + innovation strategy to phase out emissions from freight transport by 2050
Modal shift in (ground) transport	No policies	Some policies (e.g. support programmes to shift to rail or non-motorised transport)	Policies + longer-term strategy	Policies + longer-term strategy consistent with 1.5°C pathway
Near zero energy new buildings	No policies	Some policies (e.g. building codes, standards or fiscal/financial incentives for low-emissions options)	Policies + national strategy for near zero energy new buildings	Policies + national strategy for all new buildings to be near zero energy by 2020 (OECD countries) or 2025 (non-OECD countries)
Energy efficiency in Industry	0-49% average score on the policy-related metrics in the ACEEE's International Energy Efficiency Scorecard	50-79% average score on the policy-related metrics in the ACEEE's International Energy Efficiency Scorecard	80-89% average score on the policy-related metrics in the ACEEE's International Energy Efficiency Scorecard	Over 90% average score on the policy-related metrics in the ACEEE's International Energy Efficiency Scorecard
Retrofitting existing buildings	No policies	Some policies (e.g. building codes, standards or fiscal/financial incentives for low-emissions options)	Policies + retrofitting strategy	Policies + strategy to achieve deep renovation rates of 5% annually (OECD) or 3% (non-OECD) by 2020
Net-zero deforestation	No policy or incentive to reduce deforestation in place	Some policies (e.g. incentives to reduce deforestation or support schemes for afforestation / reforestation in place)	Policies + national target for reaching net-zero deforestation	Policies + national target for reaching zero deforestation by 2020s or for increasing forest coverage

The only change in criteria from 2019 to 2020 is the energy efficiency in industry indicator.
The 2020 criteria for evaluation is based on the policy elements in Table 30 in the ACEEE's report (https://www.aceee.org/sites/default/files/publications/researchreports/i1801.pdf on page 51). Given that the indicator is a policy assessment we extracted the ratings of only the policy-related elements as per the extract from the report below. Note that the change of source has resulted in this table of ratings.

Table 30. Industry sector scores **Total possible = 13**

Country	Total score	Energy intensity of industry	Voluntary agreements	Mandate for energy managers	Mandatory energy audits	EnMS policy	CHP installed capacity	CHP policy	Motor standards	R&D investment	Agricult. energy intensity
Max. score		6	**3**	**2**	**2**	**2**	2	**2**	**2**	2	2
Japan	21.5	6	3	2	2	1	0	2	2	2	1.5
Germany	20	5	3	0	2	2	1	2	2	1.5	2
Italy	20.5	5	3	2	2	2	1.5	1	2	0.5	1.5
UK	19.5	6	3	0	2	2	0.5	1	2	1.5	1.5
France	18	6	3	0	2	2	0	1	2	1.5	0.5
Mexico	17.5	5	3	2	2	1	0	1	2	0	1.5
South Korea	16.5	4	3	0	2	1	0.5	1	2	2	1
Taiwan	16.5	4	0	2	2	1	1.5	1	2	1.5	1.5
Turkey	15.5	4	3	0	2	1	0.5	2	1	0.5	1.5
Spain	15.5	5	3	0	2	1	0.5	0	2	0.5	1.5
Indonesia	15	5	3	2	2	1	0	0	0	0	2
Netherlands	14.5	5	2	0	2	0	1.5	1	2	1.5	0
India	14	1	3	2	2	2	0.5	1	1	0	2
US	13	3	2	0	0	1	0.5	2	2	2	0.5
Ukraine	13	0	3	2	2	1	1.5	1	0	0.5	2
Thailand	12.5	1	3	2	2	1	0.5	0	1	0.5	1.5
China	12	0	0	2	2	2	1	1	1	1	2
Canada	10.5	2	3	0	0	1	0.5	1	2	1	0
Russia	10	0	3	0	2	1	2	0	0	0.5	1.5
Poland	10	3	0	0	2	0	1.5	1	2	0.5	0
Brazil	7.5	1	2	0	0	1	0.5	1	1	0	1
Australia	6	2	0	0	0	0	0.5	0	1	1.5	1
Saudi Arabia	5	2	0	0	0	0	0	0	1	0.5	2
UAE	4	1	2	0	0	0	0	0	1	0	0
South Africa	1.5	0	0	0	0	0	0	1	0	0.5	0

If a policy is not relevant for a country (e.g., no coal in Saudi Arabia), we do not give a rating but write "not applicable". If there is a considerable lack of implementation that contradicts a positive policy is noted in the assessment.

Trend calculations

Trends are calculated using the most recent and five earlier data years, calculating a linear trend out of those values and then calculating a trend ($\frac{y2-y1}{y1}$, y1 being the base year) out of the values of the linear trend in the respective years. In comparison to a trend using only the first and last values of a 5-year period, the trend analysis has the advantage that all other data years within the time period are taken into account, making it less susceptible to noise in the data (e.g., an unusually warm winter affecting emissions).

IPCC 1.5°C Benchmarks

At the beginning of each mitigation subsection are global benchmarks adopted from the IPCC's *Special Report on the impacts of global warming of 1.5°C* as agreed by the Partnership in May 2019 and used in the 2019 Report.

- Rogelj, J. et al. (2018) 'Mitigation Pathways Compatible with 1.5°C in the Context of Sustainable Development', in Masson-Delmotte, V. et al. (eds) *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above preindustrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change*. Geneva, Switzerland: IPCC. https://www.ipcc.ch/site/assets/uploads/sites/2/2019/05/SR15_Chapter2_Low_Res.pdf

Emissions Overview

GHG emissions across sectors and CAT 1.5°C 'fair-share' range ($MtCO_2e$/year)

The Climate Action Tracker (CAT) is an independent scientific analysis that tracks progress towards the globally agreed aim of holding warming well below 2°C, and pursuing efforts to limit warming to 1.5°C. The CAT evaluates progress towards this global goal by quantifying the aggregate effects of current policies and the pledges and targets put forward by 31 countries and the EU, and compares these with the emissions levels consistent over time with the 1.5°C limit.

The '1.5C compatible' benchmark is derived from pathways considered by the IPCC in the *Special Report on Global Warming of 1.5°C* (SR1.5). The benchmark is based on those pathways that limit global warming to 1.5°C, or below, throughout the 21st century with no or limited overshoot (<0.1°C). Pathways that do not respect the sustainability and economic constraints on carbon dioxide removal (CDR) identified by the IPCC, which have the effect of limiting bio-energy with carbon capture and storage (BECCS) to below 5 $GtCO_2e$/yr globally in 2050 and agriculture, forestry and other land use (AFOLU) to below 3.6 $GtCO_2$/yr sequestration globally in 2050, have been excluded. The median and inter-quartile ranges (50% ranges) for the relevant pathways are extracted from the IPCC SR1.5 database for total global greenhouse gas emissions. In these pathways, global average temperature increases above pre-industrial are limited to below 1.6°C over the 21st century and below 1.5°C by 2100 (typically 1.3°C). '1.5°C compatible' emissions levels in 2030 are consistent with IPCC SR1.5 Summary for Policymakers (25–30 $GtCO_2e$/year based on Global Warming Potential (GWP) values from the IPCC's Second Assessment Report (SAR)); however, due to CDR constraints are 1 $GtCO_2e$/yr lower for the median and 2 $GtCO_2e$/yr lower for the top end of range.

To determine a country's effort sharing benchmark, the CAT abstains from defining what is 'fair' in favour of a holistic approach that constructs a country's Fair Share range based on the range of fairness estimates available from the literature. The CAT "Effort Sharing" assessment methodology applies state-of-the art scientific literature on how to compare the fairness of government efforts and NDC proposals against the level and timing of emission reductions consistent with the Paris Agreement. The effort-sharing studies in the CAT's database include over 40 studies used by the IPCC (chapter 6 of WG III and Höhne et al. (2013)), plus additional analyses the CAT has performed to complete the dataset. They cover very different viewpoints of what could be considered fair, including considerations of equity such as historical responsibility, capability, and equality.

A country's Fair Share range is divided into three sections: Insufficient, 2°C compatible, and 1.5°C Paris Agreement compatible. Each section corresponds to the temperature outcomes that would result if all other governments were to put forward emission reduction commitments with the same relative ambition level. The "insufficient" to "1.5°C Paris Agreement compatible" range represents the full Fair Share range of a country, excluding the highest and the lowest values of the full sample of equity studies, which represent the outliers for this country. This means that the top and bottom end of the Fair Share range are defined by the second highest/lowest categories. To eliminate extreme outliers for each category, the CAT only considers values within the 10th to 90th percentile of all the values included in that category.

The figures used in this report are drawn from the 1.5°C compatible range. If all governments put forward "1.5°C Paris Agreement compatible" commitments at the most ambitious end of their 'fair-share compatible range (minimum fair emissions), warming would be held to well below 2°C and limited to 1.5°C. The "less than zero" emission reductions needed for some countries means that in some interpretations of what is fair, the country in question would have no emission allowances left in 2030 or 2050 and would have to have fully phased out its emissions or compensate its remaining emissions with reductions elsewhere, for example, through supporting emission reductions in other countries.

The CAT methodology is based on assessing a country's fair share contribution towards reducing emissions from fossil fuel combustion, industry, agriculture and waste sources—in effect, on their contribution towards long-term decarbonisation. It does not consider emissions from the forestry sector (i.e., from Land Use, Land-Use Change and Forestry or LULUCF).

For France, Italy, Germany and the UK, an EU-wide NDC applies. However, in this section of the report, the national emission reduction targets of these countries were used instead of the EU's NDC.

- Gütschow, J. et al. (2019). The PRIMAP-hist national historical emissions time series (1850-2017). V.2.1. GFZ Data Services. https://doi.org/10.5880/PIK.2019.018
- Climate Action Tracker. (2020). [VARIOUS COUNTRIES]. Berlin: Climate Analytics, New Climate Institute. https://climateactiontracker.org
- Further information about the CAT effort sharing methodology is available here: https://climateactiontracker.org/methodology/comparability-of-effort/

Energy-related CO_2 emissions by sector

Annual CO_2 emissions from fuel combustion ($MtCO_2$/year)

CO_2 emissions from energy account for the highest share of total GHG emissions in most countries. They are emissions resulting from fuel combustion (coal, oil and gas) in sectors electricity and heat, transport, buildings, agriculture, industries and other emissions from the energy sector (e.g. the emissions of transforming coal into coke). Emissions are calculated according to the 2006 IPCC Guidelines for National GHG Inventories.

Enerdata provided data: Global Energy and CO_2 data: CO_2 emissions from fuel combustion (sectoral approach); CO_2 emissions in energy sector (Fuel combustion); CO_2 emissions from industries (fuel combustion incl. autoproducers); CO2 emissions from households, services, agriculture (fuel combustion); CO_2 emissions from transport (Fuel combustion); CO_2 emissions from industrial process.

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Energy Overview

Energy Mix

Total primary energy supply (TPES) is the sum of energy production, energy imports and stock variations minus energy exports and international bunkers. Other reports sometimes consider total final consumption, which is TPES minus losses in energy conversion. From a climate perspective it is, however, more important how much fuel is fed into the system and combusted, and not how much energy is consumed by end users.

'Other' includes solid fuel biomass from residential use, which is shown separately because of its negative social and environmental impacts.

All energy data is from Enerdata (with the exception of Argentina's country profile) and excludes non-energy use values, i.e., fuels that are used as raw materials.

- Enerdata. (2020). Global Energy and CO2 data. Grenoble, France. https://www.enerdata.net/research/energymarket-data-co2-emissions-database.html

Solar, Wind, Geothermal, and Biomass Development

This indicator covers solar, wind, geothermal and non-residential biomass. It excludes unsustainable renewable sources such as large hydropower or traditional biomass used in the residential sector (mainly fuel wood used for cooking).

*Enerdata provided data***:** Global Energy and CO_2 data: Total primary consumption; Primary production of solar electricity; Share of wind in primary consumption; Share of geothermal electricity in primary consumption; Share of Biomass in TPES (excl. traditional biomass (mainly solid fuel biomass for residential use)).

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Carbon Intensity of Energy Supply

Carbon intensity of a country's energy sector describes the CO_2 emissions per unit of total primary energy supply. It gives an indication on the share of fossil fuels in the energy supply, the choice of fuel (e.g., gas is less carbon intensive than coal) and on the efficiency of generation.

A country with a very low level of carbon intensity, when compared to other G20 countries, receives a very high **rating** for 'current level'. A very high rating for 'recent developments' signals a high reduction from 2014 to 2019 when compared to the G20 peers.

Enerdata provided data: Global Energy and CO_2 data: CO_2 per toe consumed (CO2 from fuel combustion).

Energy supply per capita

Total Primary Energy Supply (TPES) per capita encapsulates the energy supply in relation to a country's population. The level of energy use per capita is closely related to economic development, climatic conditions and the price of energy. There are enormous differences in the level of energy use per capita between low- and middle-income economies, and high-income economies.

Energy Intensity

TPES per unit of GDP describes the energy intensity of a country's economy. This indicator illustrates the efficiency of energy usage by calculating the energy needed to produce one unit of GDP. A decrease in this indicator can mean an increase in efficiency but also reflects structural economic changes.

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Power Sector

1.5°C Benchmark sources

- https://www.ipcc.ch/site/assets/uploads/sites/2/2018/07/SR15_SPM_version_stand_alone_LR.pdf - SPM C.2.2
- https://www.ipcc.ch/site/assets/uploads/sites/2/2019/05/SR15_Chapter2_Low_Res.pdf - Page 97: "By 2050, the carbon intensity of electricity decreases to −92 to +11 gCO_2 MJ^{-1} (minimum–maximum range)…"
- **Climate Analytics (2016).** Implications of the Paris Agreement for Coal Use in the Power Sector. Retrieved from: https://climateanalytics.org/media/climateanalytics-coalreport_nov2016_1.pdf
- **Climate Analytics (2019).** Decarbonising South and South East Asia. Retrieved from: https://climateanalytics.org/media/decarbonisingasia2019-fullreport-climateanalytics.pdf

Electricity mix

Enerdata provided data: Global Energy and CO_2 data: Electricity production; Nuclear electricity production; Electricity production from oil; Electricity production from natural gas; Electricity production from coal, lignite; Share of renewables in electricity production (incl hydro).

Share of Renewables in Power Sector

Enerdata provided data: Global Energy and CO_2 data: Electricity production from renewable biomass and waste; Offshore wind electricity production; Onshore wind electricity production; Solar electricity production; Geothermal electricity production; Hydroelectric production.

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Power Sector, continued

Emissions intensity of the power sector

Enerdata provided data: Global Energy and CO_2 data: CO_2 emissions of the electricity production.

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Transport Sector

1.5°C Benchmark source

- https://www.ipcc.ch/site/assets/uploads/sites/2/2019/05/SR15_Chapter2_Low_Res.pdf - Pages 143-144. The upper end of the IPCC range was chosen as this figure is derived from more up-to-date scenarios.

Transport Energy Mix

Enerdata provided data: Global Energy and CO_2 data: Total energy final consumption of transport; Oil products final consumption of transport; Natural gas final consumption of transport; Electricity final consumption of transport; Coal final consumption of transport; Biofuels final consumption of transport.

Transport emissions per capita

Enerdata provided data: Global Energy and CO_2 data: CO_2 emissions from transport (Fuel combustion).

- World Bank (2019). Population total. Retrieved from: https://data.worldbank.org/indicator/SP.POP.TOTL

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Building Sector

Building emissions per capita

Enerdata provided data: Global Energy and CO_2 data: CO_2 emissions from households (Fuel combustion); Indirect CO_2 emissions from households.

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Industry Sector

Industry emissions intensity (Data for 2016)

Energy emissions in industry are taken from Enerdata; industry process emissions are taken from PRIMAP (2019);

- *Enerdata provided data*: Global Energy and CO_2 data: CO_2 emissions from industries (Fuel combustion incl. autoproducers).
- *Industry process emissions:* Gütschow, J.; Jeffery, L.; Gieseke, R. (2019). The PRIMAP-hist national historical emissions time series (1850-2016). V. 2.0. GFZ Data Services. https://doi.org/10.5880/PIK.2019.018

Carbon intensity of cement production

Cement emissions intensity (kg CO_2 / t product). CO_2 emissions related to cement production divided by total cement production includes scope 1 (direct energy-related and process emissions) and scope 2 (related to electricity consumption) emissions.

Carbon intensity of steel production

Steel emissions intensity (kg CO_2 / t product). CO_2 emissions per tonne of steel produced Includes scope 1 (direct energy-related and process emissions) and scope 2 (i.e., related to electricity consumption) emissions.

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Land Use

Annual gross tree cover loss by dominant driver (Data for 2001-2018)

This indicator covers only gross tree-cover loss and does not take tree-cover gain into account. It is thus not possible to deduce from this indicator the climate impact of the forest sector.
2000 tree cover extent – >30% tree canopy.

Shows the area of tree cover loss associated with the dominant driver from 2001-2019, within the selected area. The five drivers are defined as follows:

- Commodity-driven deforestation: Large-scale deforestation linked primarily to commercial agricultural expansion.
- Shifting agriculture: Temporary loss or permanent deforestation due to small- and medium-scale agriculture.
- Forestry: Temporary loss from plantation and natural forest harvesting, with some deforestation of primary forests.
- Wildfire: Temporary loss, does not include fire clearing for agriculture.
- Urbanization: Deforestation for expansion of urban centers.
    - Global Forest Watch (2020). Global annual tree cover loss by dominant driver. https://www.globalforestwatch.org/dashboards/global

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MITIGATION: TARGETS AND AMBITION

Nationally Determined Contribution (NDC): Mitigation

Mitigation-related aspects of each country's Nationally Determined Contribution were extracted from the NDCs submitted to the UNFCCC registry.

- https://www4.unfccc.int/sites/NDCStaging/Pages/All.aspx

Climate Action Tracker (CAT) evaluation of NDC and actions

The Climate Action Tracker's "fair share" range rating system is based on published scientific literature on what a country's total contribution would need to be to make a fair contribution to implementing the Paris agreement. In order to make a fair contribution to meeting the Paris Agreement's goals, developed countries need to make both domestic emission reductions and assist poorer countries reduce their emissions. This means that a country's total NDC "fair share" action range is the total sum of domestic reductions plus emission reductions overseas (from climate finance, providing means or implementation or acquisition of emission units, if those are in turn discounted in the host country).

For a more details see:

- https://climateactiontracker.org/methodology/comparability-of-effort/

NDC Transparency Check recommendations

The NDC Transparency Check provides recommendations on what information countries should provide in their 2020 NDC Update to ensure its clarity, transparency, and understanding.

This is done by evaluating existing NDCs and assessing the information provided the annex of 4/CMA.1 under Article 4.8. of the Paris Agreement, to come up with clear and practical recommendation on which information should be included in the 2020 NDC Update in order to be in full conformance with international agreements.

- Assessments can be found here: https://www.climate-transparency.org/ndc-transparency-check

Long Term Strategies

The tables give an overview of the main content of a country's long-term strategy submitted to the United Nations Framework Convention on Climate Change (UNFCCC) Secretariat. The report provides only a summary of the targets and does not provide an evaluation.

- Communication of long-term strategies retrieved from: https://unfccc.int/process/the-paris-agreement/long-term-strategies

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3. FINANCE
MAKING FINANCE FLOWS CONSISTENT WITH CLIMATE GOALS

Fossil Fuel Subsidies

The fossil fuel subsidies data presented in the Climate Transparency Report is taken from the OECD/IEA joint fossil fuel subsidies database, released in 2020. The OECD inventory collates information on the amount of subsidies provided by governments in the form of tax breaks and budgetary support. The OECD data include country information for all G20 countries, except Saudi Arabia. The estimates include support towards production and consumption of fossil fuel subsidies, as well as general services (supporting both production and consumption). The inventory is used in the Climate Transparency Report because it provides a 'bottom-up' way of quantifying subsidies by collating government information on individual policy measures, and in this way, helps identify specific opportunities for reform. The results in this report are presented in US$ billions and are taken from the latest year for which data is available, which is 2019. The results are also broken down into three end uses: coal, petroleum, natural gas, and fossil fuel-powered electricity. Trends in the time period 2008 to 2019 are also presented for countries. The original data provided by the OECD is in national currencies, and in the Climate Transparency Report have been converted to common currency using exchange rates from the OECD database.

The subsidy data for Saudi Arabia is from the IEA database because no OECD data are available. The IEA uses a different methodology for calculating subsidies, called the 'price-gap' approach. This approach compares average end-user prices paid by consumers with reference prices that correspond to the full cost of supply. It covers a sub-set of consumer subsidies, and does not include production subsidies. The differences between OECD and IEA methodology can result in significant variations in the calculated total amount of subsidies. The results are presented in US$ billions and are taken from the latest year for which data is available on the database (2019). Trends are also presented for the time period 2010-2019.

It is worth noting that estimates on fossil fuel subsidies can differ across sources, therefore OECD may not necessarily reflect government perceptions on the level of fossil fuel subsidies. The OECD data is, however, useful in providing a comparable tool for G20 countries, from a methodological perspective. Moreover, independent estimates have often found measures and resulting subsidies that are not included in the OECD database. Electricity subsidies themselves are not necessarily 'brown' expenditures, as decarbonisation will require significant investments in electricity infrastructure. OECD calculates the support to fossil fuel-powered electricity with pro-rata calculations of the total support to electricity, multiplied by the share of fossil fuels in electricity generation.

- OECD-IEA. (2020). OECD analysis of budgetary support and tax expenditures. Fossil Fuel Support Database. http://www.oecd.org/fossil-fuels/data/

Carbon Pricing and Revenues

Effective carbon rates (ECR) are the total price that applies to CO_2 emissions from energy use as a result of market-based policy instruments. They are a sum of carbon taxes, specific taxes on energy use and the price of tradable emission permits.

The carbon revenue data presented in the Climate Transparency Report is taken from the Institute for Climate Economics (I4CE) carbon revenues data for G20 countries. The I4CE data collates information on the amount of carbon revenues generated by explicit carbon pricing schemes. This includes explicit carbon taxes and emissions trading schemes, both national and subnational in nature; but it does not include implicit schemes, that is the taxation of emissions through policies other than explicit carbon pricing policies (e.g., VAT on petrol). It is used in the Climate Transparency Report because it provides a 'bottom-up' way of quantifying carbon revenues, and in this way, helps to identify the country's ambitions in carbon pricing now and in the future (including data on schemes currently under consideration but not yet implemented). The results are presented in US$ billions and are taken from the latest year for which data is available, which is 2018. Trends for countries in the time period 2010 to 2019 are also presented.

- Institute for Climate Economics (I4CE). (2019). *Global Carbon Account 2019*. Paris, France. https://www.i4ce.org/wp-core/wp-*content*/uploads/2019/05/i4ce-PrixCarbon-VA.pdf

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Public finance

Public finance for fossil fuels

The public finance data presented in the Climate Transparency Report is taken from Oil Change International's Shift the Subsidies database (2020), which includes information provided by public finance institutions, from the Infrastructure Journal Global database (IJ Global, 2019), and in the Natural Resources Defense Council's (NRDC) 'Power shift' report database (Chen and Schmidt, 2017). The Shift the Subsidies database collates information on public finance to power by G20 public finance institutions, domestically and internationally, in the form of loans, grants and guarantees. The estimates show the amount of financing for coal production (including exploration), for its transportation, and for coal-fired power production. The Oil Change International database is used in the Climate Transparency Report because it provides a 'bottom-up' way of quantifying public finance by collating information on individual projects, and in this way, is able to be very precise about the amount of financing provided. The results presented are in US$ billions and are taken from the latest years for which data is available, usually 2018. As public financing is intermittent in nature, we use annual averages for the time period 2016 to 2018. This is calculated as the total amount of public finance provided for any relevant coal project whose financing was agreed in 2016 and 2018, divided by two (i.e. across the two years), to obtain annual average annual values.

There are some data caveats that are important to note. Due to limited transparency on the support provided by public finance at the project-level, the database is an underestimate of the total amount of support provided. The data also omits most finance delivered through financial intermediaries (because the volume of finance for specific energy activities ultimately delivered through those intermediaries is often unclear). For the same reason, the datasets omit significant volumes of MDB

development policy finance. Given a lack of transparency, other important multilateral institutions in which G20 governments participate are not covered in this report, for example, the Development Bank of Latin America (CAF), Asian Infrastructure Investment Bank, New Development Bank, Islamic Development Bank, the sub-regional MDBs, and other non-MDB multilateral financial institutions. There is a general lack of transparency in the public finance institutions in Argentina, Indonesia, Mexico, Russia and Turkey, which is likely to lead to underestimates in public financing to power.

- Oil Change International. (2020). *Shift the subsidies database*. http://priceofoil.org/shift-the-subsidies

Provision of international public support

Climate finance contributions are sourced from Party reporting to the UNFCCC.

Annex I and II Parties are required to provide information on financial resources provided to non-Annex I Parties through their National Communications as well as their Biennial Reports (BR) and Common Tabular Format (CTF) Tables. Most developed countries have submitted four Biennial Reports, the last submission being by 01 January 2020. As such, the data on the climate finance provided to developing countries to support climate change mitigation and adaptation actions are sourced from this biennial reporting of developed country Parties to the UNFCCC.

We present data for only those countries that are listed as Annex I of the UNFCCC and are therefore formally obliged to provide climate finance. While not obligated, Russia has provided data in its reporting to the UNFCCC as an Annex I country (Turkey is also an Annex I country, but has not submitted data). It is also worth noting that there is climate finance provision that is not captured in common tabular format in biennial update reports and thus is not presented here. China for example, reports the provision of bilateral climate finance but not in a format or over a time period that allows comparison with other countries. South Korea, while a non-Annex II country, is an OECD DAC member and therefore reports bilateral climate finance to the OECD-DAC. A number of other countries have contributed to multilateral climate funds on a voluntary basis and these south-south flows have been captured in the explanatory country profile text as far as possible.

The total financial contributions reported in the biennial reports (BRs) consist of climate-specific contributions through **bilateral channels** and through **multilateral climate change funds**, split into four categories: mitigation or adaptation, cross-cutting or other. The multilateral climate change funds included are those listed in paragraph 17(a) of the "UNFCCC biennial reporting guidelines for developed country Parties" in decision 2/CP.17, i.e. The Global Environment Facility, the Least Developed Countries Fund, the Special Climate Change Fund, the Adaptation Fund, the Green Climate Fund and the Trust Fund for Supplementary Activities and, other multilateral climate change funds as referred in paragraph 17(b) of the "UNFCCC biennial reporting guidelines for developed country Parties" in decision 2/CP.17 (see page 34, https://unfccc.int/sites/default/files/resource/docs/2011/cop17/eng/09a01.pdf).

Flows are measured at the point of commitment to specific climate projects or programmes. The theme of the climate finance is dictated by the reporting of the country to the UNFCCC. It is classified as mitigation, adaptation, cross-cutting or other. The definitions of these categories vary by country (and institution), however (see UNFCCC 2016, Annex D, Table D1). Germany includes mobilised finance through KfW in its reporting to the UNFCCC. The figure in the country profile is adjusted to

make figures more comparable with other G20 countries. Germany's thematic breakdown is based on the full amount, including this KfW mobilised finance, however, since data availability is not sufficient to disaggregate by theme. Similarly, the EU reports also EIB figures in their reporting, and for comparison only the EU contributions are reported here, again while recognizing the important contribution.

Reporting further includes a **'core' or 'general'** contribution category that includes support provided to multilateral institutions, including regional development banks, that Parties cannot specify as being climate-specific support (e.g. to the core budget of the World Bank or UNDP, UNEP). This allows us to capture some of the climate finance that countries provide through the MDBs. It is noted however, that MDBs can borrow funds,[1] which means their development finance commitments can exceed the funds provided by their shareholders. Each MDB has a number of developed and developing country shareholders that contribute capital (paid-in capital), as well as committing to provide additional funds in certain circumstances (callable capital).[2] Concessional finance provided by MDBs is funded mainly by developed country contributions and retained earnings, while non-concessional finance is funded mainly with money borrowed from capital markets.[3] While the core/general contributions reported by Annex II Parties in BRs went mostly to MDBs, MDB outflows are significantly greater than the government contributions (or inflows) reported in this data. Thus, while the inclusion of core-general funding in country profiles improves our understanding of MDB contributions it still omits magnitudes of funding from MDBs to support climate action in developing countries.

- Country Biennial Report submissions to the UNFCCC retrieved from: https://unfccc.int/BRs

Bilateral climate finance contributions

The numbers published in the country profiles refer to bilateral, concessional, public climate finance delivered annually in the period to developing countries. It includes climate finance reported as committed directly by donors in their biennial reporting to the UNFCCC. Only bilateral data is taken from country reports and not the multilateral nor the core general contributions that countries report to the UNFCCC. This is done to avoid double counting with the multilateral climate change funds. Flows are measured at the point of commitment to specific climate projects or programmes.

Under the Trump administration, the US did not submit a fourth biennial report to the UNFCCC, due by 01 January 2020. This reduces the bilateral figures for the G20 as a whole and hinders multi-year comparison. It is noted that a lack of reporting is not the same as the US providing $0 million. The US submission is of provisional data in 2018, for the 2015-2016 period.

Germany includes mobilised finance through KfW in its reporting to the UNFCCC. The figure reported is therefore adjusted to make figures more comparable with other G20 countries. But this contribution is recognized. Germany's thematic breakdown is based on the full amount, including this KfW mobilised finance, however, since data availability is not sufficient to disaggregate by

[1] An MDB can borrow on favourable terms, in part because some of the bank's developed country shareholders have excellent credit ratings, and also because the developing country recipients of MDB finance have a strong track record of repayment. An MDB can then lend funds to its developing country clients on more favourable terms than they would get from other lenders.
[2] Unlike shareholders of a private firm, a bank's shareholders receive no dividends or interest on their capital.
[3] MDBs are allowed to do this, largely as it can rely on callable capital if it needs to repay debt.

theme. Similarly, the EU reports also EIB figures in their reporting, and for comparison only the EU contributions are reported here, again while recognizing the important contribution.

The theme of the bilateral climate finance is dictated by the reporting of the country to the UNFCCC. It is classified as mitigation, adaptation, cross-cutting or other. The definitions of these categories vary by country (and institution), other, however, where used, generally refers to finance supporting REDD+ (see UNFCCC 2016, Annex D, Table D1).

The summary report presents data for only those countries that are listed as Annex II of the UNFCCC and are therefore formally obligated to provide climate finance. While not obligated, Russia has provided data in its reporting to the UNFCCC. It is also worth noting that there is bilateral finance provision that is not captured in common tabular format in biennial update reports and thus is not presented here. China for example, reports the provision of bilateral climate finance but not in a format or over a time period that allows comparison with other countries. South Korea, while a non-Annex II country, is an OECD DAC member and therefore reports bilateral climate finance to the OECD-DAC.

- Country Biennial Report submissions to the UNFCCC retrieved from: https://unfccc.int/BRs

Multilateral climate funds contributions

The numbers published in the country profiles refer to the G20 annual average contributions via the multilateral climate funds in 2017 and 2018 to developing countries. It is generated by attributing the resources approved by each fund's governing board/committee for projects in 2017 and 2018 to individual donors based on the percentage of each funds resources that their pledges represented at the end of 2018. Data is included for the following climate funds: Adaptation for Smallholder Agriculture Programme; Adaptation Fund; Clean Technology Fund; Forest Carbon Partnership Facility; Forest Investment Program; Global Environment Facility (6th Replenishment, Climate Mitigation Focal Area only); Green Climate Fund; Least Developed Countries Fund; Partnership for Market Readiness; Pilot Program for Climate Resilience; Scaling-up Renewable Energy Program; Special Climate Change Fund and the UNREDD Programme.

The theme of the multilateral climate fund finance is dictated by the nature of the fund and can be split into adaptation, mitigation and to projects that deliver both mitigation and adaptation actions, so called 'cross-cutting'. It should be noted that such a thematic categorization can go against those of the countries that provide finance, e.g., while REDD+ was designed as a mitigation mechanism, many contributors consider adaptation benefits can also be delivered and may consider such projects cross-cutting. Unlike other funds, the GCF supports adaptation, mitigation and crosscutting objectives. For the GCF, the approved amounts in 2017 and 2018 are first broken down into the theme as determined in the project design, and each countries contribution established as a proportion of this thematic amount.

The country reports include developing countries that have contributed to the multilateral climate funds. However, the summary report only ranks those countries that are signatories to Annex II of the UNFCCC and therefore formally obligated to provide climate finance under the Convention.

Figures for finance delivered through multilateral climate funds are sourced from Climate Funds Update, a joint ODI/Heinrich Boell Foundation database that tracks spending through all major climate funds.

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Financial Policy and Regulation

This indicator utilises an existing dataset on green macro-prudential regulation, which contains information on the mandate of a country's central bank, the type of green regulation (the instrument used) and the degree to which it is implemented (under discussion, voluntary, mandatory).

Central banks and financial regulators are important as they can set market rules that shift investments, often driven by short-term yields, to long-term sustainable solutions. They can support the direction of finance towards green projects through, for example, priority lending. They can also encourage the incorporation of climate risks in investment decisions, including through banking stress tests and improving standards of due diligence for banks and financial institutions to consider climate risks.[4]

We aggregate data into the following sets of instruments:

Green financial principles: This indicates political will and awareness of climate change impacts, showing the existence of a general discussion at the policy level about the need for aligning prudential and climate change objectives in the national financial architecture.

The following indicators were rated on a spectrum of (i) Mandatory (i.e. enforced legally required actions); (ii) Voluntary (including 'comply or explain'; or (iii) Under Discussion. Where the presence of instruments was unclear, or none were identified, they were considered (iv) Not Identified.

- **Disclosure requirements and risk assessment:** Disclosure of climate-related risks allows investors to thoroughly learn the risks to which specific banking institutions are exposed. Here the green/brown taxonomy of financial assets plays a crucial role.
- **Climate-related risk assessment and climate stress-test:** Risk assessment and stress-testing are forms of supervisory review that evaluate the resilience of the financial system to adverse shocks. Climate-related stress tests can identify the extent to which a financial institution is exposed to emission-intensive or non-climate resilient assets.
- **Liquidity instruments:** Liquidity regulations smooth the maturity mismatch between assets and funding sources to protect banks against liquidity crises. Existing liquidity regulations tend to favour carbon-intensive assets. By setting a lower Stable Fund Ratio, liquidity requirements could encourage low-carbon investments.
- **Lending limits, and credit caps and floors:** Lending limits limit banks' exposures to a specific type of sectors' activities and loan categories. They can limit the exposure to carbon-intensive investments or those that are not resilient to climate impacts. Related are minimum credit limits towards green loans or caps on brown loans.
- **Differentiated reserve requirements:** Reserve requirements set the minimum amount of reserves that must be held by a commercial bank as a counterpart to customer deposits and notes. They could be differentiated to allow lower reserve requirements for green sectors, thus aligning banks' profitability with a sustainability policy target.

[4] D'Orazio and Popoyan (2019) Fostering green investments and tackling climate-related financial risks: Which role for macroprudential policies? *Ecological Economics*, Volume 160, June 2019, Pages 25-37

All data is current as of June 2020, though it is acknowledged that this is rapidly changing policy space and policy movement in the intervening period could make the results out of date.

Nationally Determined Contribution (NDC): Finance

Finance-related aspects of each country's Nationally Determined Contribution were extracted from the NDCs submitted to the UNFCCC registry.

- https://www4.unfccc.int/sites/NDCStaging/Pages/All.aspx

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Endnotes, including policy assessment criteria

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Bibliography