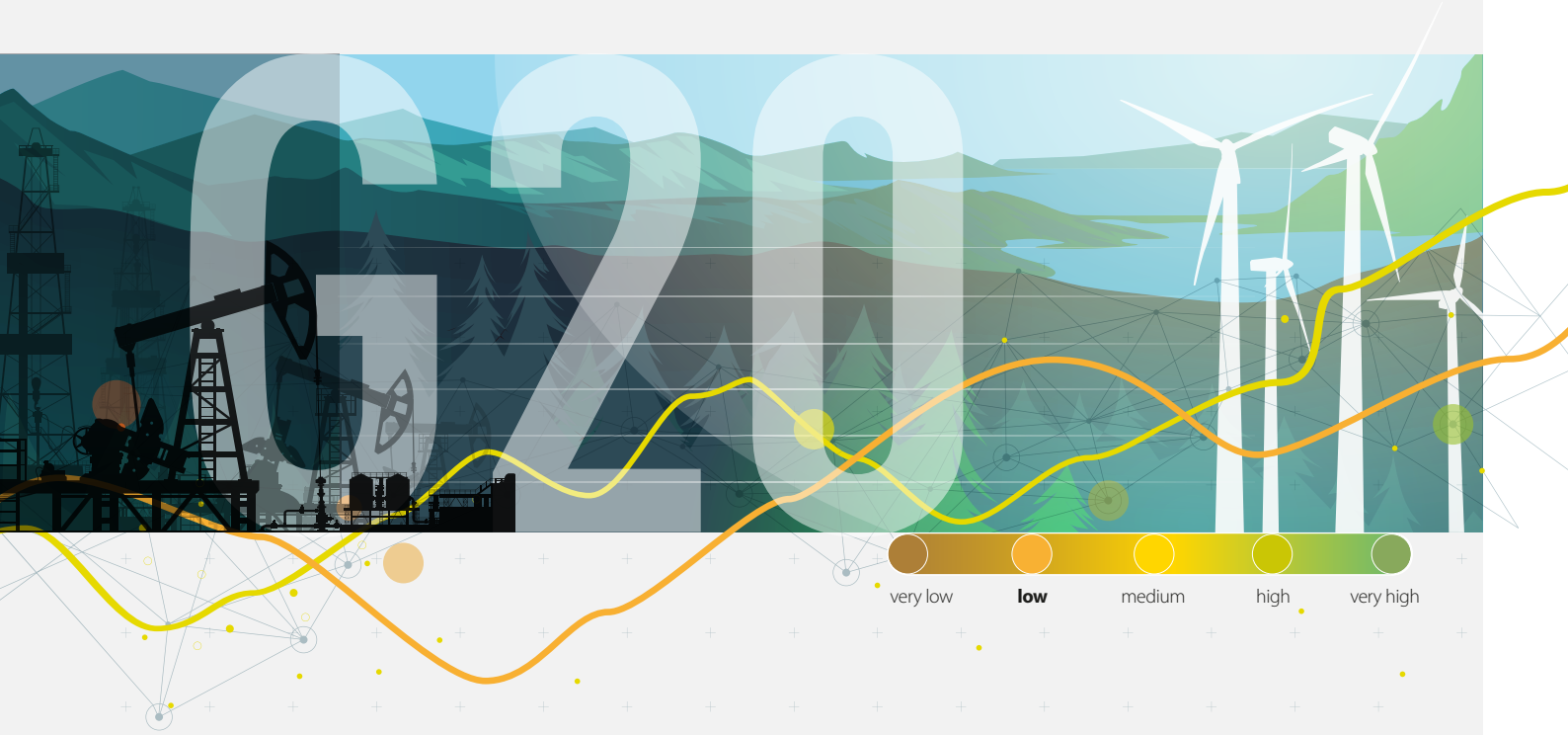
Climate Transparency

BROWN TO GREEN

THE G20 TRANSITION TO A LOW-CARBON ECONOMY | 2018



2018

ABOUT CLIMATE TRANSPARENCY AND THIS REPORT

14
PARTNERS

Our global partnership brings together experts from research organisations and NGOs in the majority of the G20 countries.

20
MAJOR ECONOMIES

Our mission is to encourage ambitious climate action in the G20 countries: we inform policy makers and stimulate national debate.

80
INDICATORS

Our Brown to Green Report is the world's most comprehensive annual review of G20 climate action: we provide concise and comparable information on mitigation, finance and vulnerability.

Partners:

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based on a decision of the German Bundestag

Data Partners:

BROWN TO GREEN

THE G20 TRANSITION TO A LOW-CARBON ECONOMY | **2018**

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The *Brown to Green Report 2018* consists of this summary report and in-depth country profiles for each G20 country. The country profiles and a technical note on data sources and methodology can be downloaded at
www.climate-transparency.org/g20-climate-performance/g20report2018

FOREWORD:
A G20 Stocktake on Climate Action

Alvaro Umaña and Peter Eigen

The Global Stocktake established in Article 14 of the Paris Agreement aims to "assess the collective progress" towards the agreed goals: 1) holding the increase in global average temperature to well below 2°C and pursuing efforts to limit the increase to 1.5°C; 2) increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience; and 3) making all finance flows consistent with a pathway towards low greenhouse gas (GHG) emissions and climate-resilient development.

At the moment, we are far away from taking the action needed to achieve these three goals. Current nationally determined contributions (NDCs) would lead to a global temperature increase of around 3.2°C. The Global Stocktake together with the NDCs are the key elements of the Paris Agreement aimed at ratcheting up the ambition of national climate actions. Countries need to submit their revised NDCs by 2020. Those that have not yet submitted an NDC with a 2025/30 target must provide a new NDC. All other countries are invited to strengthen their NDCs. Informed by the Intergovernmental Panel on Climate Change (IPCC) 1.5°C Special Report and the Talanoa Dialogue in 2018, it is clear that these next NDCs must increase the level of ambition through much stronger 2030 targets. The cycle of assessing collective progress and increasing the ambition of national climate actions will then continue with the first five-yearly Global Stocktake in 2023, to inform the submission of new and strengthened NDCs by 2025.

Our *Brown to Green Report* supports the process of raising climate ambition. It is a simple stocktake on climate action (with a focus on mitigation and finance) of the G20 countries produced collectively by 14 organisations from different G20 countries.

Setting an example: The *Brown to Green Report* compares climate action of countries with their G20 peers as well as collectively and for some specific policies against 1.5°C benchmarks. It provides indicators on emissions, decarbonisation, climate policies and finance. Our report shows that substantial information is already available on what countries are doing or not doing. This analysis can inform the preparation of the next round of NDCs to be submitted by 2020 and can drive more ambitious climate action.

Ensuring accountability: To hold governments accountable, transparency and a critical level of public attention are required. Our country profiles for all G20 countries are each 15 pages long, providing concise and illustrative information with country-tailored messages. These help our global partnership to inform national climate policy agendas. We promote the findings of the *Brown to Green Report* in the media, in stakeholder workshops and in government briefings in the G20 countries through local partners.

Facilitating learning: Raising ambition is achieved by communicating the emission gap and by facilitating learning and diffusion of good practices to close the gap. This year's *Brown to Green Report* highlights the positive developments that have happened since the Paris conference in 2015 and the best practices in G20 countries that are compatible with the 1.5°C limit. We believe that this solution-oriented approach is as important to motivate Parties to implement fully their NDCs as underlining the urgency of action.

This is the fourth edition of our annual publication. We are proud to share what is new this year:

- We have included new and improved assessments on finance, exposure to climate change, just transition and the NDCs.
- Based on collaboration with ENERDATA, we will for the first time show emission and decarbonisation trends until 2017 (last year's report showed trends up to 2014).
- We have revised our country profiles so that the front page provides a concise summary of where the country stands in its transition from brown to green.

We believe that our transparent and comparable information can be a powerful tool to stimulate a race to the top in climate action.

„Global emissions need to peak in 2020. The Brown to Green report provides us with an independent stocktake, where we stand now. This is valuable information for countries when they declare their climate contributions in 2020."

Christina Figueres, Former Executive Secretary, UNFCCC (2010-2015) and Convenor, Mission 2020

Alvaro Umaña

Co-chair of Climate Transparency, Former Minister of Environment and Energy of Costa Rica and former Ambassador of Costa Rica to the United Nations Copenhagen Climate Change Conference

Peter Eigen

Co-chair of Climate Transparency, Founder and Chair of the Advisory Council of Transparency International and Co-Founder of the HUMBOLDT-VIADRINA Governance Platform

EXECUTIVE SUMMARY

COLLECTIVELY, THE G20 NEEDS ROUGHLY TO HALVE EMISSIONS IN 2030 TO MEET THE PARIS GOALS, BUT ADEQUATE LONG-TERM STRATEGIES TO DO SO ARE STILL LACKING.

The emission gap:

- Currently, nationally determined contributions (NDCs) would lead to a global temperature increase of around 3.2°C. None of the G20 NDC targets for 2030 is in line with the Paris Agreement.
- India's NDC is the most ambitious, closest to the 1.5°C limit. The NDCs of Russia, Saudi Arabia and Turkey would lead to a warming that exceeds 4°C, if all governments were to have similar levels of ambition for their targets.
- Given current policies, Argentina, Brazil, Canada, Mexico, South Korea, Turkey and the United States are likely to miss their NDC targets (LULUCF is not considered). China, the European Union, Indonesia, Japan, Russia and Saudi Arabia are likely to achieve or even overachieve their current targets, partly because their NDCs have a low level of ambition.

IN 15 OF THE G20 COUNTRIES, ENERGY-RELATED CO_2 EMISSIONS INCREASED AGAIN IN 2017, AND 82% OF THE G20 ENERGY SUPPLY STILL COMES FROM FOSSIL FUELS.

Developments after the Paris conference:

- Energy-related CO_2 emissions – the highest share of GHG emissions – of the G20 countries grew by 56% between 1990 and 2014. Between 2014 and 2016 these G20 emissions stalled, but in 2017 they started to increase again.
- The G20 carbon intensity of the energy sector decreased slightly in 2016 and stalled in 2017 due to a slightly higher share of renewables and/or other zero-carbon technologies in the energy mix.
- On average, 82% of the energy supply in the G20 countries is still sourced from fossil fuels – the share even increased in Canada, India and Indonesia between 2012 and 2017. The United Kingdom managed to significantly reduce its share of fossil fuels in the energy mix, followed by China and France.
- Several G20 countries have made major climate policy announcements since Paris, e.g. Argentina's launch of a US$5.7 billion investment programme to push renewable energies or India's release of the draft Cooling Action Plan, to cut cooling demand by 20% to 25% by 2037. Nevertheless, there are also "brown" actions pointing in the opposite direction, e.g. the United Kingdom's cancelling of climate policies (Zero Carbon Homes, Feed-in-Tariffs, energy efficiency measures in buildings) and Brazil's new subsidy to diesel consumption provided in 2018.

THE G20 COUNTRIES THAT NEED TO DO MOST IN THE POWER AND TRANSPORT SECTORS LACK CONCRETE ACTIONS.

G20 leaders and laggards in sectoral performances:

- **Power:** South Africa (961 gCO_2/kWh), Australia (768 gCO_2/kWh) and Indonesia (755 gCO_2/kWh) have the highest emission intensity in the power sector and lack concrete actions to phase out coal.
- **Transport:** France, Japan and the United Kingdom lead the G20 policy rating with 'phase-out' plans for fossil fuel cars. The United States (5.4 tCO_2/capita), Canada (4.8 tCO_2/capita) and Australia (4.0 tCO_2/capita) have high mobility rates and the highest transport emissions per capita. The United States and Canada lack adequate fuel efficiency standards, while Australia has none.
- **Industry:** Only the European Union receives a high policy rating because of its target for new installations in emission-intensive sectors to be low-carbon. South Africa, China and Russia lag behind. They have the highest emission intensity, up to 0.6 tCO_2e/US$1,000 (2015) sectoral GDP (PPP), and insufficient policies.
- **Buildings:** Canada (2.1 tCO_2/capita), Germany (1.7 tCO_2/capita) and the United States (1.6 tCO_2/capita) show the highest direct building emissions per capita (not counting the emissions from commercial heat and electricity) in the G20. The 1.5°C-compatible EU policy of near zero-energy buildings by 2020/25 for new buildings could be a model for other G20 countries.
- **Forestry:** Indonesia (23%), Argentina (22%) and Brazil (10%) have had the highest forest loss since 1990. They do not show sufficient action to reverse this trend. A strategy for net zero deforestation by 2020 would be 1.5°C-compatible.

FOSSIL FUEL SUBSIDIES IN THE G20 INCREASED FROM US$75 BILLION IN 2007 TO US$147 BILLION IN 2016. ONLY CANADA AND FRANCE GENERATE MORE PUBLIC REVENUES THROUGH EXPLICIT CARBON PRICING THAN THEY SPEND ON FOSSIL FUEL SUBSIDIES.

G20 leaders and laggards in financing the transition:

- Several G20 countries – developed and emerging economies – have introduced green finance policies. France, the European Union and Japan are leading in implementing climate-related financial disclosure policies.
- Nearly all G20 countries spend more on fossil fuel subsidies than they receive in public revenues from explicit carbon pricing. Only Canada and France generate more public revenues through explicit carbon pricing than they spend on fossil fuel subsidies (Canada: US$3.7 billion vs US$2.1 billion; France: US$6.2 billion vs US$5.8 billion). The G20 countries providing the highest amounts of fossil fuel subsidies per unit of GDP are Saudi Arabia (total amount of subsidies US$30 billion), Italy (US$14 billion), Australia (US$7 billion) and Brazil (US$16 billion). Of these countries, subsidies have been increasing with fluctuations in Australia, Brazil and Italy since 2007.
- From 2013 to 2015, G20 countries provided on average US$91.4 billion a year for fossil fuel power projects (coal, oil and gas projects and associated infrastructure). South Korea, Japan and Russia provided the largest amounts compared to their GDP.
- G20 international climate finance provision has slightly increased recently.

JUST TRANSITION: SEVERAL G20 COUNTRIES HAVE STARTED TO ADDRESS THE QUESTION OF HOW TO CONDUCT A TRANSITION THAT IS FAIR TO THOSE ADVERSELY AFFECTED BY IT.

Just transition good practice examples in the G20:

- There are national or regional governmental initiatives to learn from in Australia, Canada, China, the European Union, France, Germany, Indonesia, South Africa and the United States.
- For example: A federal taskforce develops a just transition plan for coal workers and communities in Canada. The Chinese government will allocate 30 billion yuan (US$4.56 billion) over the next three years to support the closure of small, inefficient coal mines and redeploy around 1 million workers. France's draft finance bill for 2019 includes a ten-year compensation fund to make up for the loss of revenue for local authorities caused by the closure of coal power stations.
- India, Japan, Mexico, Russia, South Korea and the United Kingdom are socially affected by the transition, but seem to have no dialogue or action yet.

INTRODUCTION

More ambitious climate action is needed to keep global warming well below 2°C and to pursue efforts to limit the increase to 1.5°C. The newly released Intergovernmental Panel on Climate Change (IPCC) special report *Global Warming of 1.5°C* states that the difference in impacts between warming of 1.5°C and 2°C would be substantial, damaging communities, economies and ecosystems across the world. The Paris Agreement's 1.5°C temperature limit requires a rapid reduction in greenhouse gas (GHG) emissions triggered by a phase-out of coal from the power sector by 2050, substantial reductions in the use of oil and natural gas over the same timeframe, mass deployment of solar and wind energy, and the reduction of emissions from cars, trucks and airplanes, so that CO_2 emissions reach net zero around 2050.[1]

Climate change requires collective action on a global level; major change has to come from the biggest emitters and economies, that is, the G20 countries. They account for 79% of global GHG emissions (excluding emissions from forestry)[2] and about 81% of global energy-related CO_2 emissions.[3] It is in the national interest of countries to take climate action, which coincides with other social needs, supports the implementation of the Sustainable Development Goals (SDGs), and offers substantial economic benefits. Ambitious climate action could create more than 65 million new low-carbon jobs worldwide and prevent 700,000 premature deaths from air pollution in 2030.[4] Globally, government revenues could increase to US$2.8 trillion by 2030 due to subsidy reform and carbon pricing alone.[5]

In contrast, inaction can result in huge costs. Stranded assets of US$20 trillion of upstream energy and power generation constitute a financial risk that can be minimised, if capital is shifted away from carbon-intensive investment.[6] Similarly, climate impacts will increase costs in the future. In 2017, global economic losses from natural disasters and man-made catastrophes were the highest ever amounting to US$337 billion.[7] G20 countries, particularly the emerging economies in the G20, are increasingly exposed to the impacts of climate change. According to the Notre Dame Global Adaptation Index (ND-GAIN), India, Japan, Indonesia and Brazil are the G20 countries most exposed.[8]

G20 COUNTRIES' EXPOSURE TO CHANGING CLIMATE CONDITIONS

G20 countries are already experiencing significant, adverse effects of climate change with 1°C of global mean warming resulting in heat waves, extreme rainfall events, increased storm intensity and rising sea levels, all affecting natural and human systems. The IPCC 1.5°C special report has shown that these effects will increase significantly for 1.5°C of warming, and accelerate further for 2°C of warming, with impacts continuing to rise above this level. The IPPC report also shows that there would be substantial risks and damages if warming significantly overshoots the 1.5°C limit before it is reduced to this level or below.

The ND-GAIN shows the exposure of G20 countries to the future impacts of climate change (under a 2°C scenario):

→ **FOOD:** Projected reductions in cereal yields are highest in Indonesia, Brazil and Mexico.

→ **WATER:** Annual run-off is projected to change mostly in Australia, Russia and Japan and projected changes in annual groundwater recharge are expected to be highest in Russia, India and the United Kingdom.

→ **HEALTH:** The spread of malnutrition and diarrhoeal diseases are projected to be by far the highest in India, followed to a lesser degree by South Africa. Vector-borne diseases are expected to spread particularly in India, South Africa and Indonesia.

→ **ECOSYSTEM SERVICES:** Biomes in South Korea, Italy, Canada and France are likely to be the most affected. Marine biodiversity is highly affected in several G20 countries – Argentina, Australia, Brazil, Canada, Japan, Mexico, Russia, South Africa and the United States.

→ **HUMAN HABITAT:** High temperature periods are likely to be particularly frequent in Indonesia, Japan and Brazil. The frequency and severity of floods is likely to be highest in India, Mexico and China due to climate change.

→ **INFRASTRUCTURE:** Projected climate impacts on hydropower generation capacity are highest in Turkey, Italy and France. Italy, Japan and Germany have the highest proportion of land area adjacent to the ocean and lower than 4m above sea level, which approximates to a potential sea level rise by the end of the century of 0.32m to 0.63m and an average height of storm surge of around 2m to 3m.

This report assesses how far the G20 countries have progressed in their transition from a "brown" economy based on fossil fuels to a "green" low-carbon and climate-resilient economy. To present a comprehensive stocktake on G20 climate action it addresses the following four questions:

1. **THE GAP:** Are the G20 countries on track to stay below the Paris Agreement temperature limit?
2. **RECENT DEVELOPMENTS:** What has happened in the G20 countries since the Paris conference?
3. **BROWN AND GREEN PERFORMERS:** Who are the leaders and laggards among the G20 countries?
4. **FAIRNESS:** What are the G20 countries doing to make the transition just?

1 THE GAP: Are the G20 countries on track to stay below the Paris Agreement temperature limit?

To stay within the Paris Agreement temperature limit, G20 emissions need to be drastically reduced. A peak needs to be reached by around 2020 and CO_2 emissions need to decline to net zero around 2050.[9]

All G20 countries, besides Russia and Turkey which have not yet ratified the Paris Agreement, have submitted their first NDC to the United Nations Framework Convention on Climate Change (UNFCCC).[10] Russia and Turkey only submitted an "Intended Nationally Determined Contribution" ((I)NDC) before the Paris conference. Each (I)NDC contains the country's intended target for reducing or limiting its GHG emissions. Some (I)NDCs also contain information on adaptation, namely Argentina, Brazil, China, India, Indonesia, Mexico, Saudi Arabia, South Korea and South Africa. India and South Africa are the only G20 countries that specify their investment needs for mitigation and adaptation actions. Identifying investments needed to implement the NDCs is crucial to align financial flows nationally and internationally as mandated in the Paris Agreement. Finally, Brazil, Canada, Japan, South Korea, Mexico and Turkey have stated in their (I)NDCs that they might trade emissions by utilising international market mechanisms as foreseen under Article 6 of the Paris Agreement to implement their targets.[11, 12]

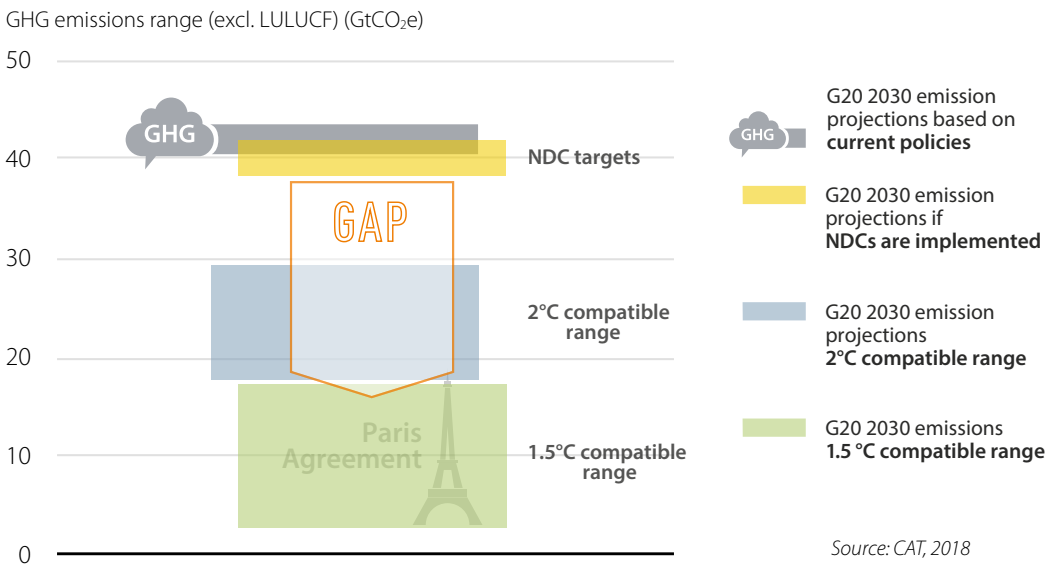
Informed by the Talanoa Dialogue in 2018,[13] countries are requested to communicate or update their NDCs by 2020, for 2025 and 2030. In most cases, current NDCs reach until 2025 or 2030. The Paris Agreement says that the efforts of each country will "represent a progression over time" and reflect its "highest possible ambition".[14] More ambitious, updated NDCs are essential to close the gap between current emissions and those needed to meet the Paris Agreement temperature goals.

G20 COUNTRIES WILL NEED TO CUT EMISSIONS IN 2030 ROUGHLY BY HALF TO BE IN LINE WITH THE PARIS AGREEMENT LONG-TERM TEMPERATURE GOALS.

Based on the targets in their NDCs, the GHG emissions of the G20 countries (excluding land use, land-use change, and foresty (LULUCF)) will be between 38.4 $GtCO_2e$ and 42 $GtCO_2e$ in 2030. This emission level is only marginally below the one of their projected 2030 GHG emissions based on an assessment of their current policies (40.6 $GtCO_2e$ to 43.7 $GtCO_2e$). This shows that their NDCs will only marginally bring down emissions.

However, the gap between the G20's NDCs and the emission range needed to keep global temperature rise below the 1.5°C limit of the Paris Agreement is large.[15] The G20 needs to cut emissions by 2030 roughly in half to be in line with the Paris Agreement goals.

Gap between NDC targets and 1.5°C Paris Agreement temperature limit



Source: CAT, 2018

According to the Climate Action Tracker,[16] **India** is leading the G20 countries in closing the gap. Its NDC would lead to a warming of below 2°C, if all other governments' targets (worldwide) were in this range. Its NDC thus comes closest to the 1.5°C limit set by the Paris Agreement. The country remains on track to overachieve its NDC with the adoption of its National Electricity Plan released in April 2018. If India further abandons plans to build new coal-fired power plants, it could become a global climate leader and Climate Action Tracker would rate it "1.5°C-compatible".

The insufficient commitments by Australia, Brazil, the European Union (and its member states), Mexico and the United States would lead to a warming of more than 2°C and up to 3°C if all other governments' targets (worldwide) were in this range.[17]

Australia lacks action to implement its already insufficient NDC target. Projected emissions in 2030 are set to far exceed its NDC target.

The current policy emissions projections for **Brazil** are no longer in line with the NDC target due to an increase of Brazil's deforestation rate of almost 30% in 2016 compared to 2015. This goes against Brazil's commitments under the Paris Agreement, including a target of zero illegal deforestation in the Brazilian Amazonia by 2030.

The **European Union** recognises that it is not on track to meet its 2030 target and is discussing a package of measures aimed at accelerating emissions reduction in different areas.[18]

Mexico is not projected to reach its NDC target. The government plans among other things to add and prioritise gas-based capacity by 2030, limiting new renewable deployment.

US President Donald Trump's intention to pull out of the Paris Agreement is contrasted by increasing activity of US cities, states, businesses and other actors. The full implementation of currently recorded and quantifiable non-federal climate commitments could take the United States close to meeting its NDC commitments.[22]

The NDC targets of Argentina, Canada, China, Indonesia, Japan, South Africa and South Korea would result in a warming of between 3°C and 4°C, if all government targets were to fall in this range.[19]

Argentina might overachieve its NDC if it implements additional measures according to its new set of energy scenarios released in December 2017. The measures would reduce the growth of emissions.

Canada is likely to miss its NDC target based on the implemented policies under its Pan-Canadian Framework on Clean Growth and Climate, despite proposals for carbon pricing and traditional coal power plant phase-out.

China is on track to overachieve its NDC targets, although an increase in coal use in 2017, together with rising demand for oil and gas, drove CO_2 emissions above 2014 levels, the previous record high.

Indonesia will achieve its NDC targets without any additional efforts while still doubling current levels of emissions (excluding forestry). It has increased its coal capacity over the past five years and, according to the country's energy plan of 2018, intends to increase it further.

Japan will not achieve its NDC target if all coal plant construction plans, which could add 17 GW of coal power, are implemented.

If **South Africa** implements its draft Integrated Resource Plan, newly released in 2018, it would achieve the upper range of its NDC targets.[20] While the plan includes a shift to increase the use of renewable energy, the completion of coal plants under construction and inclusion of new coal power plants already threaten the achievement of the lower range of their NDC target.

South Korea's weak mitigation commitment will allow domestic emissions in 2030 to more than double from 1990 levels. As a country with some of the fastest-growing emissions in the OECD, South Korea would need more stringent policies to be able to peak and start declining emissions to meet the NDC target.

The gap between the (I)NDCs and the Paris Agreement temperature limit is biggest for Russia, Saudi Arabia and Turkey. Their NDCs will lead to a global warming exceeding 4°C, if all government targets had similar levels of ambition.[21]

Russia's INDC target is so weak that it would not require a decrease in GHG emissions from current levels.

Despite its increasing efforts to move away from oil and diversify its energy sources, **Saudi Arabia's** emissions are projected to double in 2030 compared to 2014 levels. With full implementation of current policies – increase in renewable energy and phase-out of fossil fuel subsidies, among others – it might reach its NDC, which is, however, still critically insufficient.

Turkey's ongoing increase in coal power capacity is in strong contrast to its INDC target. Turkey's ongoing investment in expanding coal power production runs strongly counter to the need to fully decarbonise the power sector by 2050.

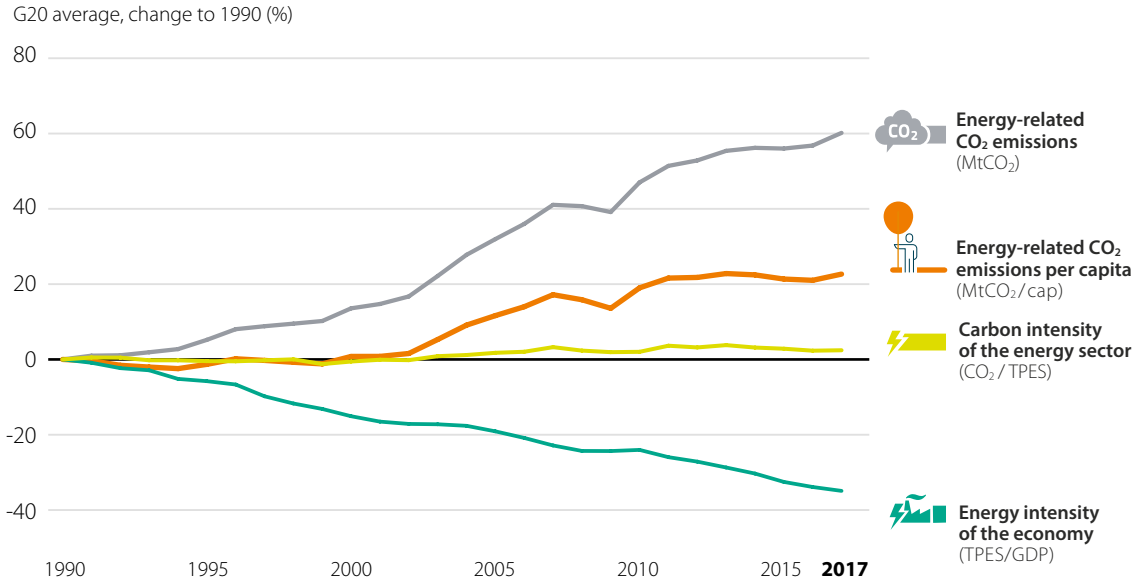
2 RECENT DEVELOPMENTS: What has happened in the G20 countries since the Paris conference?

The Paris Agreement has clearly increased awareness and triggered climate action. Recent G20 decarbonisation trends (until 2017) and policy developments, however, do not show an overall faster transition towards a low-carbon economy.

IN 15 OF THE G20 COUNTRIES, ENERGY-RELATED CO_2 EMISSIONS INCREASED AGAIN IN 2017 AFTER HAVING STALLED IN 2014.

Energy-related CO_2 emissions – the highest share of GHG emissions – of the G20 countries grew by 56% between 1990 and 2014. Between 2014 and 2016 these G20 emissions stalled, but in 2017 they started to increase again. More specifically, emissions increased in 2017 in Australia, Brazil, Canada, China, the European Union, France, Germany, India, Indonesia, Japan, Russia, Saudi Arabia, South Korea, Turkey and possibly the United States. Per capita, G20 energy-related CO_2 emissions had decreased in 2015 and 2016 but are now also again increasing.[23]

Trends of emissions, carbon intensity and energy intensity in G20 countries (1990-2017)



Source: Enerdata, 2018

The downward trend of energy intensity of the economy in G20 countries continued in 2017. This means that G20 countries' economies need less energy per unit of production. However, growth of population and the economies in G20 countries have led to an increased consumption of energy, outweighing the efficiency gains. This energy demand is satisfied to a large extent by fossil fuel-based energy.

The G20 carbon intensity of the energy sector decreased slightly in 2016 and stalled in 2017 due to a slightly higher share of renewables and other zero-carbon technologies in the energy mix.

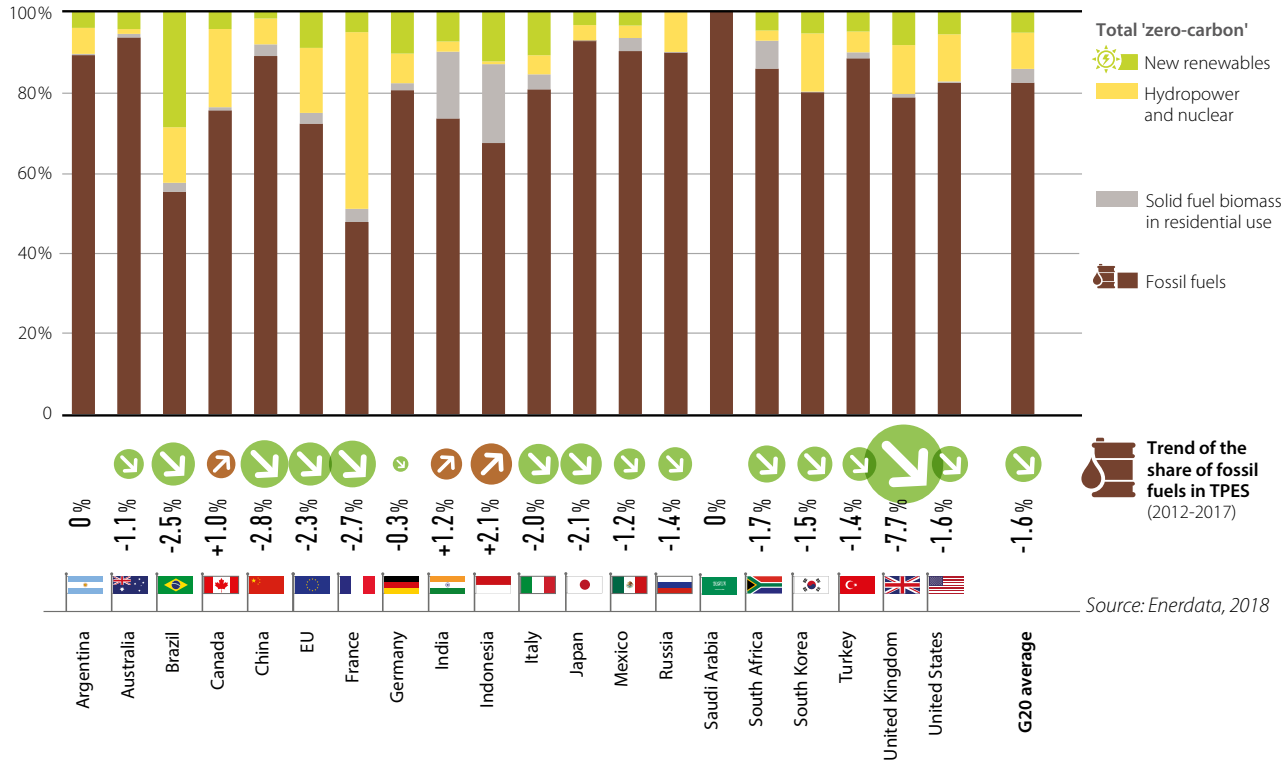
82% OF THE ENERGY SUPPLY IN THE G20 COUNTRIES IS STILL SOURCED FROM FOSSIL FUELS – IN CANADA, INDIA AND INDONESIA, THE SHARE HAS EVEN INCREASED.

Fossil fuels dominate the total primary energy supply (TPES) in all G20 countries (on average accounting for 82%).[24] Zero-carbon technologies, including hydro, nuclear and new renewables, contribute 14%, of which new renewables (solar, wind, geothermal and biomass, excluding traditional biomass in residential) account for 5%.[25] Another 3% of the G20 average energy supply comes from solid fuel biomass for residential use.

Between 2012 and 2017, the G20 total primary energy supply from new renewables increased from 18,603 Peta Joule (PJ) to 25,108 PJ. Brazil (29%), Indonesia (13%) and Germany (11%) have the highest shares of new renewables in the G20, all with increasing trends over the past years. Growth rates of the share of new renewables between 2012 and 2017 were highest in China (145%), the United Kingdom (133%) and Turkey (306%), although Turkey started from low levels.

Saudi Arabia (100%), Australia (93%) and Japan (93%) have the highest shares of fossil fuels in the G20. Fossil fuel shares decreased in most countries between 2012 and 2017 but only by a small percentage. The highest decrease was roughly 8%, in the United Kingdom. In Canada, India and Indonesia the share of fossil fuels in the energy supply even increased between 2012 and 2017, mainly due to increased fuel usage for transport and increased electricity demand.

Share of fossil fuels and 'zero-carbon' fuels in total primary energy supply (TPES)



Source: Enerdata, 2018

RECENT POLICY DEVELOPMENTS: MANY GREEN POLICY DEVELOPMENTS HAVE OCCURRED IN G20 COUNTRIES SINCE PARIS, BUT THERE ARE ALSO STEPS BACKWARDS TOWARDS BROWN.

AUSTRALIA: Government 2017 review ignores large implementation gap

UNITED KINGDOM: Cancels climate policies (Zero Carbon Homes, Feed-in-Tariffs, CCS development, energy efficiency measures in buildings)

AUSTRALIA: Government working on ways to subsidise coal power generation

ITALY: State-owned operator of natural gas transmission to invest €4.7bn in gas networks

BRAZIL: Strong reduction of last decade reverses as deforestation rises 52% from 2012 to 2017

MEXICO: Electricity mid-term forecast focuses on gas and limits renewable energy penetration

JAPAN: Revised feed-in-tariff scheme boosts biomass projects, mainly co-firing imported biomass with coal

GERMANY: Blocks talks on more ambitious CO_2 limits at EU level for light-duty vehicles for 2025 and 2030

FRANCE: CO_2 emissions overshoot first official carbon budget by 6.7%

RUSSIA: New national strategy may delay ratification of Paris Agreement until 2019

SOUTH KOREA: Revises its 2030 GHG emission plan, but not its 2030 GHG emission target

ARGENTINA: Decides to guarantee subsidies for gas exploitation until 2021

SAUDI ARABIA: Announces slow-down for phasing out fossil fuel subsidy to boost economy

JAPAN: No new targets in New Strategic Energy Plan, producing high reliance on nuclear and coal

UNITED STATES: Annulment of the Clean Power Plan

INDIA: Rows back on commitments to sell 100% electric vehicles by 2030

AUSTRALIA: No government agreement on emission standards for light motor vehicles

GERMANY: Projected to miss its 2020 GHG emission target by 8%

TURKEY: Still has not ratified the Paris Agreement

CANADA: Carbon tax introduction postponed by one year

CANADA: Purchases Kinder Trans Mountain Expansion Project and related pipeline and terminal assets for US$4.5bn

CHINA: Coal consumption rose again in 2017

INDONESIA: State-owned power utility expects coal use to double between 2017 and 2025

SOUTH AFRICA: Decides to build more coal power plants until 2024

TURKEY: Strategic Plan 2015–2019 to increase annual electricity generation from domestic coal by 54% above 2012 levels by 2019

UNITED STATES: Announces cars and trucks no longer need to be more fuel-efficient each year by 2020

CLIMATE POLICIES AND TARGETS

FORESTRY

BUILDINGS

FINANCE

POWER

TRANSPORT

CANADA: New long-term strategy contains proposals for economy-wide measures, with carbon pricing plan and phase-out of traditional coal plants

EUROPEAN UNION: Commission sparks debate on making EU long-term strategy more ambitious

CHINA: Announces launch of emissions trading scheme for power sector, trialling from 2019

TURKEY: Pledges almost US$11bn for investment in energy efficiency measures

JAPAN: Revised building energy efficiency standards in force from 2017

INDONESIA: Deforestation down 60% during 2016 and 2017, likely due to 2016 peat drainage moratorium

CHINA: Exceeds its 2020 renewable electricity target of 105 GW installed capacity three years early

INDONESIA: Pledges no new coal power plants on Java (unless agreements signed before March 2018)

SAUDI ARABIA: Launches US$30-50bn renewable energy tender programme

INDIA: Releases Draft India Cooling Action plan to cut cooling demand by 20%-25% by 2037

ITALY: Announces target of 1 million electric vehicles on the road by 2022

SAUDI ARABIA: Opens market for electric vehicles imports in 2018

FRANCE: Commits to develop a new long-term strategy for carbon neutrality in 2050

MEXICO: Paris Agreement incorporated into legal framework, with mandate for long-term plan with sectoral mitigation targets

ARGENTINA: Launches US$5.7bn programme to push renewable energies

FRANCE: Announces French carbon price of €84 euros/tonne in 2022, up from €44 now

EUROPEAN UNION: ETS reform prompts major hike in emissions allowances prices (more than €20 in 2018)

ARGENTINA: Adopts Renewable Energy Act and Renewable Energy Distributed Generation Law

GERMANY: Government launches commission to negotiate country's coal phase-out

ITALY: Announces phase-out of coal power by 2025

SOUTH AFRICA: 2018 Integrated Resource Plan boosts renewable energy until 2030

MEXICO: Renewable energy accounts for all new energy added as prices hit record lows in three long-term power auctions

RUSSIA: 2017 Transport Strategy to cut road transport emissions by 2030 to 20%–25% below 2011 levels

UNITED KINGDOM: Announces review of its 2050 target to meet the 1.5°C temperature limit

UNITED STATES: More than 3,500 cities, states, businesses and organisations pledge to respect Paris Agreement ("We are still in")

BRAZIL: Central Bank introduces requirements for banks to monitor environmental risks

SOUTH AFRICA: Announces carbon tax covering at least 75% of GHG emissions, implemented in January 2019

UNITED KINGDOM: Launches Green Finance Task Force to find public and private investment to meet UK carbon reduction targets

BRAZIL: Solar power to be boosted 4,000 times to top 13 GW of installed capacity by 2026

INDIA: National Electricity Plan to reach 47% capacity from non-fossil sources by 2027, exceeds NDC target early

RUSSIA: Adopts decrees and orders on energy efficiency and promotion of renewable energy

EUROPEAN UNION: New renewable energy and energy efficiency targets could cut emissions by 45% in 2030

SOUTH KOREA: Releases new 15-year Plan for Electricity Supply and Demand to boost share of renewable electricity generation

SOUTH KOREA: Target of 250,000 EVs on the road by 2020, with subsidies up to US$12,000 per vehicle

3 BROWN AND GREEN PERFORMERS: Who are the leaders and laggards among the G20 countries?

GHG emissions and decarbonisation indicators, such as energy use, emission intensity or forest loss, can identify sectors where urgent action is needed. However, as they only describe the status quo, the indicators have no predictive value. An assessment of the **climate policy performance** of each country shows whether there exists a policy framework to support necessary sectoral action. Finally, the degree to which **financial flows** have been redirected towards a low-emission and resilient economy determines the transition.

3.1 EMISSIONS

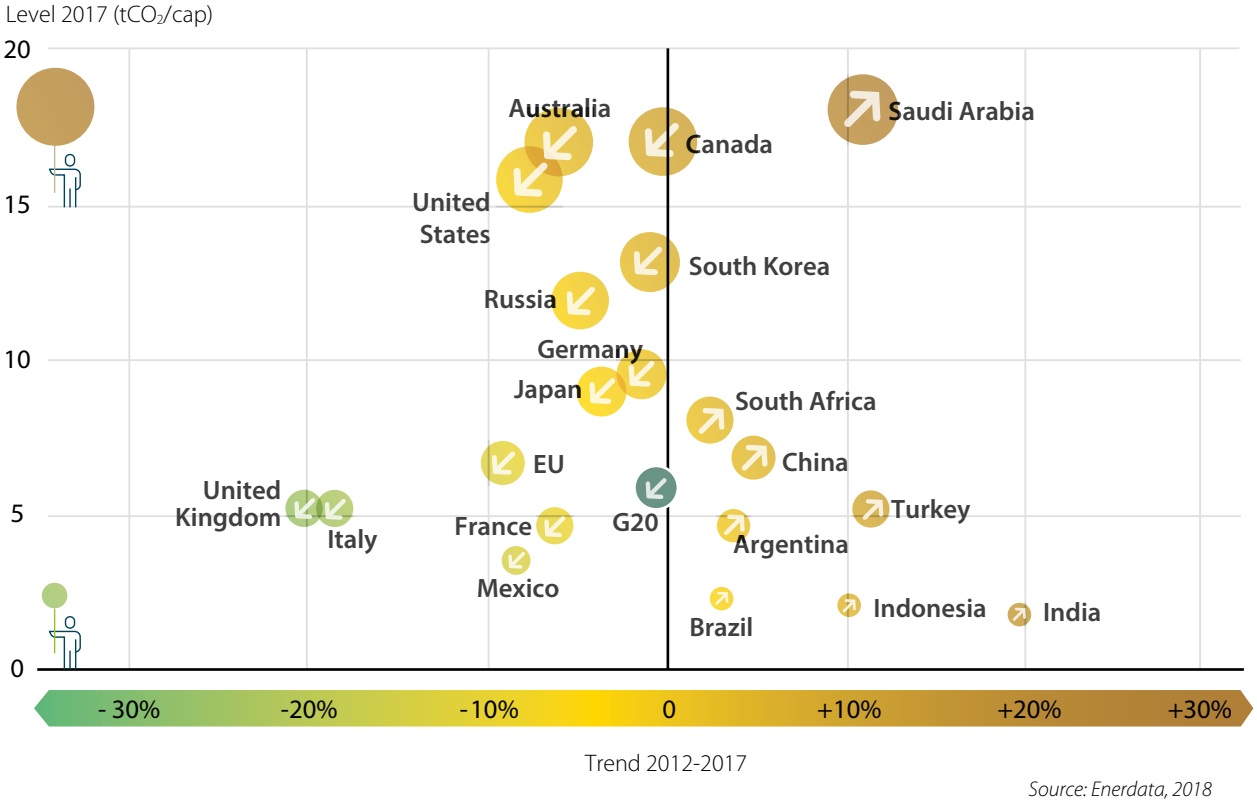
MEXICO AND FRANCE (LOW EMISSION LEVELS AND DECREASING) ARE IN THE LEAD, SAUDI ARABIA AND CANADA (HIGHEST LEVELS AND NO DECREASE) ARE LAGGING BEHIND.

Emerging economies of the G20 – India, Indonesia and Brazil – have the lowest levels of energy-related CO_2 emissions per capita.[26] As their economies are growing they show increasing trends. Taking all greenhouse gases and sectors into account, however, Indonesia's level of emissions per capita would be above the G20 average due to its high emissions from land use and forestry. For the same reason, Brazil would have higher GHG emissions per capita than France, Italy, Mexico and Turkey respectively.

Mexico and France are the two G20 countries that have at the same time low levels of energy-related CO_2 emissions per capita (2017) and show a decreasing trend within the past five years. Mexico's energy-related CO_2 emissions come mostly from power and heat (37%) and transport (34%). Recently there have been reductions in the electricity sector. In France, energy-related emissions are highest in the transport sector (38%) and households, services and agriculture (26%).

Saudi Arabia and Canada are the two G20 countries that have the highest levels of energy-related emissions per capita (2017) and do not show a decreasing emissions trend within the past five years. Industry (38%) and power and heat (38%) are responsible for most energy-related CO_2 emissions in Saudi Arabia. In Canada, power and heat (43%) and transport (28%) are responsible for the highest emission shares, due to high electricity demand and high transport activity.

Energy-related CO_2 emissions per capita



Source: Enerdata, 2018

3.2 SECTORAL DECARBONISATION TRENDS AND CLIMATE POLICIES

Different resources and degrees of economic development in G20 countries determine different sectoral priorities where GHG emissions must be reduced urgently (see table, p. 24). The Climate Transparency policy rating evaluates the extent to which governments already take necessary actions in different sectors. It picks one policy per sector that is an essential precondition for the long-term transformation required to meet the 1.5°C limit.[27] The selected policies, however, do not represent a complete picture of what is necessary to keep warming below 1.5°C (see table, p. 22).

POWER: SOUTH AFRICA, AUSTRALIA AND INDONESIA HAVE THE HIGHEST EMISSION INTENSITY IN THE POWER SECTOR AND LACK CONCRETE ACTIONS TO PHASE OUT COAL.

In most G20 countries, electricity and heat generation is responsible for the largest share of energy-related CO_2 emissions. South Africa, Australia and Indonesia are the "brownest" G20 countries in terms of their level of emission intensity of the power sector in 2017.

South Africa has the highest emission intensity in the power sector – roughly double the G20 average – with an increasing trend in recent years (2012-2017). This is due to its high dependency on coal and low share of renewables in power generation (4% compared to the 24% G20 average).[28] Due to economic development and the need to provide electricity to the poorest people, electricity demand can be expected to increase in the future. Currently, only 84% of its population has access to electricity and its electricity demand per capita (3,675 kWh/capita) is below G20 average (3,920 kWh/capita).[29]

South Africa has started to address its high emission intensity in the power sector. It receives a medium rating for its policy performance in promoting renewable energy considering the ambition of targets and the policy package. According to the draft Integrated Resource Plan (IRP) 2018 (as yet not formally adopted), South Africa plans to expand renewable energy from currently 3.3 GW to more than 25 GW of installed capacity by 2030 – this would equal about 26% of the electricity production by 2030, with the main share coming from wind and solar photovoltaic technologies. No renewables target for 2050 has been adopted so far. A programme to procure renewable energy through power purchase agreements from independent power producers was put on hold in 2016 but was kick-started again in 2018.[30] South Africa also receives a medium rating for phasing out coal. The draft IRP envisages the construction of new coal power plants until 2024, but also assumes that the share of coal will be reduced to 20% of the energy supply by 2050 as coal stations are assumed to run for 50 years. It adds 1,000 MW of new coal Independent Power Producers. However, this additional coal capacity is not needed to ensure energy security, it is not the most cost-efficient solution and it increases emissions.[31]

Australia's electricty demand per capita is more than double the G20 average. It has the second highest emission intensity in the power sector, albeit with a slowly decreasing trend. Its share of renewable energy in power generation is low compared to the G20 (15% vs 24%).[32]

There are virtually no policies apart from the renewable energy target, which will expire in 2020 and is not planned to be replaced. Australia thus receives a poor rating for its policies on renewable energies. Despite this federal inaction, renewables continue to rise due to their economic attractiveness and consumer preferences. Australia also receives a poor policy rating for phasing out coal. The Australian government emphasises the importance of coal for energy security, although the economics on the ground favour renewables. An increasing number of coal power stations are no longer economically viable and have been retired in the past five years, including Hazelwood, a 1,600 MW lignite coal-fired plant.[33]

Indonesia has the third highest emission intensity in the power sector and the intensity has increased in the past five years.[34] At the same time, Indonesia has the lowest electricity demand per capita and the second highest share of population with biomass dependency after India.[35] A diversification of energy sources is needed to meet the increasing electricity demand in the future, to prevent stranded assets and to meet the Paris targets.

Indonesia's policy performance with respect to the promotion of renewables is rated low: it plans to increase the share of new and renewable energy in the primary energy mix to 31% by 2050. The government offers feed-in tariffs for various renewable technologies but the rate is based on the average generation cost of electricity (including subsidised coal power), which renders unsubsidised renewable energy projects uneconomical in some regions.[36] The country receives a poor rating for phasing out coal. The government expects that 56 GW of new power capacity will be needed in the next decade of which the government plans to cover 21 GW by coal. No coal phase-out is under consideration.[37]

Fourteen countries of the G20 countries need a coal phase-out plan. Australia, China, Indonesia, Japan, Mexico, Russia, South Korea, Turkey and the United States lack any action to phase out coal (low policy rating). Brazil, the European Union, Germany, India and South Africa have taken some action, but still lack a concrete coal phase-out plan (medium policy rating).

Canada, France, Italy and the United Kingdom have set a coal phase-out date compatible with the Paris Agreement. However, the share of coal in their energy mix is small in comparison to other G20 countries.

Several G20 countries – Argentina, Brazil, France, Germany and India – receive a high rating for their policy performance for having ambitious new renewable targets and providing strong investment incentives. No G20 country has a 100% renewable target by 2050 in place.

G20 Climate policy performance rating

Performance:
- low
- medium
- high
- frontrunner
- n.a. not applicable

	GHG emissions target for 2050 or beyond	Long term low emissions development strategy	Renewable energy in power sector	Coal phase-out	Phase-out of fossil fuel light duty vehicles	Near zero-energy new buildings	Low-carbon new industry installations	Net zero deforestation
Argentina	low	low	high	n.a.	medium	medium	medium	medium
Australia	low	low	low	low	low	medium	low	medium
Brazil	medium	low	high	medium	medium	medium	medium	medium
Canada	medium	medium	low	frontrunner	medium	high	medium	low
China	low	low	medium	low	medium	high	medium	frontrunner
European Union (28)	high	medium	n.a.	medium	medium	medium	high	high
France	high	high	high	frontrunner	high	frontrunner	medium	medium
Germany	high	high	high	medium	medium	frontrunner	medium	frontrunner
India	low	low	high	medium	medium	medium	medium	frontrunner
Indonesia	low	low	low	low	low	medium	medium	medium
Italy	low	low	medium	frontrunner	medium	frontrunner	medium	medium
Japan	medium	high	medium	low	high	high	medium	medium
Mexico	medium	medium	medium	low	medium	medium	medium	high
Russia	low	low	medium	low	low	low	medium	medium
Saudi Arabia	low	low	low	n.a.	medium	medium	low	n.a.
South Africa	high	high	medium	medium	medium	high	medium	medium
South Korea	medium	low	low	low	medium	medium	medium	low
Turkey	low	low	medium	low	medium	medium	medium	medium
United Kingdom	high	high	low	frontrunner	high	frontrunner	medium	medium
United States	low	medium	low	low	low	medium	low	medium

Note: There is no renewable energy rating for the EU as the Allianz Climate and Energy Monitor does not include data on the EU.

Description of the criteria used for policy rating

Low No action
Medium Some action
High Significant action and a long-term vision
Frontrunner Significant action, and a long-term vision that is compatible with 1.5°C

	Low	Medium	High	Frontrunner
GHG emissions target for 2050 or beyond	No emissions reduction target for 2050 or beyond	Existing emissions reduction target for 2050 or beyond	Existing emissions reduction target for 2050 or beyond and clear interim steps	Emissions reduction target to bring GHG emissions to at least net zero by 2050
Long-term low emissions development strategy	No long-term low emissions strategy	Existing long-term low emissions strategy	Long-term low emissions strategy includes interim steps and/or sectoral targets	Long-term low emissions strategy towards full decarbonisation by around 2050; includes interim steps and/ or sectoral targets, plus institutions and measures in place to implement and/or regularly review the strategy
Renewable energy in power sector	Allianz Monitor 2018 Category 1.2 (targets) and 2 (policies), average 0-25	Allianz Monitor 2018 Category 1.2 (targets) and 2 (policies), average 26-60	Allianz Monitor 2018 Category 1.2 (targets) and 2 (policies), average 61-100	Allianz Monitor 2018 Category 1.2 (targets) and 2 (policies), 61-100 plus 100% renewables in the power sector by 2050 in place
Coal phase-out	No consideration or policy in place for phasing out coal	Significant action to reduce coal use implemented or coal phase-out under consideration	Coal phase-out decided and under implementation	Coal phase-out date compatible with 1.5 C
Phase-out of fossil fuel light duty vehicles (LDVs)	No policy or emissions performance standards for LDVs in place	Energy/emissions performance standards or support for efficient LDVs	National target to phase out fossil fuel LDVs in place	Ban on new fossil-based LDVs by 2025/30
Near zero-energy new buildings	No policy or low emissions building codes and standards in place	Building codes, standards or fiscal/ financial incentives for low emissions options in place	National strategy for near zero-energy buildings (at least for all new buildings)	National strategy for near zero-energy buildings by 2020/25 (at least for all new buildings)
Low-carbon new industry installations	No policy or support for energy efficiency in industrial production in place	Support for energy efficiency in industrial production (covering at least two of the country's sub-sectors (e.g. cement and steel production))	Target for new installations in emissions-intensive sectors to be low-carbon	Target for new installations in emissions-intensive sectors to be low-carbon after 2020, maximising efficiency
Net zero deforestation	No policy or incentive to reduce deforestation in place	Incentives to reduce deforestation or support schemes for afforestation / reforestation in place	National target for reaching zero deforestation	National target for reaching zero deforestation by 2020s or for increasing forest coverage

Sectoral decarbonisation indicators

Performance:
- very high
- high
- medium
- low
- very low

	Emissions intensity of the power sector (gCO_2/kWh) (2017)	Values recent trends (2012-2017)	Transport emissions per capita (tCO_2/capita) (2017)	Values recent trends (2012-2017)	Industry emission intensity (tCO_2e/1,000 US$2015 sectoral GDP (PPP)) (2015)	Values recent trends (2010-2015)	Building emissions per capita (tCO_2/capita) (2017)	Values recent trends (2012-2017)	Agriculture emission intensity (tCO_2e/1,000 US$2015 sectoral GDP (PPP)) (2015)	Values recent trends (2010-2015)	Forest area compared to 1990 level (%) (2015)
	Enerdata, 2018		Enerdata, 2018		Enerdata, 2018; PRIMAP 2018		Enerdata, 2018		PRIMAP, 2018		PRIMAP, 2018
Argentina	358.36	-9.90%	1.09	-2.0%	0.25	-6.7%	0.64	1.4%	1.6	3.3 %	78%
Australia	768.45	-5.90%	4.04	1.6%	n.a.	n.a.	0.62	7.3%	2.9	-0.6%	97%
Brazil	92.70	42.00 %	0.96	-3.9%	0.30	3.7%	0.09	-5.0%	2.8	-10.5%	90%
Canada	144.86	-7.90%	4.76	-2.2%	0.33	-3.1%	2.13	2.1%	3.3	-9.5%	100%
China	623.58	-13.60%	0.63	21.2%	0.50	-20.0%	0.40	17.7%	0.8	-11.5%	133%
European Union (28)	288.62	-15.00%	1.80	4.5%	0.22	-10.0%	1.08	-6.3%	1.6	-3.0%	121%
France	67.99	-2.10%	1.85	-1.6%	0.21	-8.2%	1.09	-11.7%	2.0	-5.5%	118%
Germany	400.34	-11.10%	1.99	7.4%	0.20	-5.3%	1.71	0.3%	3.0	11.8%	101%
India	742.92	-9.50%	0.21	20.2%	0.37	-9.8%	0.10	15.6%	0.4	-8.3%	111%
Indonesia	755.13	5.00%	0.50	1.4%	0.20	-9.4%	0.09	5.4%	0.3	-17.3%	77 %
Italy	304.70	-15.70%	1.69	-3.6%	0.16	-16.9%	1.06	-9.5%	0.9	-2.4%	122%
Japan	491.59	-10.40%	1.66	-2.4%	0.25	-2.7%	0.91	-0.7%	0.7	0.4%	100%
Mexico	464.01	-6.60%	1.16	-7.9%	0.19	-4.4%	0.15	-24.8%	1.8	-5.1%	95%
Russia	330.22	-9.50%	1.21	0.4%	0.49	-3.0%	1.06	24.3%	1.1	-18.9%	101%
Saudi Arabia	717.61	-3.60%	4.03	-2.7%	0.40	2.7%	0.14	-13.3%	0.2	9.1%	100%
South Africa	960.64	5.00%	0.97	-1.1%	0.60	12.1%	0.39	-17.1%	2.3	-2.6%	100%
South Korea	516.99	1.40%	2.04	15.0%	0.39	-11.7%	1.05	-1.2%	0.7	-9.9%	97%
Turkey	543.37	20.50%	1.03	50.7%	0.25	-34.4%	0.72	-10.9%	0.5	-6.0%	122%
United Kingdom	236.60	-51.20%	1.83	1.0%	0.25	-7.8%	1.26	-15.8%	2.5	-13.9%	113%
United States	413.21	-12.90%	5.39	2.2%	0.25	-3.0%	1.55	0.4%	2.9	-11.5%	103%

Note: This rating is relative to the G20 range of performance; it considers the circumstances of the different indicators and at the same time the distance between country data. No data exist on emission intensity of the power sector in the EU for 2017, 2016 data are used for level and 2011–2016 for trend calculations. Brazil's data on emission intensity in the power sector are not drawn from Enerdata, 2018, but from the Brazilian government.[38] National data are also shown for Argentina and Brazil in the industry and agricultural sector. The building sector refers to estimates of direct emissions and both absolute amounts and trends will be different when both Scope 1 and Scope 2 (electricity and commercial heat emissions) are included. For the industry sector, data from Enerdata for the energy-related CO_2 emissions coming from industry are combined with the process emissions from industry (PRIMAP).

TRANSPORT: FRANCE, JAPAN AND THE UNITED KINGDOM LEAD WITH PHASE-OUT PLANS FOR FOSSIL FUEL CARS. THE UNITED STATES, CANADA AND AUSTRALIA HAVE THE HIGHEST TRANSPORT EMISSIONS PER CAPITA. THE UNITED STATES AND CANADA HAVE INADEQUATE FUEL EFFICIENCY STANDARDS, WHILE AUSTRALIA HAS NONE.

The situation is particularly alarming in the United States, Canada and Australia. They are the G20 countries with the highest transport emissions per capita – even increasing trends in the United States and Australia – and insufficient policies to counterbalance this trend.

The **United States** has the highest transport emissions per capita in the G20. Emissions are still growing.[40] The United States has the highest motorisation rate in the G20 (891 vehicles per 1,000 inhabitants).[41] At the same time, its market share of electric vehicles in 2017 of 1.2% is low. Norway remains the world's most advanced market for electric car sales, with more than 39% of new sales in 2017.[42]

The United States is rated poor for its non-existent efforts in phasing out fossil fuel-based light duty vehicles (LDVs). It aims, however, to purchase electric vehicles for 50% of its government fleet by 2025.[43] In 2018, the administration delayed implementation of fuel efficiency standards that had mandated doubling fuel efficiency of new vehicles by 2025. The adjusted regulation will no longer require cars and trucks to become more fuel-efficient every year from 2020 onwards.[44]

Canada has the second highest transport emissions per capita in the G20, although these decreased between 2012 and 2017.[45] The country's motorisation rate is high – 669 vehicles per 1,000 inhabitants.[46] With 1.1%, its market share of electric vehicles is small compared to its G20 peers.[47]

Canada's policies on phasing out fossil fuel-based LDVs are rated medium. The government has adopted emission and fuel standards for LDVs. Some provinces provide financial incentives on the purchase of electric vehicles, although some have recently been scrapped, but taxes on transport fuel remain very low compared to other OECD countries. Canada is currently developing a national Zero-Emissions Vehicle Strategy, to be published in 2018, and a Clean Fuel Standard.[48]

Australia has the third highest transport emissions per capita in the G20. These still show an increasing trend.[49] For every 1,000 inhabitants, there are 762 vehicles in Australia.[50] The country's share of electric vehicles (0.1 %) is negligible.[51]

Australia receives a poor rating as there are very few policies in the transport sector. The government provides exemptions from some vehicle taxes for highly efficient vehicles. In contrast to other developed countries, Australia does not have any efficiency or CO_2 emissions standards for passenger vehicles. Passenger vehicles are responsible for the largest share of emissions.[52]

The transport emissions per capita of several **other G20 countries** – the European Union, France, Germany, Italy, Japan, Mexico, Russia, Saudi Arabia, South Korea and the United Kingdom – are also above the G20 average. Urgent action in all these countries is needed to reduce emissions in this sector to zero by 2050 if the Paris Agreement goals are to be reached. Policy efforts in the transport sector in these countries are still limited. France, Japan and the United Kingdom are the only ones that have a high policy rating.

France and the United Kingdom announced a ban on new petrol and diesel cars by 2040. If this ban were for 2030/35, it would be 1.5°C-compatible. Despite ambitious targets, however, France's emissions in the transport sector continue to increase because of an increasing demand for mobility as well as insufficient policies, e.g. to effectively conduct a modal shift in freight transportation. Japan aims for a 50% to 70% share of electric vehicles in total domestic vehicles sales by 2030. In 2018, the government announced that Japan would be selling only electric passenger vehicles by 2050, and that emissions of all passenger vehicles would be reduced by 90% against 2010 level.[53]

With much lower motorisation rates, India, Indonesia and China are the G20 countries with the lowest transport emissions per capita in the G20. At the same time, economic development has led to increased emissions in all three countries over the past five years (2012–2017). Efficient policies in the transport sector are thus vital.

India has the lowest transport emissions per capita in the G20, but at 20% it has the third highest growth rate in the past five years. (Turkey has the highest growth rate at 51%.)[54] India's motorisation rate is still the lowest: there are 17 vehicles per 1,000 inhabitants.[55] Its market share of electric vehicles remains very low (0.06% in 2017).[56]

With regard to phasing out fossil-based LDVs, India receives only a medium rating: the government promotes the deployment of electric vehicles (EVs), however, it has recently dropped the target of 100% EV sales by 2030. In 2018, the government launched a new National Electric Mobility Programme focusing on charging infrastructure and government procurement of EVs.[57]

Indonesia has the second lowest transport emissions per capita in the G20 with growth rates below the G20 average for the past five years (1.4%).[58] Indonesia's motorisation rate – 50 vehicles per 1,000 inhabitants – is higher than that of India, but is still low compared to the G20.[59]

Indonesia is rated poor for its transport policy as it has no target to phase out fossil fuel-based LDVs. Since 2018, petrol vehicles need to adhere to Euro 4 standards, while for diesel the former Euro 2 standard still applies until 2021.[60]

China has the third lowest transport emissions per capita in the G20, but the second highest growth rate in the past five years (21%).[61] The motorisation rate is still low in China, with 83 vehicles per 1,000 inhabitants.[62] Of the 1 million electric cars sold worldwide in 2017 – a new record – half were sold in China. The country has the highest market share of electric vehicles (2%) among the G20.[63]

China receives a medium policy rating as the government has no targets to phase out fossil fuel-based LDVs. China has climate policies for the transport sector: it has established stringent fuel efficiency standards, a subsidy scheme for the purchase of EVs, the highest in the world, a new cap-and-trade scheme obliging car manufacturers to produce at least 12% zero- or low-emission vehicles by 2020, and a target to sell 2 million EVs per year by 2020.[64]

BUILDINGS: CANADA, GERMANY AND THE UNITED STATES HAVE THE HIGHEST EMISSIONS PER CAPITA IN THE G20. G20 COUNTRIES CAN LEARN FROM 1.5°C-COMPATIBLE PRACTICES IN THE EUROPEAN UNION.

Emissions from buildings are driven by the average size of homes, climatic conditions (heating and cooling needs), efficiency and fuel choice. The figures below only include direct emissions from space heating. Emissions from electricity use, such as for air conditioning, are not included.

Canada has by far the highest building emissions per capita, more than four times higher than the G20 average, followed by Germany and the United States. All three countries have significant heating needs and relatively large homes. Their emissions show slightly increasing trends from 2012 to 2017.[65]

Canada has begun to counterbalance its increasing emissions in the building sector, receiving a high rating in the policy assessment. Different government levels are working together to adopt a "net zero-energy ready" code for new buildings by 2030 (2017 Buildings Strategy). To be 1.5°C-compatible, however, new buildings would have to become near zero-energy already by 2020/25. From 2019 it will be mandatory to label energy use of buildings in Canada, and governments are working to establish a country-wide building code for existing buildings by 2022.[66]

Equally **Germany** counterbalances its high emissions with 1.5°C-compatible policies, thus is rated "frontrunner". The government implements EU legislation to make all new buildings zero-energy by 2020, and to make the entire building stock virtually climate-neutral by 2050 (80% energy reduction). Yet, there are no adequate policies for existing buildings and renovation rates are far from sufficient.[67]

The **United States** receives a medium policy rating for its actions. Most states have building codes, but the majority requires weaker standards than the voluntary national model code. Its Better Building Initiative aims to make buildings 20% more energy-efficient by the 2020s but no strategy for near zero-energy buildings exists.[68]

Countries with building emissions above the G20 average are Argentina, Australia, the European Union, France, Italy, Japan, Russia, South Korea, Turkey and the United Kingdom. Increased policy ambition is thus needed in all of these countries. The European countries are the only ones in the G20 that have targets in the building sector that are 1.5°C-compatible.

Indonesia, Brazil and India have the lowest building emissions per capita in the G20. Arguably, this is also the reason why no ambitious policies are in place in these countries. Indonesia's buildings emissions per capita, however, have increased by 5.4% between 2012 and 2017 (increase above G20 average).[69]

INDUSTRY: ONLY THE EUROPEAN UNION RECEIVES A HIGH POLICY RATING BECAUSE OF ITS TARGET FOR NEW INSTALLATIONS IN EMISSIONS-INTENSIVE SECTORS TO BE LOW-CARBON. SOUTH AFRICA, CHINA AND RUSSIA LAG BEHIND IN REDUCING THEIR EMISSION INTENSITY.

Emission intensity in the industry sector is heavily influenced by the structure of industry: many developed countries have outsourced heavy industries leading to a lower intensity when emissions are counted and attributed according to territorial boundaries. If emissions from goods produced elsewhere were taken into account, developed countries' emissions would be roughly 10% to 20% higher.[70]

Considering industrial production emissions (e.g. by-product of conversion of raw materials to mineral, metal or chemical products), South Africa, China and Russia have the highest emission intensity in the industry sector[71] and lack ambitious policies with a long-term vision.

South Africa has by far the highest emission intensity in this sector compared to its G20 peers. Only in Brazil and Saudi Arabia has the emission intensity also been increasing over the past few years. South Africa receives a medium policy rating for having some energy efficiency measures in the industry sector in place. Its Draft Post-2015 Energy Efficiency Strategy (not yet adopted) envisages reducing energy consumption in industry by 16% by 2030 compared to 2015 levels. Support schemes mainly include voluntary energy audits, training and tax incentive schemes. It lacks, however, a target for new installations in emissions-intensive sectors to be low-carbon.[72]

Despite a decrease of 20% (2010-2015), **China** has the second highest emission intensity in the industry sector. For the top 10,000 energy-consuming companies, a programme for energy conservation and low-carbon developments is in place. China receives however only a medium policy rating as it has no target for new installations in emissions-intensive sectors to be low carbon thus it lacks a long-term vision to reduce emissions in the sector.[73]

Russia has the third highest emission intensity in the industry sector with a slightly decreasing trend of 3%. The country requires mandatory energy audits for large energy consumers and transition to best available technologies by 2025. It thus receives a medium policy rating for limited action, which is, however, insufficient to reach the Paris targets.[74]

No G20 country has a low-carbon target for new installations in emissions-intensive sectors, besides the European Union. The EU's Industrial Emissions Directive requires around 50,000 installations undertaking industrial activities to receive a permit showing that they operate according to the Best Available Techniques. Most G20 countries support energy efficiency in industrial production (medium policy rating), albeit with different ambition levels. No action is taken in Australia, Saudi Arabia and the United States (low policy rating).

FORESTRY: INDONESIA, ARGENTINA AND BRAZIL HAVE THE HIGHEST FOREST LOSS IN THE G20 AND DO NOT SHOW SUFFICIENT ACTION TO REVERSE THIS TREND.

Between 1990 and 2015, the forest area in Indonesia, Argentina and Brazil decreased by 23%, 22% and 10% respectively.[75] In total numbers, the loss is less for Argentina, by virtue of having a much smaller forest area.

Indonesia receives a medium policy rating in the forestry sector as it has no national target to reach zero deforestation. Despite a 2011 moratorium on logging in undisturbed areas, valid until May 2019, Indonesia is still facing alarmingly high rates of deforestation, mainly driven by the pulp and palm oil industry. However, the government put a freeze on issuing new palm oil licences until 2021, offers support schemes for reforestation, and is establishing an agency tasked to manage financing for REDD+ activities.[76]

In 2017, **Argentina** adopted a National Action Plan on Forests and Climate Change, to reduce GHG emissions from the forest sector by at least 27 $MtCO_2e$ by 2030. There is no target for reaching net zero deforestation. The country receives a medium rating.

Brazil had in 2008 set itself a target of reaching "net zero deforestation" by 2015 but has corrected this to a target of "zero illegal deforestation" by 2030. The country's climate policy in the forest sector is thus rated medium. The deforestation rate in the Amazon forest dropped by 76% from 2005 to 2012 but increased again by 52% from 2012 to 2017. This recent trend is not consistent with Brazilian NDC goals. The government plans to reforest an area of 12 million hectares by 2030, and launched in 2017 a revised monitoring system to fight illegal logging.[77]

China, Germany and India present targets for reaching at least net zero deforestation by the 2020s, which is 1.5°C-compatible. These countries thus receive a frontrunner rating.

China aims to increase the country's tree coverage from 21.7% to 23% from 2016 to 2020, leading to net zero deforestation.[78]

According to its 2050 Climate Plan **Germany** aims to increase its forest area over the next decades.[79]

The **Indian** government is currently revising its forest policy to align with India's NDC: the draft policy aims to have at least one-third of the total land area under forest and tree cover. The current level is 24.4%, so India is seeking to increase its total forest cover.[80]

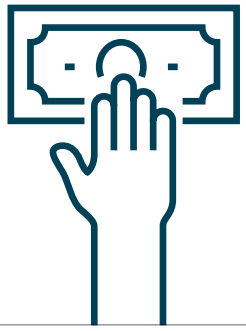
3.3 FINANCING THE TRANSITION

Transitioning to low-carbon, climate-resilient economies consistent with the ambitions of the Paris Agreement requires mobilising green finance and redirecting fossil fuel-based, brown finance. The scale of investment needed to meet countries' NDCs will be substantial. The International Energy Agency (IEA) (2015) estimated that the full implementation of country pledges would require energy sector investment of US$13.5 trillion between 2015 and 2030.[81] Even irrespective of climate mitigation considerations, huge infrastructure investments in this sector are required due to the ageing energy system in industrialised countries and lacking or limited energy access in developed countries.

Public and private actors need to act. Governments and public institutions are crucially important in creating an enabling environment to finance the transition with three core tools at their disposal: 1) financial policies and regulations; 2) fiscal policy levers; and 3) public finance. Private green investment is both an output of the application of these tools, and a catalyst to further green investment.[82]

FINANCIAL POLICIES AND REGULATIONS

Many G20 governments are putting policies in place for greening the financial system and (re)directing finance towards low-carbon, climate-resilient opportunities. These include policies on climate-related financial disclosure, green market development such as green bonds standards, climate-related credit policies and lending requirements for banks or climate-related investment requirements of public funds and development finance institutions. **Argentina, China, Italy** and **South Africa** are all developing financial system roadmaps, or plans to enhance the financial system's ability to mobilise private capital for green investment.[83] While increasing numbers of G20 countries are pursuing routes to increase green finance, few have systematically joined these to plans for phasing out or redirecting brown financing.



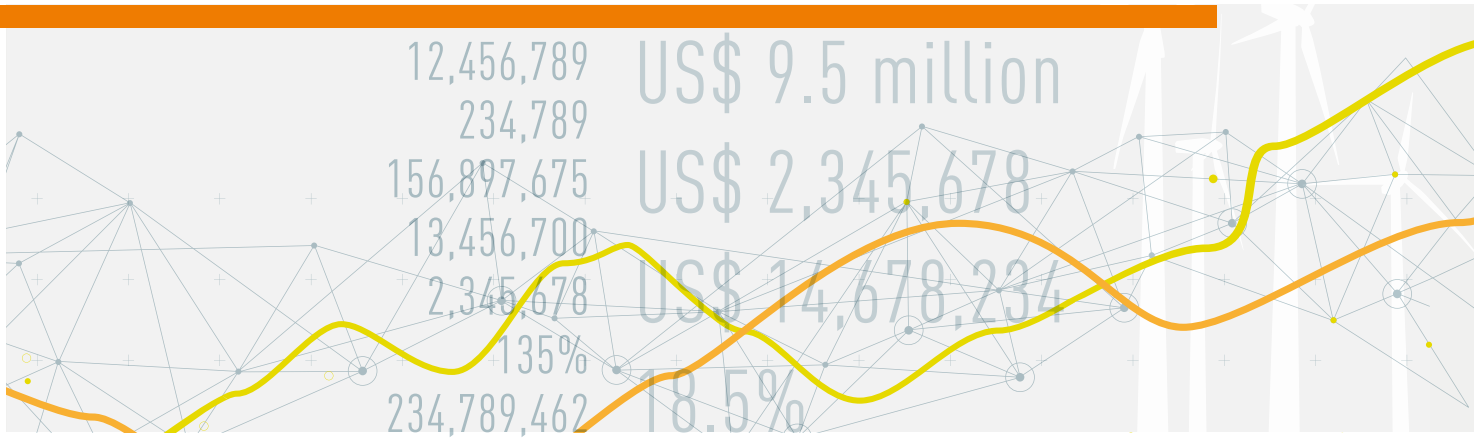
FRANCE, THE EUROPEAN UNION AND JAPAN LEAD ON CLIMATE-RELATED FINANCIAL DISCLOSURE.

Climate risks are financial risks:

1) floods or droughts can destroy assets (physical risks);
2) parties can seek compensation for losses they suffered due to climate impacts (liability risks); and
3) assets can become stranded if investments, particularly in oil-, gas- and coal-intensive industries are not aligned with long-term climate policies in a country (transition risks).

The Financial Stability Board of the G20 established in 2015 the Task Force on Climate-related Financial Disclosures (TCFD). The TCFD developed voluntary recommendations for companies on how to disclose climate-related financial risks.[84]

Several G20 regulatory authorities have taken actions towards implementing the TCFD recommendations.[85] The recommendations were only published in June 2017, so it is still early to judge the progress that countries have made and a number of G20 countries have not yet formally



engaged with TCFD recommendations. It is worth noting that the TCFD is just one way to increase disclosure of climate risk. Some G20 countries have other environmental risk disclosure guidelines in place.

France is the only G20 country to have TCFD recommendations **encoded into law**. Article 173 of the 2015 Energy Transition Law mandates climate disclosure for institutional investors (both on the financial risks and measures to tackle them).[86] In 2017, the Autorité de Contrôle Prudentiel et de Résolution (ACPR)[87] and French President Emmanuel Macron, at his One Planet Summit, called for TCFD implementation worldwide. Moreover, the Banque de France and ACPR are founding members of the Central Banks and Supervisors Network for Greening the Financial System (NGFS)[88] to progress this agenda.

The **European Union** and **Japan** have **published guidance and action plans**, but have not yet made implementation of the TCFD recommendations mandatory. The European Commission (EC) High-Level Expert Group on Sustainable Finance (HLEG) 2018 report called for implementation of the TCFD recommendations. The EC also published its Sustainable Finance Action Plan in 2018, detailing how reforms, new laws and amendments to existing laws can implement the HLEG recommendations, in line with the TCFD recommendations.[89] Japan's Ministry of Economy, Trade and Industry (METI) created a Study Group on Long-term Investment toward Sustainable Growth in 2016 (Investment evaluating Environment, Social and Governance Factors and Intangible Assets). In 2017, this group published guidelines for companies and investors that aim to support the disclosure of corporate information including sustainability and climate change.[90]

Australia, Canada, the European Union, Italy, Japan, South Africa, Turkey and the United Kingdom have engaged with the private sector on developing climate-related financial disclosure policies by setting up expert groups and task forces. The United Kingdom, for example, set up a Green Finance Taskforce in 2017 exploring policy changes needed to make green finance an integral part of the financial system.[91]

Approaches to implementing the recommendations of the TCFD

	No formal engagement with TCFD	Political and regulatory engagement	Formal engagement with private sector	Publication of guidance and action plans	Encoding into law
Argentina	■				
Australia		■	■		
Brazil		■			
Canada		■	■		
China		■			
European Union (28)		■	■	■	
France		■			■
Germany		■			
India	■				
Indonesia	■				
Italy		■	■		
Japan			■	■	
Mexico		■			
Russia	■				
Saudi Arabia	■				
South Africa		■	■		
South Korea	■				
Turkey			■		
United Kingdom		■	■		
United States		■			

Source: : CISL, 2018

FISCAL POLICY LEVERS

Fiscal policy levers raise public revenues and direct public resources. Critically, they can shift investment decisions and consumer behaviour towards low-carbon activities by reflecting externalities in pricing. Well-known instruments include energy taxes, carbon pricing schemes and phasing out of fossil fuel subsidies.

SAUDI ARABIA, ITALY, AUSTRALIA AND BRAZIL PROVIDE THE HIGHEST AMOUNTS OF FOSSIL FUEL SUBSIDIES PER UNIT OF GDP WITHIN THE G20.

G20 countries provided US$147 billion subsidies to coal, oil and gas in 2016 – an enormous increase from US$75 billion in 2007.[92] This estimate only includes tax exemptions and budgetary support towards production and consumption of fossil fuels, and does not consider other types of subsidies, such as state-owned enterprise investments and public financing. Per unit of GDP, **Saudi Arabia** (total subsidies: US$30 billion), **Italy** (US$14 billion), **Australia** (US$7 billion), **Brazil** (US$16 billion), **Indonesia** (US$9 billion) and **Argentina** (US$3 billion)[93] provided the largest amount of subsidies in 2016. In half of these countries – Australia, Brazil and Italy – subsidies have increased, although with fluctuations, since 2017. In Brazil they have roughly doubled and in Italy quintupled.

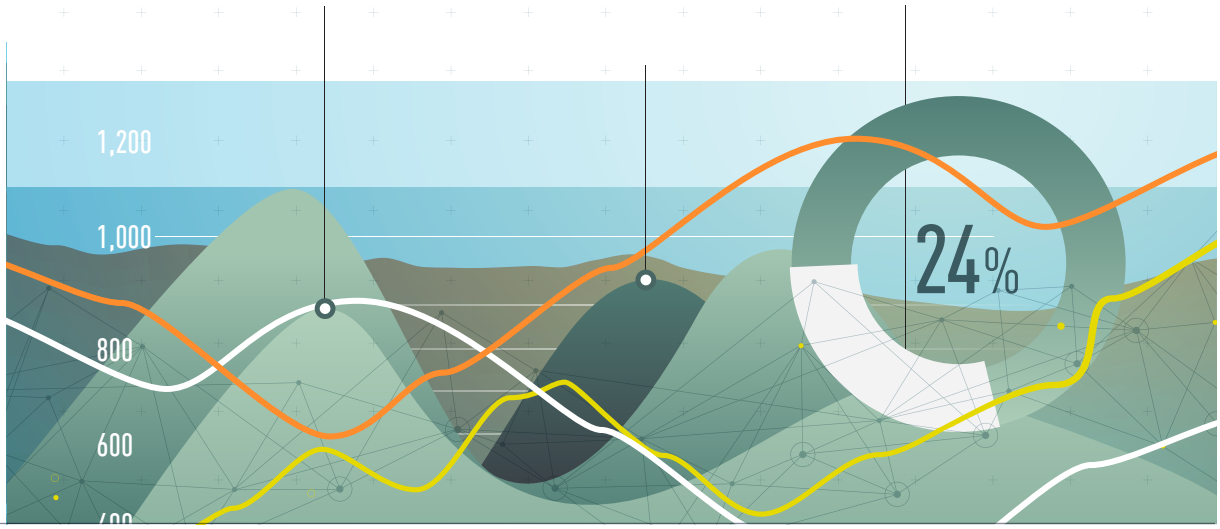
In **Australia**, shifts are in part due to the increase in fuel tax credits to off-road users and on-road heavy transport whose primary beneficiary is the mining sector (from US$1.4 billion in 2007 to US$4.4 billion in 2016).

In **Brazil**, the largest subsidy, which has increased over time, is the PIS/COFINS measure to maintain fixed prices for the import and retail sale of gasoline, diesel, aviation kerosene and natural gas (US$8.7 billion in 2016).

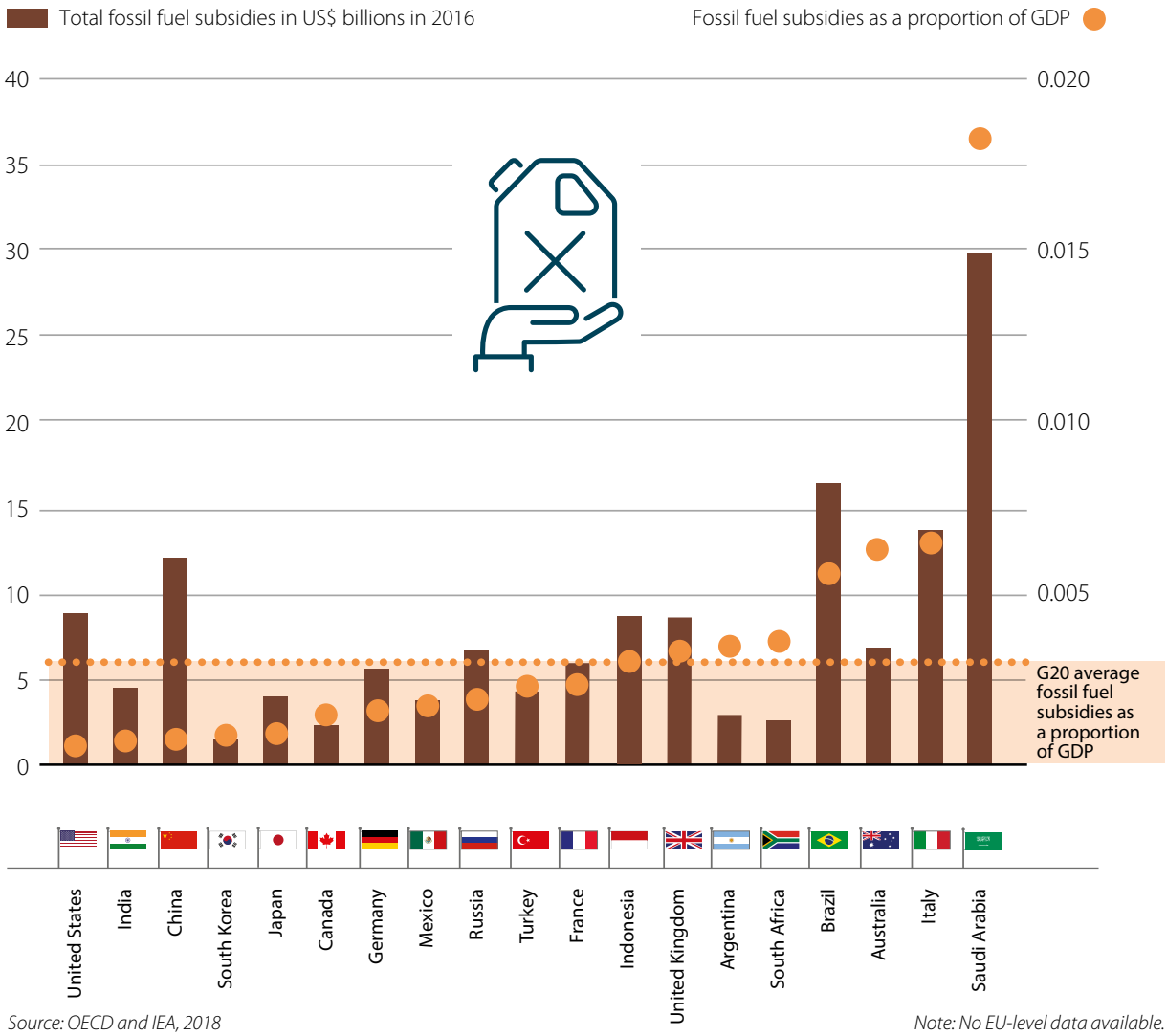
Italy increased its consumption-based subsidies, accounting for 93% of fossil fuel subsidies in 2016.[94]

In contrast, Saudi Arabia sticks out because of its enormous reduction in fossil fuel subsidies from US$57.1 billion in 2014 to US$29.7 billion in 2016. The decline is likely the result of reforms undertaken in a time of low fuel prices and export revenues.[95]

What is alarming however, is that the provision of subsidies is increasing in several countries that are currently below the G20 average: France, Germany, Japan, Mexico,[96] Russia, South Africa and Turkey.



Fossil fuel subsidies in the G20



Source: OECD and IEA, 2018

Note: No EU-level data available.

Since 2009, the G20 has committed every year to phasing out inefficient fossil fuel subsidies in the medium term. Under the previous German G20 Presidency it was suggested to follow the G7's pledge on phasing out fossil fuel subsidies by 2025; however, a consensus on this has not been reached, including under the Argentinian Presidency this year. Fossil fuel peer reviews, increasing the awareness of subsidies in place, have been conducted by the US–China, Mexico–Germany and Indonesia–Italy (due 2018). This year, Argentina and Canada have announced they will undertake a fossil fuel subsidy peer review.[97]

AUSTRALIA, INDIA, INDONESIA, RUSSIA AND SAUDI ARABIA ARE THE ONLY G20 COUNTRIES THAT DO NOT HAVE, AND ARE NOT CONSIDERING, AN EXPLICIT CARBON PRICING SCHEME.

Most G20 countries have implemented or are in the process of implementing explicit carbon pricing schemes such as Emission Trading Systems (ETS) and carbon taxes. Australia,

India, Indonesia, Russia and Saudi Arabia have no explicit carbon pricing schemes and are not considering it. India phased out the earmarking of revenues from the Clean Environment Cess (taxing coal) for environmental purposes, subsumed under the introduction of the centralised General Systems Tax. Turkey is currently considering the introduction of a carbon pricing scheme, as is Brazil. The United States has only a carbon pricing scheme at subnational level.[98]

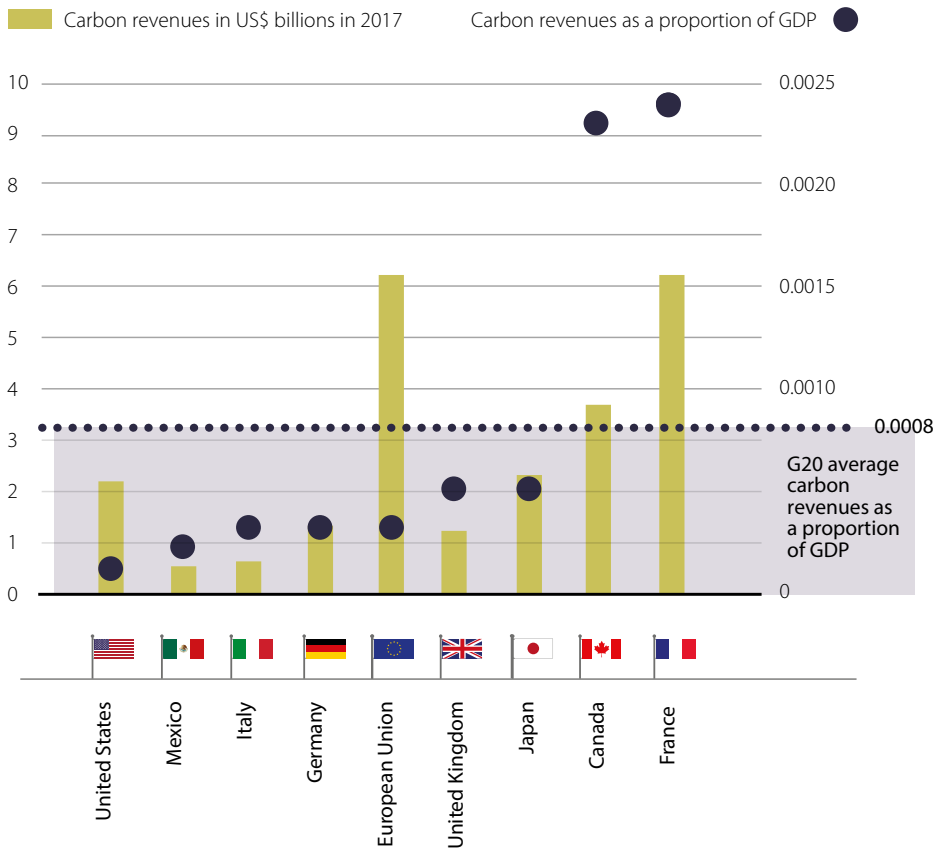
In addition to explicit carbon pricing mechanisms, there are implicit carbon pricing mechanisms – namely specific taxes on fossil fuels. In 2015, G20 countries with both explicit and implicit carbon pricing – Canada, China, the European Union, France, Germany, Italy, Japan, Mexico, South Korea, the United Kingdom and the United States – covered on average 70% of total carbon emissions from energy use. In particular, France, Germany, Italy and South Korea taxed between 83% and 97% of emissions from energy use in these ways. In contrast, G20 countries with only implicit carbon pricing mechanisms in 2015 – Argentina, Brazil, India, Indonesia, Russia, Turkey and South Africa – taxed on average 38% of total carbon emissions from energy use. For example, Indonesia taxed 16% and South Africa 12% of carbon emissions from energy use.[99]

ONLY CANADA AND FRANCE GENERATE MORE PUBLIC REVENUES THROUGH EXPLICIT CARBON PRICING THAN THEY SPEND ON FOSSIL FUEL SUBSIDIES.

Despite the wide application of carbon pricing schemes, price levels are often low.[100] This structure – high fossil fuel subsidies and low carbon prices – favours high-carbon investments and hinders creating a conducive fiscal space for sustainable financing.

In 2017, Canada and France were the two G20 countries with the highest carbon revenues as a proportion of GDP with total revenues of US$3.7 billion and US$6.2 billion,[101] respectively. Both countries are also the only ones in the G20 which generate more public revenue through explicit carbon pricing than they spend on fossil fuel subsidies (Canada: US$3.7 billion vs US$2.1 billion; France: US$6.2 billion vs US$5.8 billion).[102]

Revenues of explicit carbon pricing mechanisms in G20 countries



The G20 average carbon revenues line excludes the EU ETS. There is double counting across (i) the EU ETS and (ii) the national EU ETS revenues from France, Germany, Italy and the UK. China has no data available. South Korea due to the free allocation of permits has not generated revenues in 2017.

Source: I4CE, 2018

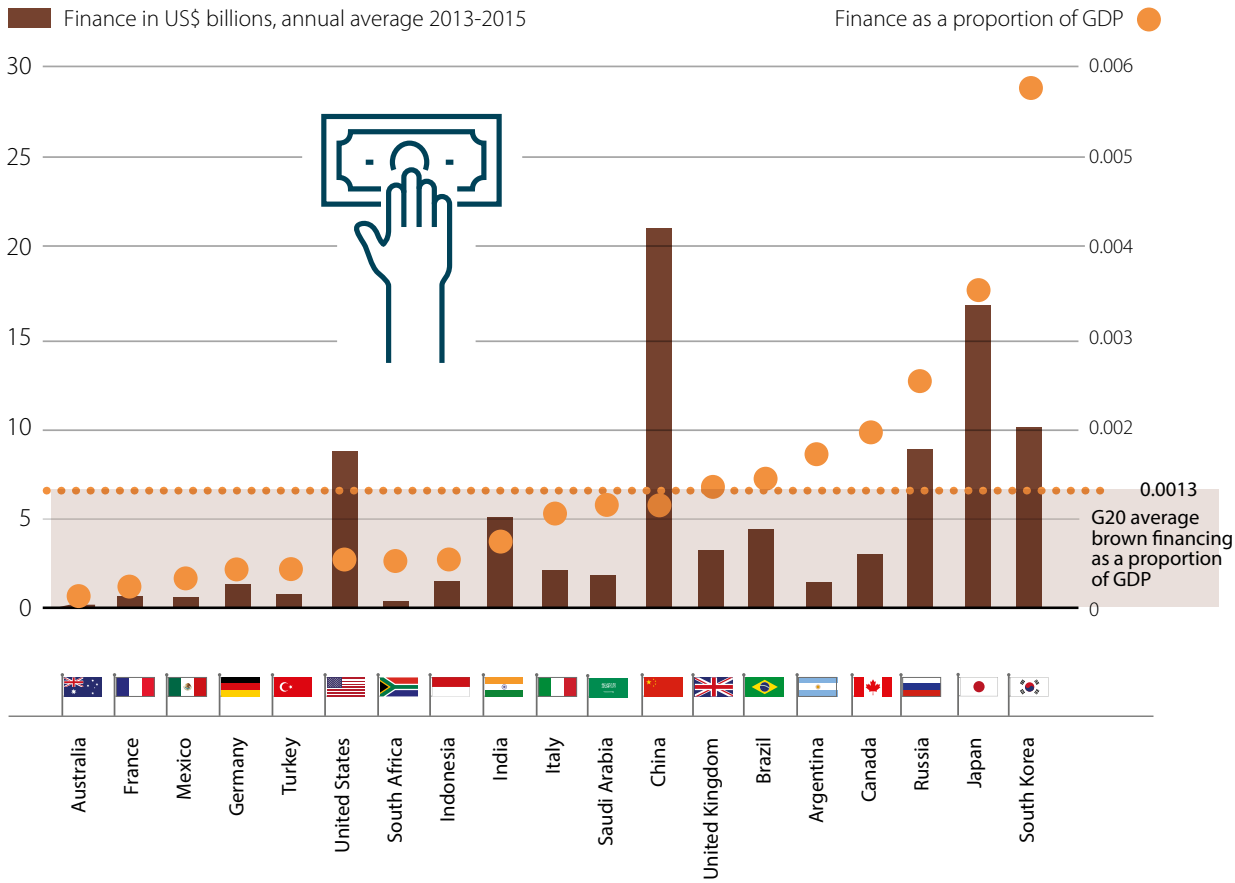
PUBLIC FINANCE

Public finance has a significant impact on the transition to a low-carbon economy – in stimulating innovation, helping to mainstream new technologies, overcoming market barriers to private investment, as well as providing direct investment to climate action. In advanced economies, for example, public resources contribute about 40% of the infrastructure investment.[103] Governments steer investments through their public finance institutions, both at home and overseas, including development banks and green investment banks. Developed G20 countries also have an obligation to provide financing to developing countries; public sources are a key aspect of these obligations under the UNFCCC.

G20 COUNTRIES INVEST ON AVERAGE US$91.4 BILLION A YEAR IN FOSSIL FUEL POWER PROJECTS.

From 2013 to 2015, G20 countries provided on average US$91.4 billion a year for fossil fuel power projects (coal, oil and gas projects and associated infrastructure). This direct national and international investment by each G20 country is channelled through national and international development banks, majority state-owned banks and export credit agencies.[104] South Korea, Japan and Russia provide the largest amounts compared to their GDP.

G20 Public finance to coal, oil and gas projects



Source: Oil Change International, 2017

G20 INTERNATIONAL PUBLIC FINANCE PROVISION IS INCREASING.

The international provision of public climate finance remains a small but important part of total finance flows relevant to efforts addressing climate change. This concessional public climate finance can help developing countries to mobilise and scale up investment across key sectors. Crucially, developed[105] country members of the G20 have an obligation to support developing countries to mitigate and adapt to climate change.

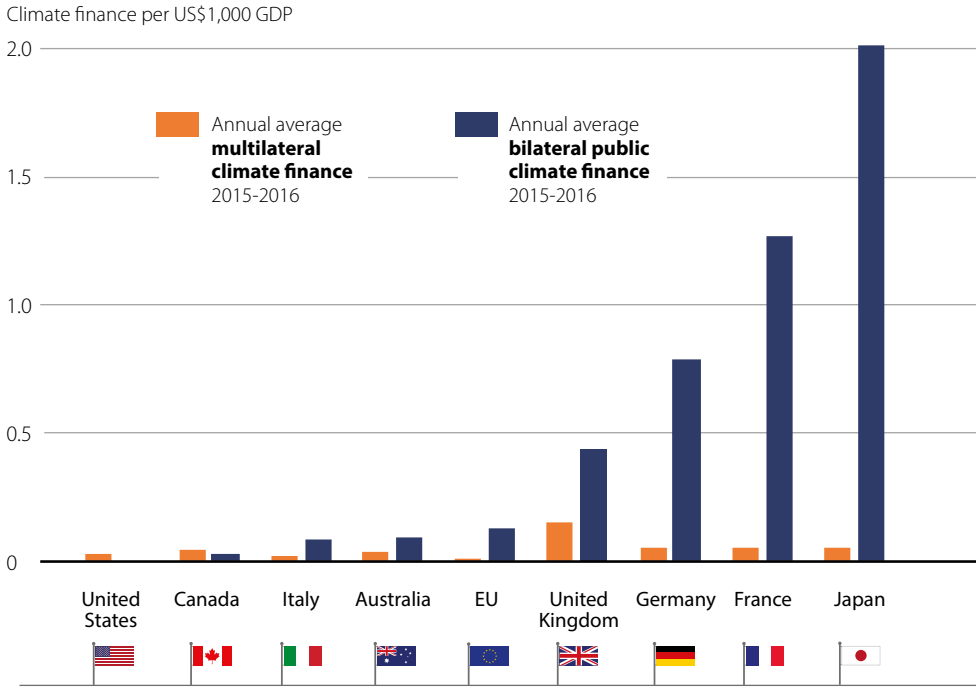
During 2015 and 2016, the eight G20 countries obligated to provide finance under the UNFCCC reported US$19.6 billion in bilateral flows, increasing from US$17 billion in the 2013/2014 period.[106] The provision via multilateral climate funds, based on approval figures, remained at the level of US$1.5 billion. More than half (52%) of the funds are directed to mitigation, the contribution towards adaptation is comparatively small at 19%, while finance supporting cross-cutting and other objectives amounts to 28%.[107]

The largest climate finance donors are Japan, France, Germany, the European Union and the United Kingdom, each providing between US$1.5 billion and US$10 billion per year in 2015/2016. The United Kingdom remains the highest contributor via the multilateral climate funds, while Japan, France and Germany remain highest bilateral contributors. The nature of support differs between these donors, however. Japan and France use significantly more concessional loans compared to other G20 countries. The United States is not included in the findings on bilateral funding as it has not submitted a biennial report to the UNFCCC.[108]

Bilateral and multilateral commitments, such as to the Green Climate Fund, signal strong ambition and ongoing trust in the UNFCCC system. Two things undermine this somewhat: the Australian prime minister's recently stated intention to drop all contributions to the Green Climate Fund, and the uncertainty over the remaining US$2 billion pledged by the United States.

A number of developing G20 countries have shown leadership in international climate finance provision. Though not obliged to provide climate finance, many have pledged to the multilateral climate funds. South Korea, Mexico, China, Brazil, Russia, India, South Africa and Indonesia have all provided resources on a voluntary basis, equating to shares of between US$0.02 million and US$8.9 million of approvals through these funds in 2015/2016.

International public climate finance provision relative to GDP



Source: Biennial reporting to the UNFCCC and Climate Funds Update, 2018

4 FAIRNESS: What are the G20 countries doing to make the transition just?

More ambitious climate action requires broad political and societal support. It is important that the transition to a low-carbon economy is considered just for those potentially adversely affected by it: workers, communities, enterprises, poor households. What is therefore needed is a just transition of the workforce through compensation and retraining for those people who lose their jobs and national policies to support the development of green and decent jobs.[109] Phasing out fossil fuel subsidies and establishing carbon pricing can lead to higher energy prices, placing a greater burden on the poor. To prevent these social repercussions, subsidy reforms and carbon pricing can be complemented by compensation of poor households. Revenues of carbon pricing and phasing out fossil fuel subsidies can support public goods such as energy access, health, education and sustainable infrastructure.[110]

At the climate conference COP24 under the Polish Presidency, Parties will discuss the implementation of the just transition principle in the Paris Agreement stating that "the imperatives of a just transition of the workforce and the creation of the decent work and quality of jobs in accordance with nationally defined development priorities" have to be taken into account.[111] As country-specific contexts differ substantially, no comparable information exists on just transition actions. In various G20 countries, the debate on just transition has started with the engagement of trade unions and the regions affected. There are national or regional governmental initiatives to learn from in Australia, Canada, China, the European Union, France, Germany, Indonesia, South Africa and the United States.

Australia: Major Australian unions (the CFMEU and ACTU) agreed to negotiate a comprehensive agreement with the Victoria state government and three privately owned power stations – the Latrobe Valley Worker Transfer Scheme – aimed at managing and preventing job losses, rather than simply mitigating their effects.[112] The agreement provides for placing Hazelwood workers in alternative jobs, and commits partner companies to minimise job losses, retrain workers and implement early retirement schemes, allowing more opportunities for younger workers who want to remain in the industry.[113]

Canada: The Pan-Canadian Framework, Canada's long-term climate plan, calls for "a commitment to skills and training to provide Canadian workers with a just and fair transition to opportunities in Canada's clean growth economy".[114] A federal taskforce has since begun work on developing a just transition plan for coal workers and communities.[115] Similar work has yet to be called for oil and gas workers. Canadian unions have continued campaigning for just transition implementation, providing proposals for programmes on skills development, worker retraining and employment insurance, while calling for clean energy investment to be targeted at indigenous, remote and rural communities.[116]

China: Reducing coal could affect employment. Currently there are nearly 3.5 million workers in coal mining. The Chinese government has allocated 30 billion yuan (US$4.56 billion) over the next three years to support the closure of small, inefficient coal mines and redeploy around 1 million workers. It is not known how the fund will help these workers.[117]

European Union: The European Commission included the concept of just transition in its Communication on the Energy Union, according to which a just energy transition will require "retraining or up-skilling of employees in certain sectors and, where needed, social measures at the appropriate level".[118] In December 2017, the Commission established the Platform for Coal Regions in Transition to assist EU Member States and regions in structural and technological transition in coal regions. Just transition has also been referenced in the European Union's Governance directive that requires taking its aspects into consideration in the process of decarbonisation.[119]

France: "Just transition" entered the French political discourse following President Macron's election in 2017, with the formation of the Ministry of Ecological and Inclusive Transition. France's Climate Plan prioritises closing the four remaining coal power stations by 2022; national coal and shipping unions have expressed opposition to this deadline. The plan calls for a "managed transition", emphasising the need to support affected workers in the short and medium terms.[120] Subsequently, the draft finance bill for 2019 plans to create a ten-year compensation fund to make up for the loss of revenue for local authorities caused by the closure of coal power stations.[121] Meanwhile, similar local support schemes have already been agreed with nine other regions, which support local mitigation projects or green start-ups, rather than wholesale industrial restructuring.[122]

Germany: Around 20,000 workers would be affected if the government decides to phase out lignite coal use, to reach the targets of the Paris Agreement. The government pledged €1.5 billion (US$1.72 billion) for the period 2017–2021 to ease structural changes. It acknowledges that more funding will be needed beyond 2021, and has set up a commission on "growth, structural change and employment" to address coal phase-out.[123]

Indonesia: Indonesia is the world's fourth largest producer of coal and the tenth largest producer of natural gas, and is increasingly reliant on oil imports. In 2015, Indonesia introduced a new fuel pricing mechanism that effectively reduces subsidies on imported oil and gasoline. While it is difficult to determine impacts on employment, the reduced budget allocation to fuel subsidies allowed greater spending in socially linked programmes to boost growth and reduce poverty indirectly including developing a universal health coverage programme.[124]

South Africa: South Africa's economy is highly coal-dependent, and the coal mining sector employs 80,000 workers. South Africa has high levels of poverty and unemployment; ensuring a just transition has therefore been explicitly recognised as a priority in national policy.[125] Moreover South Africa is the only country to directly refer to "an inclusive and just transition" in its NDC.[126] Currently a social dialogue process has been launched by South Africa's National Planning Commission to develop just transition sustainable development pathways, but explicit transition policies for workers and communities are not yet in place.[127]

United States: Activity and discourse varies at state level. States in the Appalachian coal region (e.g. Kentucky, West Virginia) established the Power Plus initiative in 2015 to support economic diversification, including worker retraining and benefits. By contrast, California currently has no official policy to manage its transition away from oil.[128]

India, Japan, Mexico, Russia, South Korea and the United Kingdom are socially affected by the transition, but seem to have no dialogue or action yet.

ENDNOTES

1 IPCC (2018): *"Global Warming of 1.5°C"*, http://report.ipcc.ch/sr15/pdf/sr15_spm_final.pdf

2 Data from 2015; Gütschow, J.; Jeffery, L.; Gieseke, R.; Gebel, R. (2018): *"The PRIMAP-hist national historical emissions time series (1850-2015)"*. V. 1.2. GFZ Data Services, https://doi.org/10.5880/PIK.2018.003

3 Data from 2016; International Energy Agency (IEA) (2018): *"CO_2 Emissions from fuel Combustion"*, http://data.iea.org/payment/products/115-co2-emissions-from-fuel-combustion-2018-edition.aspx

4 New Climate Economy (NCE) (2018): *"Unlocking the inclusive growth story of the 21st century"*, https://newclimateeconomy.report/2018/executive-summary/

5 See endnote 4

6 These stranded assets are calculated based on 2°C scenario. International Renewable Energy Agency (IRENA) (2017): *"Stranded assets and renewables"*, http://www.irena.org/publications/2017/Jul/Stranded-Assets-and-Renewables

7 Swiss RE (2018): *"Natural catastrophes and man-made disasters in 2017. A year of record-breaking losses"*, http://institute.swissre.com/research/overview/sigma/1_2018.html

8 ND-GAIN (2018): *"Notre Dame Global Adaptation Index"*, https://gain.nd.edu/our-work/country-index/

9 IPCC (2018): *"Global Warming of 1.5°C"*, http://report.ipcc.ch/sr15/pdf/sr15_spm_final.pdf

10 UNFCCC (2018): *"NDC Interim Registry"*, http://www4.unfccc.int/ndcregistry/Pages/All.aspx

11 With limited public and concessional finance available, there is a need to leverage private capital intelligently. When designed well, climate markets and carbon pricing could mobilise private sector resources, reduce the burden of NDC implementation, and raise collective ambition to reduce emissions. The World Bank's Mitigation Action Assessment Protocol (MAAP) is now being extended to add a new module that would assess countries' readiness to engage in post-2020 climate markets. World Bank (2018): *"Mitigation Action Assessment Protocol"*, https://maap.worldbank.org/#/homepage

12 Argentina, India and Indonesia have referred to Art. 6 in their NDC, but have not specified any involvement in international mechanisms yet.

13 As part of the Paris Agreement, governments agreed to take stock of climate action progress towards meeting the objectives of the Agreement. The Talanoa Dialogue is the first opportunity since Paris for countries to take a look at how their efforts are stacking up against the Paris Agreement objectives. It is structured along three questions: Where are we? Where do we want to go? How do we get there? The outcome is designed to provide impetus to Parties to submit more ambitious NDCs by 2020.

14 UN (2015): *"Paris Agreement"*, https://unfccc.int/sites/default/files/english_paris_agreement.pdf

15 Climate Action Tracker (CAT) (2018): *"Climate Action Tracker"*, https://climateactiontracker.org/. The calculations of climate action compatible with the Paris Agreement are based on an analysis that makes various assumptions for sharing global efforts fairly among countries. This analysis indicates the level of ambition required by the G20 as a whole, while allowing for variation among individual members, according to the chosen approach for sharing effort.

16 See endnote 15. The CAT rating system evaluates the emissions levels resulting from emissions reductions commitments against effort-sharing benchmarks for each country. The effort-sharing studies in the CAT's database include more than 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 fair, including considerations of equity such as historical responsibility, capability and equality. The CAT rating system takes into account results from studies that are compatible with the former 2°C goal, as well as the 1.5°C limit in the Paris Agreement, to cover the full range of perspectives and historical developments of the long-term temperature goals.

17 See footnote 15

18 The EU countries have a joint NDC and are thus not considered separately, although they do have separate climate change plans that vary in ambition.

19 See endnote 15

20 Burton, J., Caetano, T. and McCall, B. (2018): *"Coal transitions in South Africa: understanding the implications of a 2°C-compatible coal phase out plan for South Africa"*, https://coaltransitions.files.wordpress.com/2018/09/coal_south-africa_final.pdf

21 See endnote 15

22 Data-Driven Yale; NewClimate Institute; PBL (2018): *"Global Climate Action from cities, regions, and businesses"*, http://datadriven.yale.edu/wp-content/uploads/2018/08/YALE-NCI-PBL_Global_climate_action.pdf

23 Enerdata (2018): Global Energy and CO_2 data, https://www.enerdata.net/research/energy-market-data-co2-emissions-database.html

24 See endnote 23

25 The share of new renewables in the final energy supply would be higher as there are no transformation losses, making new renewables more energy-efficient than other energy sources.

26 See endnote 23

27 CAT (2016): Climate Action Tracker: The ten most important short-term steps to limit warming to 1.5°C, http://climateactiontracker.org/assets/publications/publications/CAT_10_Steps_for_1o5.pdf

28 See endnote 23

29 World Bank (2018): *"Access to electricity"*, https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS

30 Government of South Africa (2018): *"Draft Integrated Resource Plan 2018"*, http://www.energy.gov.za/IRP/irp-update-draft-report2018/IRP-Update-2018-Draft-for-Comments.pdf; Winning, A. (2018): *"South Africa signs $4.7 billion of delayed renewable energy deals"*, https://www.reuters.com/article/us-safrica-power/south-africa-signs-4-7-billion-of-delayed-renewable-energy-deals-idUSKCN1HB230; Steyn, L. (2018): *"Cleaner Power is a win for Cyril Ramaphosa"*, https://www.businesslive.co.za/bd/national/2018-08-28-cleaner-power-is-a-win-for-ramaphosa/

31 Ireland, G. and Burton, J. (2018): *"An assessment of new coal plants in South Africa's electricity future: The cost, emissions, and supply security implications of the coal IPP programme"*. Cape Town, Energy Research Centre, University of Cape Town, https://cer.org.za/wp-content/uploads/2018/05/ERC-Coal-IPP-Study-Report-Finalv2-290518.pdf

32 See endnote 23

33 CAT (2018): *"Australia"*, https://climateactiontracker.org/countries/australia

34 See endnote 23

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