

G7 Climate Crossroads: State of Play



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**Umwelt
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Executive Summary

G7 countries play a central role in global decarbonisation efforts. The war in Ukraine makes a quick transition to renewable energy sources even more urgent. For this reason, this report takes stock of emission trajectories, climate policies and complementary policies in G7 countries. Table ES 1 provides an overview of emission reduction targets, carbon pricing schemes, support schemes for renewable energy, existing fossil fuel subsidies, phase-out dates for coal and internal combustion engines as well as dependencies on imports of coal, oil and gas. Table ES 2 summarises policies to enable just energy transitions, protect consumers against energy poverty, climate finance commitments and energy partnerships to facilitate energy transitions in other countries as well as proposals to introduce carbon border adjustment mechanisms.

This overview helps identify gaps in the existing policy landscape and propose potential improvements. Based on these insights, we propose that G7 countries would be able to accelerate the global energy transition by:

- Clarifying the nature of their net-zero targets and implementation plans
- Clear commitments, timetables and guidelines to phase out fossil fuel subsidies
- Agreeing on dates to phase out internal combustion engines
- Strengthening and demonstrating leadership on just coal transition
- Establishing a roadmap towards phasing out gas and oil use
- Adopting measures to alleviate energy poverty that are aligned with energy security concerns
- Accelerating deployment of both renewable energy sources and energy efficiency measures to address energy security, energy affordability and decarbonisation
- Moving forward on climate finance towards the US\$ 100 bn per year goal by increasing the total amounts deployed and the share of grant finance
- Ensuring that carbon border adjustments are applied as enablers of domestic climate policy that minimise detrimental effects on the trade partners targeted
- Building momentum to establish a cooperative climate club based on existing energy and climate partnerships

Table ES 1: Key climate targets and policies

	Emissions reduction targets	Carbon pricing policies	Renewables support measures
Canada	NDC: 40-45% reduction below 2005 levels by 2030 Net-zero target: 2050	Canada federal OBPS (ETS) Canada federal fuel charge Regional carbon pricing programmes across all states.	Capital Cost Allowance Canadian Renewable and Conservation Ex-pense
US	NDC: 50-52% reduction below 2005 levels by 2030 Net-zero target: 2050	California Cap-and-Trade Program Massachusetts ETS RGGI	Investment tax credit Renewable electricity production tax credit Federal loan programme
Japan	NDC: 46% reduction below 2013 levels by 2030 Net-zero target: 2050	Japan carbon pricing mechanism Japan carbon tax Saitama ETS Tokyo Cap-and-Trade Program	Feed-in tariffs Offshore wind support measures
UK	NDC: 68% reduction below 1990 levels by 2030 Net-zero target: 2050	UK ETS UK Carbon Price Support	Contracts for Difference Feed-in tariffs Certificate system Tax mechanism
France	NDC: 55% reduction below 1990 levels by 2030 (EU) Net-zero target: 2050	EU ETS France Carbon Tax	Feed-in tariff Feed-in premium Tax incentives
Germany	NDC: 55% reduction below 1990 levels by 2030 (EU) National target of 65% reduction below 1990 levels by 2030 Net-zero target: 2045	EU ETS Germany ETS	Premium tariff Tendering programme Feed-in tariff Low-interest loans
Italy	NDC: 55% reduction below 1990 levels by 2030 (EU) Net-zero target: 2050	EU ETS	VAT and real estate tax deductions Feed-in tariff

Table ES 1: Key climate targets and policies

	Fossil fuel subsidies	Phase-out dates	Energy trade (net imports)
Canada	Oil and Gas Industry Recovery Assistance Fund Emissions Reduction Fund Subsidies for domestic pipelines and export infrastructure Total FFS: USD 64 bn (EUR 58 bn)	Coal power: 2030 ICEs: 2035	Oil: -6654 PJ Coal: -616 PJ Gas: -1785 PJ
US	Depreciation of capital expenses for fossil fuel extraction Tax exemptions Total FFS: USD 662 bn (EUR 604 bn)	Coal power: 2035 (implicit date) ICEs: No date set	Oil: 8988 PJ Coal: -2190 PJ Gas: -1935 PJ
Japan	Provides finance for international fossil fuel projects Total FFS: USD 170 bn (EUR 155 bn)	Coal power: 2030 ICEs: No date set	Oil: 6221 PJ Coal: 4811 PJ Gas: 3767 PJ
UK	Provides tax allowances and relief for fossil fuel extraction Total FFS: USD 24 bn (EUR 22 bn)	Coal power: 2024 ICEs: 2030 for sales of petrol and diesel cars	Oil: 302 PJ Coal: 180 PJ Gas: 1395 PJ
France	Continues to support fossil fuel-based power through state ownership of utilities Total FFS: USD 30 bn (EUR 27 bn)	Coal power: 2022 ICEs: 2035	Oil: 2075 PJ Coal: 305 PJ Gas: 1643 PJ
Germany	Provides a large amount of lignite subsidies Total FFS: USD 72 bn (EUR 65 bn)	Coal power: 2038 ICEs: 2035	Oil: 3650 PJ Coal: 1117 PJ Gas: 3168 PJ
Italy	Provides tax credits and exemptions for diesel consumption Total FFS: USD 41 bn (EUR 37 bn)	Coal power: 2025 ICEs: 2035	Oil: 2704 PJ Coal: 286 PJ Gas: 2426 PJ

Table ES 2: Key policies for just transition, climate finance, energy partnerships and border carbon adjustment measures.

	Just Transition Policies	Social Assistance Policies
Canada	Just Transition Taskforce and Just Transition Engagement process	No federal, but various regional programmes against energy poverty
US	Partnerships for Opportunity and Workforce and Economic Revitalization Several regional initiatives	Low Income Home Energy Assistance Program
Japan	Experience with closure of coal mines in 1960–2000 period	Only general social assistance, no dedicated policies aimed at energy poverty
UK	City-region deals and growth deals	Warm Home Discount and support for basic needs
France	Ecological Transition Contracts	Capped electricity prices Energy and fuel vouchers for low-income households
Germany	Financial support of up to EUR 40 bn for coal phase-out	Lowering EEG surcharge Grants for low-income households
Italy	Enel's just net-zero transition pledge	Reduced charges and taxes for electricity and gas Increase of the 'social bonus' Tax credit for energy-intensive companies

Table ES 2: Key policies for just transition, climate finance, energy partnerships and border carbon adjustment measures.

	Climate Finance	Energy and Climate Partnerships	Border carbon adjustment & climate clubs
Canada	USD 1.5 bn (EUR 1.4 bn), 55% grants	Several bilateral agreements to cooperate on climate	Under consideration
US	USD 6.6 bn (EUR 6.0 bn), 43% grants	USDA Partnerships for Climate-Smart Commodities	Proposed, but unlikely due to legal challenges
Japan	USD 14.1 bn (EUR 12.9 bn), 14% grants	Asia Energy Transition Initiative Development Cooperation for Green Technology Transfer	Not considered
UK	USD 4 bn (EUR 3.6 bn), 93% grants	Partnering for Accelerated Climate Transitions Various energy and climate partnerships	Under consideration
France	USD 6.7 bn (EUR 6.1 bn), 10% grants	Development cooperation supports renewable energy	EU CBAM proposed for direct emissions from iron and steel, aluminum, cement, fertilisers and electricity, to be phased in 2026–2035. No exemptions for LDCs or crediting of non-price climate policies. Revenues shall go to the EU general budget
Germany	USD 10.3 bn (EUR 9.4 bn), 39% grants	Energy partnerships and energy dialogues, H2Global hydrogen scheme	
Italy	USD 2.3 bn (EUR 2.1 bn), 79% grants	International Tropical Timber Agreement, Solar Alliance	

List of abbreviations

Abbreviation	Definition
AFD	French Development Agency (Agence française de développement)
ASEAN	Association of Southeast Asian Nations
CAD	Canadian Dollar
CAT	Climate Action Tracker
CBAM	Carbon Border Adjustment Mechanism
CCC	Climate Change Committee
CCS	Carbon Capture and Storage
CCU	Carbon Capture and Utilisation
CDIAC	Carbon Dioxide Information Analysis Center
CDR	Carbon Dioxide Removal
CfD	Contract for Difference
CO₂	Carbon Dioxide
CO_{2e}	Carbon Dioxide Equivalent
ECO	UK Energy Company Obligation
EDF	Electricity of France (Électricité de France)
EEG	German Renewable Energy Sources Act (Erneuerbare-Energien-Gesetz)
EERS	Energy Efficiency Resource Standards
EIA	US Energy Information Administration
ETS	Emissions Trading System
EUR	Euro
FFS	Fossil Fuel Subsidies
GBP	Great British Pound
GHG	Greenhouse Gas
GSE	Italy Manager of Electricity Services
ICE	Internal Combustion Engine
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
ITC	Investment Tax Credit
JPY	Japanese Yen
LDC	Least Developed Country
LNG	Liquefied Natural Gas
LTS	Long Term Strategy
LULUCF	Land Use, Land Use Change and Forestry
N₂O	Nitrous Oxide
NDC	Nationally Determined Contribution

Abbreviation	Definition
NEEAP	National Energy Efficiency Action Plan
OBPS	Output Based Pricing System
OECD	Organisation for Economic Cooperation and Development
OFGEM	Office of Gas and Electricity Markets (UK)
PFC	Perfluorocarbon
PTC	Production Tax Credit
PV	Photovoltaic
R&D	Research and Development
RE	Renewable Energy
RGGI	Regional Greenhouse Gas Initiative
RISE	Regulatory Indicators for Sustainable Energy
TCI-P	Transportation and Climate Initiative Program
USD	United States Dollar
USDA	United States Department of Agriculture
VAT	Value Added Tax
WTO	World Trade Organization
WWF	World Wide Fund for Nature

CONTENTS

Executive Summary	3
List of abbreviations	8
1. Introduction	11
2. Emission Trajectories and Energy Systems in the G7	13
3. Climate and Energy Policies	19
3.1 Nationally Determined Contributions (NDCs)	20
3.2 Net-zero targets	21
3.3 Carbon pricing	23
3.4 Phase-out dates	24
3.5 Energy efficiency	25
3.6 Renewable support schemes	26
3.7 Fossil-fuel subsidies	27
4. Complementary Policies for Sustainable Development	29
4.1 Just Transition Policies	30
4.2 Policies to Address Energy Poverty	32
4.3 Climate Finance	33
4.4 Energy and Climate Partnerships	35
4.5 Border Carbon Adjustments and Climate Clubs	37
5. Policy recommendations	40
6. References	44

Introduction



Recent years have witnessed some progress in global climate policy. With about 90% of global emissions covered by net-zero emission targets, the world is getting a step closer to the targets of the Paris Agreement. Yet, targets are only meaningful if they are backed up with concrete measures to achieve them. This includes measures for effective emission reductions, policies to avoid adverse impacts for workers and households in countries implementing climate policies, as well as financial and technological support for low- and middle-income countries to reduce their emissions.

**The G7
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High-income countries are responsible for the largest share of ‘historical’ emissions and hence for most of the rise in the global mean temperature — roughly 1.1 °C since the industrial revolution. The G7 is responsible for over a third (34.5%) of global CO₂ emissions since 1850, despite being home to only 10% of the global population today (see Figure 1). At the same time, rich countries possess the financial, technological and institutional means to transition to low-carbon economies and support such transitions in other countries.

The war in Ukraine has clearly shown the political and economic risks of dependence on fossil fuel imports, and drastic price increases for oil and gas have put substantial economic pressures on consumers. The turmoil in energy markets caused by the war provides an additional impetus to transition away from fossil fuels by increasing energy efficiency and accelerating the deployment of renewable energy sources.

This report takes stock of emission trajectories, climate policies and complementary policies in G7 countries. The insights help to identify gaps in the existing policy landscape and to propose potential improvements.

This report is structured in the following way: Section 2 provides a brief overview of emission trajectories and energy systems in the G7 countries. Section 3 assesses climate targets and policies. Section 4 analyses complementary policies that facilitate climate change mitigation and help ease potential adverse social impacts. Section 5 provides some tentative policy recommendations.

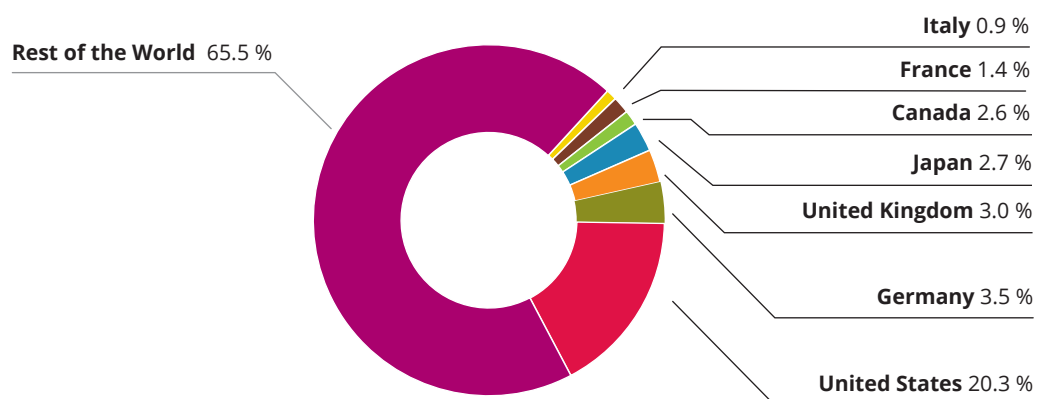


Figure 1: G7 share of cumulative global CO₂ emissions from fossil fuels, cement, land use and forestry over the period 1850-2021 — based on a Carbon Brief analysis of figures from the Global Carbon Project, CDIAC, Our World in Data, Carbon Monitor, Houghton and Nassikas (2017) and Hansis et al. (2015)).¹⁻⁶

Emission trajectories and energy systems in the G7



G7 countries need to support nations in the global South in their pursuit of low-carbon economic development models.

Over the last few decades, global greenhouse gas (GHG) emissions have been increasing at an alarming rate, from 38 GtCO_{2e} in 1990 to 59 GtCO_{2e} in 2019 as shown in the most recent report of the IPCC Working Group III.⁷ Over this thirty-year period, emissions have increased in Canada and the US, but have decreased in the G7 overall. In 2019, the G7 emitted 10 GtCO_{2e}, accounting for 17.6% of global emissions.* The recent increase in global emissions has mostly come from low-income countries. Hence, whilst it is important for G7 countries to decarbonise, it is also important to support developing countries in pursuing a low(er)-carbon model of economic development. The Paris agreement set out to limit the increase in global temperature to well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C, which would require global emissions to reach net-zero by 2050.⁸ Bringing global emissions to net-zero by 2050 requires net neutrality in the G7 countries well ahead of this date in order to allow for slower decarbonisation rates in developing countries. This is an enormous challenge, given that fossil fuels still account for more than half of primary energy use in all G7 countries.

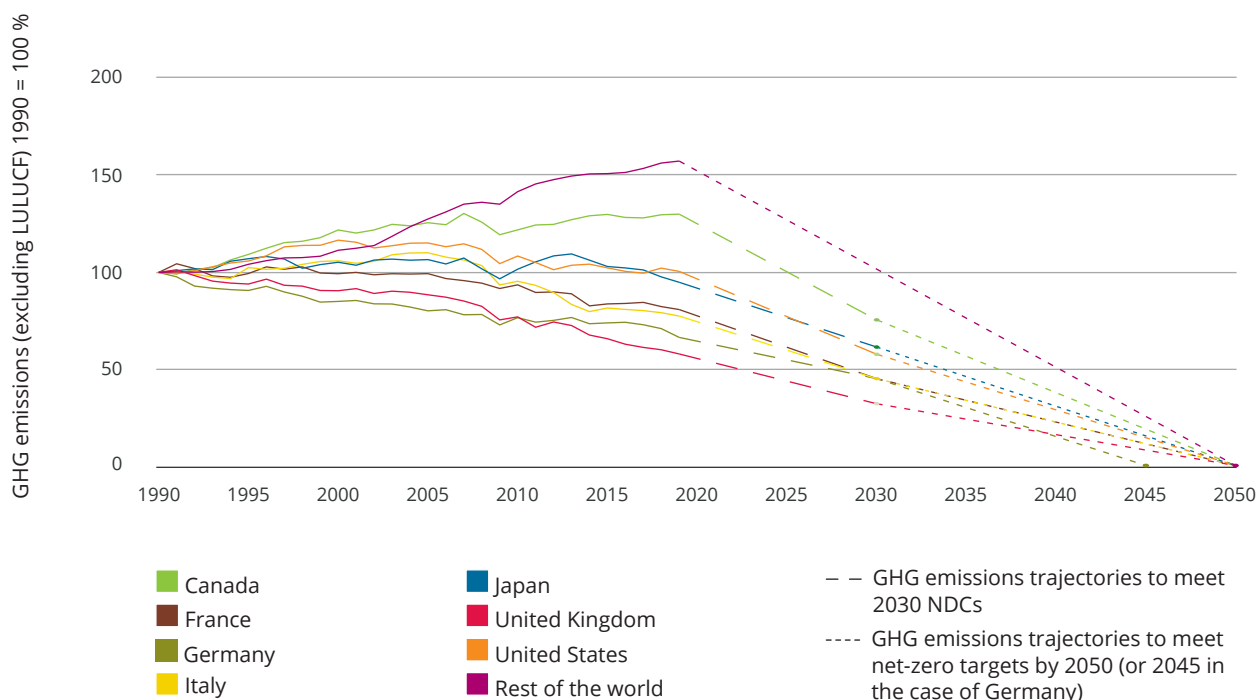


Figure 2: Normalised past emissions trajectories of G7 Countries from 1990 to 2019 and necessary future trajectories in order to meet submitted NDCs and net-zero pledges by 2050 or earlier.⁷

Canada is rich in natural resources, with large reserves of oil, coal and other commodities. In 2019, **oil production in Canada accounted for 6% of the global total, 5% for natural gas and 1% for coal — a net exporter for each** (see Table 1).

* All emission data reported in this section are drawn from the database used in the IPCC AR6 WG3 report, reference 7.

Country	Oil*				Coal**				Natural gas			
	Production	Net imports	Imports	Exports	Production	Net imports	Imports	Exports	Production	Net imports	Imports	Exports
Canada	6%	-6,654	40%	75%	1%	-616	43%	72%	5%	-1,785	19%	41%
France	n/a	2,075	98%	n/a	n/a	305	100%	n/a	n/a	1,643	100%	n/a
Germany	n/a	3,650	97%	n/a	1%	1,117	52%	5%	n/a	3,168	100%	n/a
Italy	n/a	2,704	95%	n/a	n/a	268	100%	n/a	n/a	2,426	95%	n/a
Japan	n/a	6,221	100%	n/a	n/a	4,811	100%	n/a	n/a	3,767	98%	n/a
UK	1%	302	88%	87%	n/a	180	83%	n/a	1%	1,395	60%	20%
US	17%	8,988	39%	22%	9%	-2,190	1%	16%	23%	-1,935	9%	14%

*Oil statistics include NGL and feedstock

**Coal Statistics include peat and oil shale

Table 1: Energy trade statistics in 2019, where production figures are expressed as global shares. Imports are given as a share of total consumption, exports as a share of total production. Net imports are expressed in petajoules (PJ).¹⁰

Its domestic electricity generation is relatively clean — more than half is generated from hydroelectric power (61%), with the remainder produced by a variety of sources including nuclear (15%), natural gas (9%), coal (7%) and other renewables (8%).⁹ The largest share of emissions in Canada comes from oil and gas production, representing over a quarter of its national emissions. Canada's GHG emissions account for **1.3% of the global total, despite it being home to only 0.5% of the global population.** With a population of 38.0 million, Canada has the largest energy intensity and emissions per capita out of the G7.

France is predominantly an energy importing country. In 2019 France **imported 98% of its oil, 100% of coal, and 100% of natural gas** — with negligible levels of production for all three fuels. The power sector in France is almost fully decarbonised as a result of its persistent emphasis on nuclear energy which accounts for 69% of total production. The remainder of France's electricity mix is made up of renewables (22%), gas (6%), oil (2%) and coal (1%). France is close to achieving a 2022 phase-out date set for coal-fired power. Furthermore, France has the lowest GHG emissions per capita and grid carbon intensity of all G7 countries. GHG emissions in France amount to **0.8% of global emissions — accounting for 0.9% of the global population.**

Germany's energy supply has been historically dominated by oil and coal, including both hard-coal and lignite. Germany **imports 97% of its oil, 52%**

of coal and 100% of gas — a net importer for each fuel. The use of coal in Germany has rapidly declined in recent years from 42% of its electricity mix in 2015 to just under a quarter (24%) in 2020. However, the current energy crisis has caused an increase in the share of coal-fired power generation to 29% in 2021 and is likely to remain high for 2022. The remaining electricity generation is produced by renewables (40%), natural gas (15%), nuclear (12%) and oil (4%). The use of natural gas-fired power in Germany has more than doubled since 2015 and is almost entirely imported — a serious concern given the current geopolitical situation as approximately 55% of its **3168 PJ of net imports** come from Russia. Overall, total GHG emissions in Germany account for **1.4% of the global total, despite it being home to only 1.1% of the global population.**

The energy sector of **Italy** is heavily reliant on fossil fuels, with oil and gas representing almost 80% of the country's total energy consumption. Italy chose to abandon nuclear power following a referendum after the 1986 Chernobyl disaster. However, Italy has been successful at integrating large volumes of variable renewables, having the highest share of solar (9%) used for electricity generation among the G7 countries. Italy is a **fossil fuel importer** with very few extractable domestic reserves. Italy **imports 95% of its oil, 100% of coal and 95% of gas.** Approximately half of Italy's electricity is produced using natural gas (48%), with the remainder coming from renewables (41%), coal (5%) and oil (5%). Italy's total GHG emissions account for **0.7% of the global total — accounting for 0.8% of the global population.**



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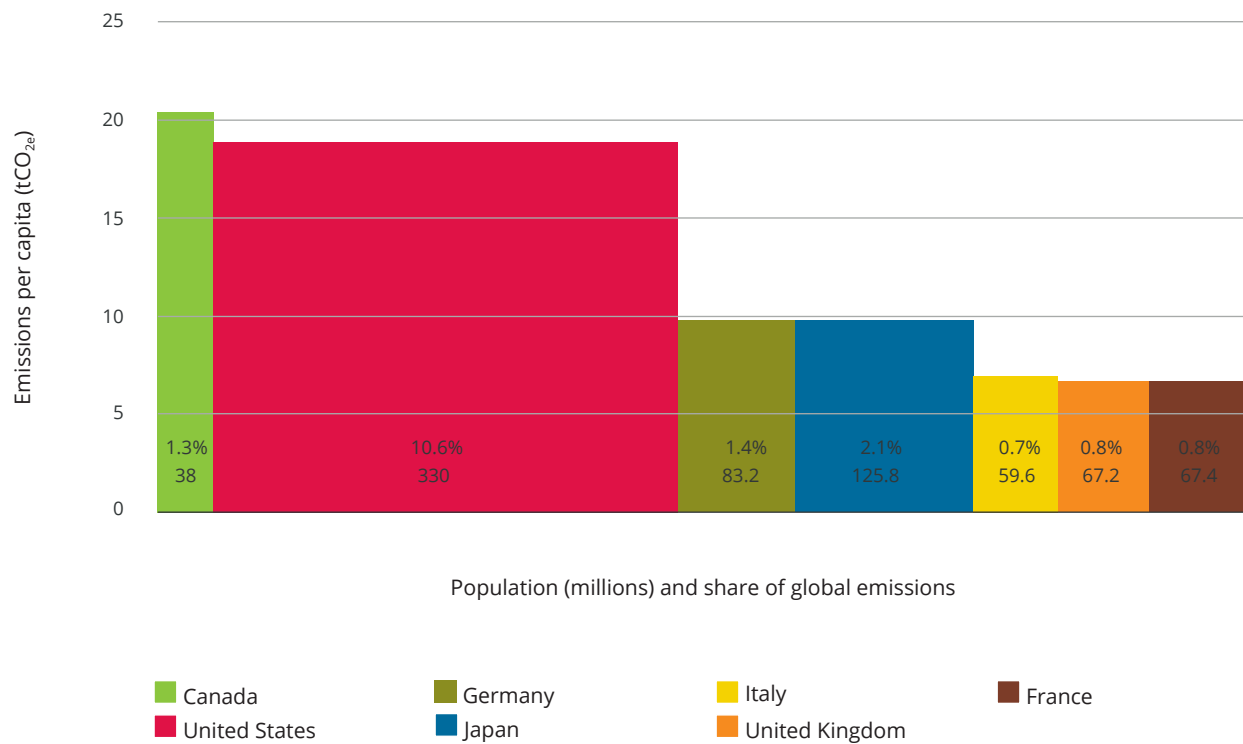


Figure 3: Comparison of per capita and total emissions for G7 countries. Labels on graph illustrate population of country (millions) and share of global emissions.^{7, 11}

Japan's energy supply is dominated by fossil fuels, accounting for 87% of total energy consumption. Japan produces few fossil fuels domestically, instead relying on **imports for almost all of its oil (100%), coal (100%) and natural gas (98%)**. This issue became even more pertinent after the Fukushima disaster in 2011, at which time nuclear power produced a third of its electricity. After essentially eliminating nuclear power from its electricity mix, Japan has become increasingly reliant on coal and gas-fired power, now accounting for a combined share of 60% of Japan's electricity mix. Oil accounts for an additional 9%, nuclear 5%, and the share of renewables has increased to 26%. The reliance on fossil fuels in Japan has led to increased emissions and the **highest grid carbon intensity of the G7**. GHG emissions in Japan account for **2.1% of the global total, despite it being home to 1.6% of the global population**.

The **UK** was historically a large producer of coal. However, due to a swift transition away from the production of coal followed more recently by a rapid decline in its use for electricity generation, the UK has shifted its reliance to oil, gas and renewable energy. Oil and gas account for three quarters (76%) of its energy consumption. The UK **produces approximately 2253 PJ of oil (1% of global production) and 1422 PJ of natural gas (1% of global production)**, but is still a **net importer** of each. For power generation, both natural gas and renewables produce around 40% each. Nuclear produces an

additional 15%, followed by oil (3%) and coal (2%). The UK has achieved the greatest percentage of economy-wide greenhouse gas emissions reductions in the G7 since 1990. GHG emissions in the UK amount to **0.8% of the global total, accounting for 0.9% of the global population.**

The **US** has the highest total emissions out of the G7, which can be understood by observing the relative size of its consumption and population compared to other countries in Figure 3. A large share of these emissions come from the production of oil and gas, which has expanded rapidly over the past few decades due to the shale revolution.[†] The US has become a **net exporter** of both **coal (2190 PJ)** and **natural gas (1935 PJ)**. However, despite becoming the **largest oil producer in the world (22% of global production)**, the US is still a **net importer (8988 PJ)** — as a result of also being the largest consumer of oil globally. With regard to power generation, natural gas takes the highest share (40%) of the US electricity mix, followed by renewables (21%), nuclear (20%), coal (19%) and oil (1%). GHG emissions in the US account for **10.6% of the global total** — a share larger than all other G7 countries combined, despite being home to only **4.2% of the global population.**

[†] The US shale revolution enabled the US to significantly increase production of oil and natural gas. This stemmed from technological developments in hydraulic fracturing (fracking) and horizontal drilling. New sources of gas became economic to extract, resulting in major increases to fossil fuel reserves in the US.

Climate and Energy Policies



3.1 Nationally Determined Contributions

Nationally Determined Contributions (NDCs) represent targets set by each country to reduce national emissions towards the achievement of the Paris Agreement long-term goals while specifying planned adaptation measures. The Paris Agreement requires each Party (including all G7 countries) to prepare, communicate and maintain successive NDCs that it intends to achieve. Parties are required to pursue mitigation measures domestically, with the aim of limiting global temperature increase to well below 2 °C below pre-industrial levels. The World Wide Fund For Nature (WWF) has developed a framework for tracking and assessing NDCs across countries.

The WWF has developed a framework for tracking and assessing NDCs across countries.

WWF's **#NDCsWeWant** checklist aims to identify progress and gaps by comparing the updated NDCs of the respective Parties to the Paris Agreement with previously submitted NDCs, as well as analysing trends in order to assess the submitted targets. The checklist proposes 20 mostly qualitative factors to assess enhancement, these are divided into five areas — considering ambition, but also fostering systemic change, inclusiveness and participation, contribution to sustainable development and tracking progress. The ratings are not only based on the respective GHG emissions reduction targets, but on an assessment across all checklist factors.²³

G7 countries have all set economy-wide NDCs, although there is a large discrepancy between the ambition areas of the policies and the different base years used.

- The **European Union** has submitted (on behalf of the 27 member states including **France, Italy and Germany**) a proposed **55% reduction of emissions below 1990 levels by 2030**. WWF concluded its rating that the NDC has a **Short Way to Go** to become an NDC We Want.
- **Canada** has committed to a **40-45% reduction below 2005 levels by 2030**. This NDC is not aligned to 1.5 °C according to the Climate Action Tracker (CAT), which recommends a 54% reduction in this timeframe. However, Canada's NDC only has a **Short Way to Go** because it addresses most of the NDCs We Want criteria.
- **Japan** recently committed to a **46% reduction below 2013 levels by 2030**. The NDC represents an improved target compared to its previous version of reducing emissions 26% by 2030. However, it falls short of a 60% reduction, which would be aligned with a 1.5 °C-compatible trajectory, according to the CAT. Furthermore, Japan's NDC lacks detail on finance, contribution to sustainable development (including nature-based solutions) and adaptation, which is why the NDC is rated as having **Some Way to Go**.
- The **UK** has committed to **reducing GHGs by 68% compared with 1990 levels** by the year 2030; which means a **Short Way to Go** to

becoming an NDC We Want. To help achieve this goal and its climate neutrality target, the UK established the Climate Change Committee (CCC) which advises the UK government on emissions targets and reports to Parliament on progress made on reducing emissions.

- The **US** has recently updated its NDC to achieve a **50-52% reduction in net greenhouse gas pollutants levels by 2030**, with **2005** as the **base year**.[‡] According to the CAT, the reduction target would have to be in the range of 57-63% to be aligned to 1.5°C.

3.2 Net-zero targets

There are many different interpretations of the term net-zero, such as ‘carbon neutrality’ or ‘climate neutrality’ — it is a term frequently proclaimed by governments, businesses, and society as the landmark policy for demonstrating climate action. However, many elements of these policies are often left unclear, such as the extent to which they allow for carbon offsets, carbon dioxide removal (CDR) as well as land use, land use change and forestry (LULUCF) to meet these targets. This study adheres to the definition used by the Intergovernmental Panel on Climate Change (IPCC):

“Net-zero carbon dioxide (CO₂) emissions are achieved when anthropogenic CO₂ emissions are balanced globally by anthropogenic CO₂ removals over a specified period.”⁸

Global CO₂
emissions will need
to reach net-zero
by 2050 or earlier.

Net-zero policies are restricted not only to carbon dioxide emissions, but can also apply to all GHGs across the jurisdiction. According to the IPCC⁸, global CO₂ emissions will need to reach net-zero by 2050 to limit global temperature increase to well below 2 °C above pre-industrial levels. In light of the principle of common but differentiated responsibilities and respective capabilities, it is clear that G7 members should achieve net-zero emissions much earlier than 2050. However, only Germany has currently committed to a net-zero pledge before 2050.

- **Canada** has enshrined into law a **net-zero target for all GHG emissions by 2050** under the **Canadian Net-Zero Emissions Accountability Act**. The act also mandates setting intermediate targets at five year-intervals, providing emissions reduction plans for each. Canada plans to reach net-zero through domestic measures with no removals outside its borders. However, it has no separate emissions reduction or removal targets.

- **France** has legislated **carbon neutrality by 2050** and has included this goal in its Long Term Strategy (LTS). Whilst this reads as only

[‡] WWF's NDCsWeWant assessment is underway and will include in its scope climate policy developments and efforts to rollback climate misaligned policy of previous administrations since the NDC publication.

covering carbon dioxide, its LTS explains that the goal includes **all main GHGs**, covering all sectors with the exclusion of international shipping and aviation. Furthermore, remaining emissions in 2050 can be compensated by natural and technical sinks (CCU/CCS). International carbon offset credits are not considered. France is also covered by the **EU commitment to climate neutrality for all GHGs by 2050**, laid out in the EU's LTS. This policy includes transparent assumptions or pathways for LULUCF and removals.

- **Germany** has recently legislated a **national net-zero commitment of 2045 for all GHG emissions**, the earliest net-zero target of any G7 country. Germany is the only country in the G7 to include separate emission reduction and removal targets. However, the policy relies upon international offset credits to meet the goal and excludes international aviation and shipping.
- **Italy** is similarly covered by the EU target, and has committed to **climate neutrality by 2050, covering all main GHGs**. Like France, the legislation covers all domestic sectors, remaining emissions can be compensated by CCU/CCS and the use of international carbon credits to meet the goal is excluded. There has been comprehensive planning towards achieving this goal with key measures for reaching net-zero.
- **Japan** has announced a **net-zero target of 2050 for all GHG emissions**, legislated with **the Promotion Act. The Green Growth Strategy** provides sector-level, technology-focused roadmaps towards net-zero in Japan. However, neither of these strategies provide sufficient details on key elements to ensure the transparency and effectiveness of the net-zero goal; including the emissions scope, use of carbon dioxide removals and reporting. Furthermore, the policies rely on international carbon offsets to achieve net-zero.
- The **UK** has legislated a **net-zero target of 2050 for all GHG emissions**, an amendment of the **Climate Change Act 2008**. An earlier net-zero GHG target of 2045 has also been set at the subnational level for Scotland. To achieve these goals, the UK sets 4-year interval carbon budgets 12 years ahead of time to provide an appropriate long-term signal for low-carbon investments. Furthermore, the **UK's Net-Zero Strategy: Build Back Greener** sets out sectoral policies and proposals for decarbonising all sectors of the UK economy to meet its net-zero target by 2050.
- The **US** has set a **net-zero target of 2050 for all GHG emissions** in its policy documents, but the target has not been legislated. The net-zero policy makes transparent assumptions of CO₂ removal by nature-based and technology-based solutions. The US has not committed to reaching net-zero emissions without the use of international carbon offsets. At the subnational level, California has committed to an earlier net-zero target of 2045 for all GHGs.

3.3 Carbon pricing

Carbon pricing will have an important role to play in G7 policy mixes in the coming decades.

Many carbon pricing policies have been adopted across the G7 in the last two decades with the aim of addressing the economic problem that GHG emissions are a negative externality and are otherwise not charged for by any market. Carbon pricing will have an important role to play in G7 policy mixes in the coming decades, either through carbon taxes, emissions trading systems (ETS) or both.

The European Union Emissions Trading System (EU ETS) represents the cornerstone of the EU's response to climate change. The ETS regulates all EU member states (including **France, Germany and Italy**) as well as Norway, Iceland and Liechtenstein. It caps CO₂ emissions from the industry, power and aviation sectors. It also covers N₂O emissions from certain chemical sectors and PFC emissions from aluminium production. The system covers roughly 39% of the EU's emissions, reaching over **96 EUR/tCO_{2e}** in February 2022. As part of the EU's Fit for 55 reforms, a separate **ETS 2** has been proposed to cover emissions from buildings and road transport, similar to the national system currently in operation in Germany.

In 2021, **Germany** launched a **national ETS** to impose a carbon price on GHG emissions from the buildings and transport sectors which are currently not covered by the EU ETS. The carbon price is set at a fixed rate initially (**25 EUR/tCO_{2e}** in 2022) and is **set to rise annually**. The Germany ETS covers 40% of the country's emissions. While Italy has no carbon pricing policy in place other than the EU ETS, **France** has implemented a **supplementary carbon tax** currently (2022) at a price of **45 EUR/tCO_{2e}** to cover emissions that are not already covered under the EU ETS. The French Carbon Tax covers roughly 35% of the country's CO₂ emissions from industry, buildings and transport.

Japan has one of the lowest carbon prices in the world. **The Japan Carbon Tax**, implemented in 2012, is set at a price of **289 JPY/tCO_{2e} (2 EUR/tCO_{2e})**. The tax covers 75% of Japan's CO₂ emissions from all sectors with some exemptions for the industry, power, agriculture and transport sectors. Two regional ETS have been created with the **Tokyo Cap-and-Trade Program** and the **Saitama ETS**, targeting CO₂ emissions from energy use in the industry, power and buildings sectors (20% of each jurisdiction's emissions). However, the carbon price in each of these markets is only a small increment over the existing carbon tax — trading in 2022 at roughly **5 EUR/tCO_{2e}**. Japan is currently considering a new carbon pricing mechanism, the design of which has yet to be agreed.

From 2005 until the UK's departure from the European Union in 2020, UK installations in power and heavy industries were part of the EU ETS. During a period of low prices in the EU ETS price, **the UK Carbon Price Support** (a carbon tax) was implemented, which remains applicable to the power sector today should the ETS price drop below **18 GBP/tCO_{2e} (21 EUR/tCO_{2e})**. In 2021, the UK implemented its own UK ETS as a replacement for the EU ETS. The **UK ETS** covers GHG emissions from the power sector, energy-intensive

industries and aviation — regulating approximately 33% of the country's emissions.

At the Canadian provincial level, carbon taxes have been in place for 15 years, with Alberta and British Columbia being the first movers. British Columbia is regarded by many economists as a best practice example in terms of its equity effects, by returning (almost) all the revenues to the population. Since 2019, **mandatory carbon pricing** has been in place across **Canada** at the federal level. **The Canada federal output-based pricing system (OBPS)** requires that all Canadian provinces and territories must have an ETS or a carbon tax for the power and industrial sectors at **40 CAD/tCO_{2e} (29 EUR/tCO_{2e})** or above. Those that have neither will be subject to the federal backstop. As a result, all Canadian jurisdictions have carbon pricing programmes in place with at least some coverage. For this reason, the federal OBPS only covers 9% of the country's emissions. Canada is currently looking to extend the scope of its carbon pricing policies by developing a system for GHG offsets which would cover sectors and activities that are not yet covered. The programme would initially focus on voluntary projects in the agriculture, forestry, and waste sectors.

In the **US** there is **no federal carbon price**. Instead, several US states have adopted their own (or connected) carbon pricing policies. **The Regional Greenhouse Gas Initiative (RGGI)** is the first mandatory market-based programme to reduce GHGs in the US, covering CO₂ emissions from the power sector in eleven US states. However, the price signal from this programme is weak, trading in 2022 at around **14 USD/tCO_{2e} (13 EUR/tCO_{2e})**. Massachusetts has implemented a supplementary ETS to the RGGI to meet its climate targets by ensuring that emissions reductions occur within the state. The most comprehensive ETS in the US is the **California Cap-and-Trade Program**, which covers 80% of the state's GHG emissions from the industry, power, transport and buildings sectors — trading in 2022 at **28 USD/tCO_{2e} (26 EUR/tCO_{2e})**. Another cross-state ETS is under consideration, the **Transportation and Climate Initiative Program (TCI-P)** — a collaboration of north-eastern and mid-Atlantic states with the aim of developing a carbon pricing initiative for the transport sector.

3.4 Phase-out dates

The majority of G7 countries have already announced dates after which coal power plants will cease to operate.

Energy-related phase-out dates will be crucial in the coming decades. Coal-fired power appears to be coming to an end globally, and the majority of G7 countries have already announced dates after which coal power plants will cease to operate. **Canada has pledged to end the operation of coal-fired power by 2030**, with earlier deadlines set or already met within some of its provinces. **France by the end of 2022, Italy by 2025, Germany by 2038** (which is expected to be accelerated to 2030), **Japan by 2030** and the **UK by 2024**. In the US, there is no explicit retirement date, however coal-fired power plant operators have reported to the US Energy Information Administration (EIA) that they plan to retire their plants by 2035.

As part of the **EU's Fit for 55** proposal, all member states will be required to **end the sale of new Internal Combustion Engine (ICE) cars by 2035**.¹² Similarly, Canada has announced a federal ban on ICE cars and light-duty trucks from **2035**. Even more ambitious, the **UK** Government has agreed to **end the sale of new non-electric cars by 2030, hybrid cars by 2035 and new CO₂ emitting lorries and buses by 2040**. Japan and the US to date have no such targets in place at the federal level. No G7 country has so far set a phase-out date for the operation of existing ICE vehicles.

Some more recent and up-and-coming phase-out dates include the ending of fossil fuel boiler sales or fossil fuel production. So far, of the G7 only Germany (with significant remaining fossil fuel reserves) has committed to a **phase-out of coal production**. At the state level in the US, California is currently evaluating a 2045 phase-out of oil production. Furthermore, in light of the current war in Ukraine, there have been discussions on setting phase-out dates on fossil fuel imports from Russia.

3.5 Energy efficiency

Energy efficiency
has failed to
sufficiently
improve in past
years.

Recent political developments have raised the urgency to improve energy efficiency, as reducing energy consumption directly increases energy security. In the past decade, global improvements in energy efficiency as measured by primary energy intensity have shown little change, with an estimated 1.9% improvement in 2019.¹³ The IEA estimates that primary energy intensity needs to improve by 4.2% annually to achieve global net-zero CO₂ emissions by 2050. **The Regulatory Indicators for Sustainable Energy (RISE)** scored each of the G7 countries according to the strength of their national energy efficiency policies out of 100, with **Canada scoring 100, France 93, Germany 100, Italy 93, Japan 67, UK 100 and the US 88**.¹⁴

The Canada Energy Efficiency Act sets a range of federal standards across appliances, refrigeration equipment, electronics, heating and air-conditioning equipment, industrial/commercial equipment, lighting products, and water heaters. **EU member states (including France, Italy and Germany)** set out their energy efficiency policies in the **National Energy Efficiency Action Plan (NEEAP)**. Under the EU Energy Efficiency Directive, these plans must be updated every three years and report on the progress in achieving their national energy efficiency targets. Energy efficiency improvements in Japan include standards for products and vehicles, as well as performance requirements for industry based on benchmarking. The **UK Energy Company Obligation (ECO)** scheme legally requires energy suppliers to improve the energy efficiency of British households by establishing obligatory targets for emissions reductions and home heating costs. The case is similar in the **US**, with **Energy Efficiency Resource Standards (EERS)** that mandate quantified energy efficiency goals for energy suppliers and jurisdictions.

3.6 Renewable support schemes

Several policies have been enacted to accelerate investment in renewable energy (RE) through the provision of subsidies or other financial incentives. In **Canada**, a number of initiatives and programmes support renewable energy deployment, including two **tax incentives** to promote business investment in renewable energy equipment. The first is the **Capital Cost Allowance**, which provides deductions on qualifying RE investments at rates of 30% or 50%. The second is the **Canadian Renewable and Conservation Expense**, which allows investors to fully deduct certain upfront expenses associated with RE investments. Furthermore, as part of the government's pandemic recovery plan, **CAD 2.5 bn (EUR 1.8 bn)** has been devoted to developing infrastructure projects for low-carbon power generation, transmission and storage over a three-year period.

The G7 have enacted several policies to accelerate investment in renewable energy.

France supports renewable energy through feed-in tariffs and feed-in premiums. The **feed-in tariffs** are available for small-scale renewable plants — photovoltaic and thermodynamic installations as well as plants fixed on buildings. **Feed-in premiums** are issued in tenders for large-scale plants such as for onshore wind, offshore wind, rooftop solar and biomass co-generation projects. Moreover, investments in renewable energy are promoted through **tax incentives**, such as an income tax credit. Through substantial investments in renewable energy, France aims to reach 32% of generation from RE by 2030 in order to supplement its base-load stock of nuclear power.

Germany promotes renewables primarily through a **market premium scheme** in which a tendering programme determines the level of the premium. Small generators up to 100 kW are still supported by a feed-in-tariff set out in **the Renewable Energy Sources Act**. New renewable investments are also supported through low-interest loans, and there are additional subsidies to promote biogas capacities. **The Market Incentive Programme** stipulates support schemes for heat produced from renewable energy sources, providing investment support for district heating systems. **Germany** recently increased its target share renewables to 80% in the power sector by 2030.

Renewable energy power generation is promoted in **Italy** through **VAT** and **real estate tax deductions**. For example, solar PV and wind energy plants are eligible for a VAT of 10% rather than 20%. This benefit applies to both business and households. It is also possible to receive a reduction in real estate tax for buildings equipped with renewable energy. Renewable electricity fed back to the grid can be sold to the market or to the GSE (Manager of Electricity Services) at a minimum price.

The growth of renewables in **Japan** over the past decade can be largely attributed to government support provided for solar power. **Feed-in tariffs** have been in effect since 2012 and are some of the highest rates in the world. As a result, Japan's RE capacity almost doubled from 2012 to 2018 — solar PV representing

almost 95% of this increase. Japan also implemented a new act for promoting offshore wind energy, as well as measures for improving grid capacity.

The **UK** supports renewables through **Contracts for Difference (CfDs), feed-in tariffs, a certificate system and a tax mechanism**. The CfD scheme allows renewable energy generators to enter a contract with the **Low Carbon Contracts Company**, where the difference between the “strike price” and the market price is paid over a fixed period. At a tariff rate fixed by the regulator (Ofgem), producers with capacity below 5 MW can sell electricity to the grid under the feed-in tariff. The UK aims to fully decarbonise its power sector by 2035.

RE support policies in the **US** are **mostly determined at the state level**, with different variations of competing instruments in each state. At the federal level, the main policy tools for developing RE are tax credits, such as those which are used to offset income tax obligations for firms and households. For example, solar PV installations are eligible for a 30% **investment tax credit (ITC)**. The renewable electricity **production tax credit (PTC)** is a similar mechanism used to support wind energy deployment. The US invests heavily in clean energy research and development (R&D).

3.7 Fossil-fuel subsidies

Fossil fuel subsidies need to be reformed across all G7 countries.

Reform of fossil fuel subsidies (FFS) remains a challenge across all G7 countries, as they can pose negative economic and environmental impacts. FFS also tend to disproportionately benefit rich households. **In 2020, post-tax fossil fuel subsidies reached approximately USD 5.9 trillion (EUR 5.38 trillion) globally.**¹⁵ By keeping energy prices artificially low, FFS incentivise greater energy consumption, accelerating the depletion of natural resources, protracting fossil fuel dependency and raising external costs from fossil fuel use. FFS have been increasing globally, with existing trends being exacerbated further by the COVID-19 pandemic.

As a means of stimulating a COVID-19 recovery, governments have supported the production of fossil fuels through regulatory changes, new tax incentives, or other financial support. As an example, **Canada** created the **Oil and Gas Industry Recovery Assistance Fund**, which has allocated **CAD 320 m (EUR 229 m)** to fossil fuel production activities. Commitments that incentivise the construction of fossil-fuel infrastructure perpetuate carbon lock-ins and can have lasting impacts on climate neutrality efforts, as infrastructures often have a lifespan of up to 50 years. These actions are in contradiction to the G7 commitment of “eliminating inefficient fossil fuel subsidies by 2025.”¹⁶

The **US** federal government provides over a dozen forms of subsidies to oil, gas and coal production, such as the **immediate depreciation of capital expenses**. States provide additional subsidies, through **tax exemptions** and

levies for well plugging or abandonment that are too low to cover the costs of the abatement. Moreover, **the US leases public assets** such as land or waters **to fossil fuel producers**, often below market rates. Furthermore, fossil fuel production is often exempted from environmental regulations such as hazardous waste requirements. Fossil fuel subsidies reached **USD 662 bn (EUR 604 bn)** in 2020 — the highest of the G7.

In **Canada**, fossil fuel exports are seen as crucial for stimulating economic growth and funding the low-carbon transition. The Canadian government plans to expand export infrastructures such as pipelines and liquified natural gas (LNG). It has been estimated that national and provincial FFS in Canada reached more than **CAD 4.8 bn (EUR 3.4 bn)** per year pre-pandemic.¹⁷ Furthermore, **CAD 750 m (EUR 537 m)** have been provided as an **Emissions Reduction Fund** for oil and gas companies. From 2018–2020, The Canadian government provided over **CAD 23 bn (EUR 16 bn)** in **public finance for three fossil fuel pipelines**. Fossil fuel subsidies in Canada reached approximately **USD 64 bn (EUR 58 bn)** in 2020.

In 2019, the **UK** provided **tax allowances and relief for fossil fuel extraction**, reaching **GBP 3.7 bn (EUR 4.4 bn)**. In addition, for the period 2020–2065, the UK government will provide a tax relief to oil and gas companies worth an estimated **GBP 18 bn (EUR 22 bn)**, in order to cover the cost of decommissioning offshore infrastructure. On the other hand, the UK **ended all new bilateral public finance for overseas fossil fuel extraction** and was the first G7 country to do so. Fossil fuel subsidies in the UK reached approximately **USD 24 bn (EUR 22 bn)** in 2020, the lowest level of the G7.

Even though **Germany** phased-out hard-coal production in 2019, it remains one of the largest producers of lignite globally. **National and subnational subsidies for lignite extraction** reached **EUR 309 m** in 2019 (OECD, 2021). Moreover, **KfW** (Germany's development bank) provided a total of **EUR 1.3 bn for international oil and gas financing** from 2015–2018. However, since 2019, KfW has excluded financing for new projects related to the extraction of coal or unconventional oil. Lastly, Germany's export credit agency provided **EUR 1.3 bn for international fossil fuel projects** in 2019. Fossil fuel subsidies in Germany reached approximately **USD 72 bn (EUR 66 bn)** in 2020.

Italy, France, and Japan have much smaller domestic fossil fuel reserves. Support for fossil fuel consumption subsidies is often greater for each of these countries. Italy continues to provide significant support for consumption through **tax credits and exemptions for diesel consumption**. Fossil fuel subsidies in Italy reached **USD 41 bn (EUR 37 bn)** in 2020. France provides low support for fossil fuel production, yet continues to support fossil fuel-based power through state ownership of utilities. Fossil fuel subsidies in France reached approximately **USD 30 bn (EUR 27 bn)** in 2020. Japan has also been criticised for providing public finance for domestic and international fossil fuel extraction projects. Fossil fuel subsidies in Japan were valued at approximately **USD 170 bn (EUR 155 bn)** in 2020.

Complementary Policies for Sustainable Development



4.1 Just Transition Policies

Although net-zero can create numerous advantages in addition to climate change mitigation, and although they provide a net welfare gain overall, such policies also create economic costs that tend to be concentrated on specific industries and regions. To assist such affected groups and regions in the transition to net-zero, G7 members have already implemented or are considering an array of just transition policies.

Just Transition Policies are necessary to assist affected groups and regions in the transition to net-zero.

In 2016, the government of **Canada** announced its intention to phase out coal-fired power generation by 2030. The transition will be supported with CAD 21.9 bn (EUR 15.7 bn) over 11 years for **investment in low-carbon infrastructure and commercially viable renewable energy** and will be supported by a **Just Transition Taskforce**. Some regional plans to phase out coal have earlier phase-out dates. The Canadian government also aims to complement its climate targets with a strategy to create and maintain employment in the energy sector. For this purpose, it has launched a Just Transition Engagement process. Stakeholders (e.g., unions, non-governmental organisations and industry, as well as provincial, territorial and Indigenous partners) are invited to provide their input for the **development of just transition principles and the creation of a Just Transition Advisory Body**.

In 2018, the French government launched **Ecological Transition Contracts** for industrial conversion and local job creation in fossil fuel-dependent regions. More than 100 local areas have carried out over 1,000 projects under such contracts and received funding of more than EUR 1.5 bn.

In **Germany**, a **high-level commission** of representatives from industry, academia and civil society have negotiated an agreement to **phase out coal by 2038**, with a view to an earlier phase-out by 2035. To assist this transformation, the government has pledged up to EUR 40 bn for **investment in alternative infrastructure and direct financial compensation** in the four federal states in which coal is a major economic factor. Owners of lignite-fired power plants will receive about EUR 4.35 bn as compensation for early retirement of their plants. In its coalition treaty Germany's new government, which took office in late 2021, calls for an earlier coal phase-out date in 2030. This has been met **by calls from utilities for further compensation**.

Italian Utility Enel, which is majority state-owned, has pledged to become carbon-neutral by 2050. Its just transition strategy, **developed jointly with trade unions** and managed in a participatory manner with Enel's employees, includes early retirement incentives for older workers, apprenticeships to ensure knowledge transfer to younger workers, solidarity agreements with unions to prevent layoffs and negotiated agreements for the relocation of workers.

EU Just Transition policies

The EU's **Just Transition Fund** supports structural change in regions most negatively impacted by the transition to renewable energy. It provides grants of up to a total of EUR 17.5 bn over the period 2021–2027 to member states in order to implement measures such as assistance for small and medium-sized firms and creation of new firms, up- and reskilling of workers and job-search assistance.

Japan almost exclusively relies on imported coal for coal-fired power generation. **More than 900 coal mines, accounting for about 200,000 jobs**, were closed during the period 1960–2000. The national Employment Promotion Corporation, local governments, coal companies and labor unions jointly developed programmes for job training and job creation in other industries as well as benefit schemes for unemployed coal workers and early retirement arrangements. These experiences can also support the transition away from the use of fossil fuels, for instance in the power, steel production and automotive sectors, for all of which Japan's leading businesses have announced plans to transition to products that are in line with a net-zero economy.

The **UK** has a large array of policies to manage the decline of coal mining, which the Thatcher government brought about through market liberalisation policies in the 1980s for reasons unrelated to climate policy. Several relevant **policies to support workers** exist at the sub-national level, such as Skills Development Scotland which, for instance, provides apprenticeships and training in industry-specific skills for workers who have lost their jobs. Instead of being managed by the central government, transition policies to safeguard regional economic prospects are devolved to the local level in the form of **'city-region deals'** or **'growth deals'** negotiated between the central government and local authorities and/or local enterprise partnerships. Over the next 30 years, about GBP 7.5 bn (EUR 8.9 bn) has been pledged for such agreements.

In the **US**, the federal **'Partnerships for Opportunity and Workforce and Economic Revitalization'** initiative supports communities and workers affected by the decline of coal, mainly in the Appalachian region. It aims to provide jobs for more than 26,000 people through the help of almost 300 projects. They receive federal funds of USD 238 m (EUR 217 m) and are expected to leverage more than USD 1 bn (EUR 0.9 bn) in private investment.

Several US states have initiated policies for a just energy transition. For instance, **Colorado** has created a Just Transition Office and a Just Transition Advisory Committee to provide recommendations for workers and communities, and Kentucky levies a severance tax on coal to support economic development, job creation, infrastructure and services in some of the state's poorest counties and municipalities with several hundred million USD.

4.2 Policies to Address Energy Poverty

Rising energy prices place substantial financial burdens on end consumers. This is of particular importance for low-income households that spend a large share of their disposable income on energy. To address the recent stark rise in energy prices, some G7 countries have either expanded existing schemes or introduced additional measures to protect households at risk of energy poverty. In the current geopolitical situation, governments are confronted by the challenge of balancing energy security concerns with the objective to shield low-income households from energy poverty.

In view of rising energy prices, the G7 countries need to protect households from energy poverty.

In **Canada**, **no federal programme** exists to support low-income homeowners in paying their energy bills. However, most provinces have some form of energy efficiency and energy assistance programme for low-income households.

To ease the impact of rising energy prices, **France** has provided **energy and fuel vouchers for low-income households** and **capped electricity prices** charged by France's state-owned utility EDF below market rates.

Household energy bills in **Germany** have been lowered by more than EUR 3 bn as a result of **lowering the EEG surcharge** (a levy on the price of electricity used to finance feed-in-tariffs for renewable power production) from 6.5 to 3.72 cents per kilowatt-hour. The government has announced that the surcharge will be eliminated **by July 2022**. It has also announced a relief package with temporary measures, including lowering taxes on transport fuels — they would be lowered to the minimum specified in the EU Energy Taxation Directive, which will **reduce gasoline and diesel prices** by about 30 ct/l and 14 ct/l, respectively. Costs for **public transport** have reduced to EUR 9 per month for a term of three months. Income earners receive a (taxable) **one-time support** of EUR 300, recipients of social assistance EUR 200 and families get EUR 100 per child.

The **Italian** government has introduced measures that are estimated to amount to roughly EUR 8.5 bn in order to shield consumers and small businesses from rising energy prices by **reducing certain charges for electricity and gas** and **reducing VAT on gas**. It has also allocated **EUR 450 m to increase**

EU measures to address energy poverty

The EU Commission's **Fit for 55 package** proposes a novel instrument to assist vulnerable households, the **Social Climate Fund**. This Social Climate Fund is supposed to cushion social hardships for households at risk of energy poverty. According to the proposal, it would be equipped with about EUR 72 bn.

Even though the Social Climate Fund would provide the majority of funding for EU member countries with per-capita incomes below the average, it can also be employed to assist just transition policies in the G7 countries (France, Germany and Italy) in addition to national funding.

the ‘social bonus’ on bills for families in economic difficulty and with serious illnesses. Energy-intensive companies experiencing a 30% price increase (relative to 2019) receive a 20% tax credit.

The rate of energy poverty has increased in recent years in **Japan** especially after the rise of energy prices, especially in the aftermath of the accident at the Fukushima nuclear plant. Households that are adversely affected by higher energy prices may receive **financial support from social security**, but there is **no dedicated scheme to address energy poverty**.

In the **UK**, the **Warm Home Discount scheme** provides an allowance between GBP 100–300 (EUR 118–357) to help households living in fuel poverty or to help a fuel poverty risk group pay heating bills. The government also implemented a **GBP 500 m (EUR 595 m) fund** to support basic needs for the most vulnerable people. Recently, **additional financial support of GBP 350 (EUR 416)** was announced to help the large majority of households pay rising energy bills (this will cover about half of the increase in the cost of energy for the average recipient household).

A central policy to protect vulnerable households in the **US** is the **Low Income Home Energy Assistance Program**. It is funded by the federal government and provides grants ... of about **USD 5,000 (EUR 4,560)** on average for weatherproofing measures (furnace replacement, insulation, and infiltration reduction) to reduce energy consumption in low-income households. Several additional programmes exist at the state level in order to provide financial assistance to households at risk of energy poverty.

4.3 Climate Finance

In addition to domestic emission reductions, achieving global net-zero emissions requires support for decarbonisation in other, especially low-income, countries.

In addition to domestic emission reductions, achieving global net-zero emissions requires support for decarbonisation in other, especially low-income, countries. Here we only assess public financial flows and relate them to the ‘fair share’ that each country needs to contribute to achieve the target of USD 100 bn per year agreed in the Copenhagen Accord. The OECD notes that progress towards this target has been achieved in recent years. In 2019, all sources of climate finance (bi- and multilateral public, private as well as export credits) mobilised by OECD countries amounted to almost USD 80 bn.¹⁸ Whereas the largest share of climate finance is directed at mitigation activities, finance for adaptation and loss and damage falls short of actual needs. Moreover, as the USD 100 bn per year target was not backed up by robust assessments at the time when it was prescribed, a new target for climate finance is currently being negotiated.

Various concepts on how to share the effort have been proposed in order to assess the extent to which individual countries need to scale up their climate financing efforts. These measures typically reflect equity principles stating that those countries with a greater ability to pay as well as those with greater (historical) responsibility for greenhouse gas emissions should provide a higher

share of climate finance. In the following, we summarize reported climate finance flows for the year 2018 and provide upper and lower bounds of fair share estimates as compiled in a recent report by the World Resources Institute.¹⁹ Even though these estimates are based on subjective criteria, they can help to inform the discussion on how to close existing financing gaps.*

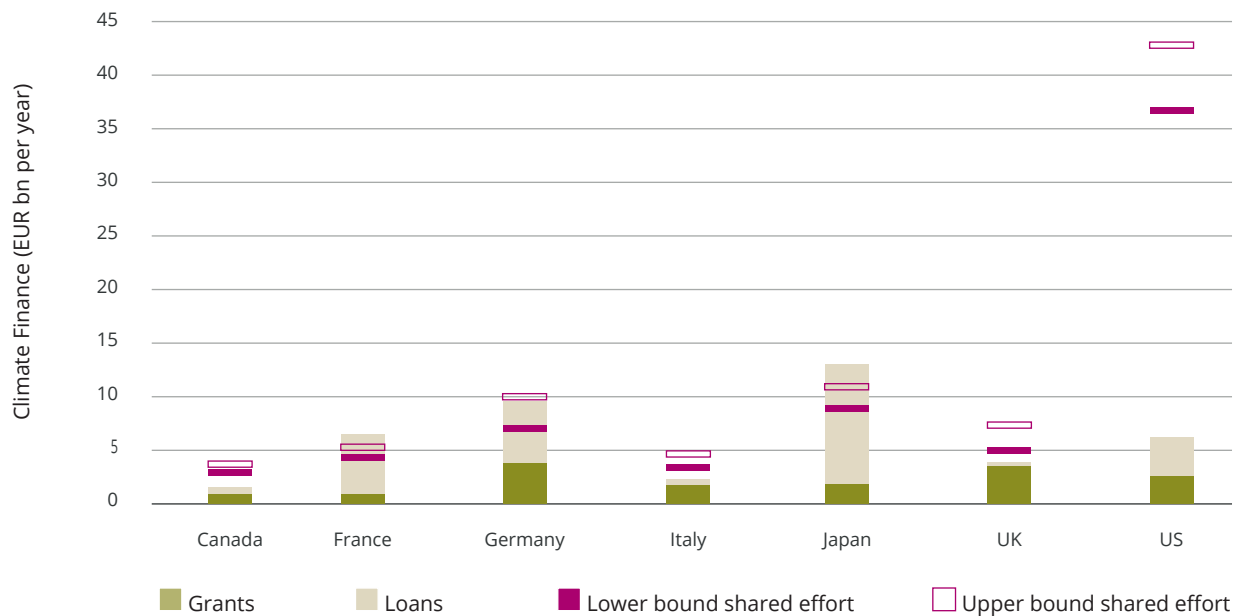


Figure 4: Actual climate finance in 2019 and upper/lower bounds for what is deemed a country's shared effort to achieve the target of USD 100 bn per year.¹⁹

Canada provided about **USD 1.5 bn (EUR 1.4 bn)** of climate finance in 2019. This figure is substantially below the effort sharing range of **USD 2.9-3.8 bn (EUR 2.6-3.5 bn)** for Canada's contribution to climate finance. With a grant share of **55%**, Canada occupies an intermediate position among G7 countries.

In 2018, **France** provided about **USD 6.9 bn (EUR 6.3 bn)** of climate finance. This figure is substantially above what is considered as the shared effort that France has to contribute to reach **USD 100 bn (EUR 91 bn)** per year, which ranges from **USD 4.6-5.5 bn (EUR 4.2-5.0 bn)**. However, only 10% of climate finance disbursed were grants, the rest loans or cushions.

In 2018, **Germany** provided about **USD 10.3 bn (EUR 9.4 bn)** of climate finance. This figure falls within the range of shared effort estimates, which for Germany ranges from **USD 7.6-10.6 bn (EUR 6.9-9.7 bn)**. A total of **39%** of climate finance disbursed by Germany was in the form of grants.

* In addition to several concepts of effort sharing, there are different approaches in calculating the contributions to climate finance. Depending on what kind of finance is included (e.g. how loans are accounted for), this results in different figures. The data from the WRI report do not convert to grant equivalents of loans, but Oxfam data on the share of grants is included.

All G7 members are part of numerous partnerships and alliances dedicated to climate-relevant aspects.

Italy provided about **USD 2.3 bn (EUR 2.1 bn)** of climate finance in 2019. This figure is well below the range of what is estimated to constitute Italy's shared effort, namely **USD 3.4–4.8 bn (EUR 3.1–4.4 bn)**. However, with 79% Italy has the second highest share of grants in climate finance among G7 countries.

With about **USD 14.1 bn (EUR 12.9 bn)** in 2018, **Japan** was the largest single contributor to global climate finance. This amount is significantly above the **USD 9.5–11.8 bn (EUR 8.7–10.8 bn)** estimated to constitute Japan's shared effort of climate finance. However, Japan has the lowest share of climate finance disbursed in the form of grants among G7 countries, only **14%**. At the same time, Japanese investors are a major source of **cross-country finance for coal-fired power** generation, with Japanese banks accounting for **USD 50 bn (EUR 46 bn)** in loans and underwriting in other countries.²⁰

In 2018, the **UK** provided about **USD 4 bn (EUR 3.6 bn)** of climate finance, which falls well below the range of **USD 5.3–7.7 bn (EUR 4.8–7.0 bn)** estimated to be the country's shared effort of climate finance needed to achieve public funding of USD 100 bn (EUR 91 bn) per year. However, with 93% the UK's share of grants in climate finance flows is the highest among all G7 countries.

In 2018, the **US** provided about **USD 6.6 bn (EUR 6.0 bn)** of climate finance. This figure is almost an order of magnitude below the estimated **USD 40–47 bn (EUR 36–43 bn)** that have been estimated as the shared effort for the US in climate finance. A total of 39% of the climate finance disbursed by the US was in the form of grants.

At the same time, **US-based investors** hold about **USD 70 bn (EUR 64 bn)** in bonds and shares related to financing of **coal-fired power** generation in third countries, and **US banks** account for roughly **USD 80 bn (EUR 73 bn)** in loans and underwriting.

4.4 Energy and Climate Partnerships

G7 members cooperate with each other and other countries on climate and energy issues within a variety of forums and partnerships. For example, the NDC partnership brings together various stakeholders to help member countries better align their climate and development agendas.

Canada has several bilateral agreements to cooperate on climate issues. These include the **Canada-EU Strategic Partnership Agreement**, the **Canada-China cooperation on climate change** and the **Canada-US agreement on weather and climate collaboration**.

Through its development agency AFD, **France** supports projects aiming to provide **universal access to clean renewable energy**, improving **energy**

efficiency, accelerating the **uptake of renewables** and **modernizing electricity grids**. In 2019, EUR 2.8 bn were spent on such projects benefiting 3.6 m people in Africa, Asia, Latin America and the Pacific.

The **German** government **maintains energy partnerships** and **energy dialogues** with more than 20 partner countries. These initiatives aim to jointly develop solutions for, inter alia, the regulation and management of electricity grids, the design of power markets and coal phase-outs by means of workshops, events study tours and high-level exchange. Future opportunities for cooperation are envisaged in order to support the production of green hydrogen to be used in Germany. To this end, the German government has recently initiated **H2Global**, an entity serving as a market maker to tender a pre-determined quantity of green hydrogen and derivatives on the global market and make it available to the highest bidding German companies.

Climate cooperation between several G7 members

All G7 members are part of numerous partnerships and alliances dedicated to climate-relevant aspects. These include, inter alia the **Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants**, the **Carbon Sequestration Leadership Forum**, and the **International Partnership for Energy Efficiency Cooperation**.

All G7 members except France are part of the **Global Methane Initiative**, Canada, France, Germany, Italy and the UK have joined the **Powering Past Coal Alliance**, and Canada, Germany and the UK are members of the **Industrial Deep Decarbonization Initiative** to decarbonise steel, cement and concrete. In 2021, the US and Japan entered into a **Climate Partnership on Ambition, Decarbonization, and Clean Energy** to cooperate on implementation of domestic climate policy, development of clean technologies and accelerating transitions in third countries, particularly in the Indo-Pacific. The “Net-Zero Producers Forum” was established in 2021 by Canada, Norway, Qatar, Saudi Arabia and the US with the goal of forming a cooperative forum to develop net-zero emissions strategies and other measures to align with each country’s circumstances. However, the forum has not yet acknowledged the need to reduce production levels.

For France, Germany and Italy, the **EU Global Gateway initiative**, which aims to mobilise up to EUR 300 bn by 2027 to boost smart, clean and secure links in digital, energy and transport sectors across the world will likely play an important role in supporting climate measures in third countries.

At COP26 in Glasgow, the US, UK, Germany and France have announced that they will jointly provide EUR 7.5 bn to support **just transition measures for coal phase-out in South Africa**.

Border carbon
adjustments should
prevent carbon
leakage.

Italy has relatively few climate and energy partnerships. It was one of the earliest signatories of the **International Tropical Timber Agreement** and in 2021 it joined the **Solar Alliance**.

Japan has established the **Asia Energy Transition Initiative** to provide financial, technological and human resource development support for sustainable economic growth and carbon neutrality in ASEAN countries. The Japan International Cooperation Agency conducts programmes for transferring green technologies, technical knowledge and training, such as the **Green Power Island Program** to replace diesel power generation in Pacific Island states. At the EU-Japan summit in 2021 both parties announced their intention to form a **Green Alliance to protect our environment, stop climate change and achieve green growth**.

The **UK** cooperates with various countries with its **Partnering for Accelerated Climate Transitions** approach. It also maintains **various energy and climate partner ships** with other countries, including Bangladesh, China and Norway.

US development cooperation also supports farmers, ranchers and forest owners in low-income countries to track and reduce land use emissions through its **Partnerships for Climate-Smart Commodities**.

4.5 Border Carbon Adjustments and Climate Clubs

To avoid the costs of emission reductions, firms might relocate to regions with less ambitious climate policy. To prevent such ‘carbon leakage’, border carbon adjustments have been proposed. These trade measures would level the carbon playing field by imposing the costs borne by domestic firms on producers from other countries as well. This approach has also been discussed as an incentive for other countries to ratchet up their climate policies and might form the backbone of a ‘climate club’ of frontrunners adopting ambitious climate policies. Yet, some concerns have been voiced regarding the negative impacts of border carbon adjustment on the countries against which they are applied.²¹

Canada’s government announced in late 2020 that it is exploring the potential of border carbon adjustments in discussion with its international partners to “ensure that Canada’s transition to a low-carbon economy is achieved in a way that is fair and predictable for businesses, and supports Canada’s international competitiveness.”²² The government solicited feedback about Border Carbon Adjustments from stakeholders until January 2022.

For **France, Germany and Italy**, trade policy is determined at the EU level. In its ‘Fit for 55’ package from July 2021, the European Commission proposed a Carbon Border Adjustment Mechanism (CBAM) for direct (‘Scope 1’) emissions

related to imports of iron and steel, aluminum, cement, fertilisers and electricity, with a view towards including additional sectors in the future. The proposed CBAM does not envisage reimbursement of the carbon costs for exporting domestic producers. Exemptions are proposed for producers from countries with a carbon price comparable to the one prevailing in the EU. However, neither exporters from low-income countries, nor from countries that apply non-pricing policies (such as performance standards) to reduce emissions could be credited. The European Commission proposes using the revenues from the CBAM as an 'own resource' for the EU budget — an approach which has been heavily criticised by civil society, which favours spending on green investment in low-income countries. According to the proposal, the CBAM would be phased in from 2026–2035.

The design of a potential CBAM will be negotiated in the triologue process between the Commission, the European Parliament and the European Council. A draft report from the European Parliament's environmental committee suggests expanding the application of the CBAM to imports of hydrogen, organic chemicals and polymers, to also include indirect emissions from electricity use ('Scope 2') and to phase it in more quickly than envisaged by the European Commission; namely, in the period from 2025 to 2028. The report also proposes an increase in support for trade partners 'commensurate' with CBAM revenues. The **French** government has put progress on CBAM at the top of the agenda for its presidency of the European Council, which it holds during the first six months of 2022.

In addition, the **German** government has announced its intention to use its presidency of the G7 to make the group into a climate club. Even though details still need to be fleshed out, a first proposal aims at an 'ambitious, bold and cooperative' approach.

Japan has not announced intentions to implement a border carbon adjustment, arguably since the country does not have an economy-wide carbon price. In the discussion of whether Japan should introduce carbon pricing, border carbon adjustments are sometimes mentioned as a complementary policy to address the risk of carbon leakage. Furthermore, there has been some interest in the possible effects of the EU CBAM on Japanese exporters, and the prospect of being exempt from the EU CBAM if Japan has a domestic carbon price. Even though there is a national carbon price, it is one of the lowest ones in the world. Emission trading schemes with more significant prices are restricted to regions, such as Tokyo.

In a report on how to achieve net-zero emissions in the **UK** published in early 2021, the Environmental Audit Committee of the UK parliament recommended that the UK government should investigate the merits of a (unilateral) CBAM. **An inquiry invited stakeholders to submit proposals** on the design and implementation of such a mechanism and the associated impacts, risks and opportunities by the end of October 2021. Opinions were submitted by Celsa Steel, the Society of Motor Manufacturers and Traders and the Zero Carbon Campaign. The Environmental Audit Committee will bring forth a recommendation on this basis as to how and whether a CBAM in the UK should be introduced.

In the **US** the **trade agenda of the Biden administration** takes import fees on goods manufactured in non-carbon-taxing countries into account; these would be considered as part of an effort to explore and develop market and regulatory approaches in order to reduce greenhouse gas emissions. **A proposal by to apply costs accruing to US producers to meet environmental regulations to imports** as well has been advanced by Democrat Senator Croons. Legal experts have repeatedly expressed concerns that border measures adjusting for differences in stringency of climate policies other than carbon pricing would not be compatible with the provisions of the World Trade Organization (WTO). The US does not have an economy-wide carbon price in place and is unlikely to achieve one in the foreseeable future, due to lack of support in both the Senate and the Congress. Thus border carbon adjustment in keeping with the WTO appears unlikely in the US.

Policy recommendations



Accelerating the use of renewable energy and increasing energy efficiency is key for climate neutrality, energy security, economic stability and peace.

With the war in Ukraine, transitioning away from fossil fuels is no longer only a climate issue, but also a geo-political issue and a matter of international security. Accelerating the deployment of renewable energy sources and increasing energy efficiency is needed in any case in order to obtain climate neutrality — but has become all the more important and urgent as a matter of energy security, economic stability and peace.

Our analysis shows that G7 members have targets for net-zero, yet it remains to be seen if they are sufficient to set the world on track to meet the goals of the Paris Agreement. To make efforts comparable across countries, a **commitment to net-zero GHG emissions** (as opposed to net-zero CO₂ emissions) is necessary. The **activities** (e.g. treatment of CDR or carbon offsets in reduction targets) and the **policies** with which to achieve net-zero emissions also need to be clarified. Such policies should be included in their **NDCs and Long-Term Strategies**.

Carbon pricing is used in all countries to some extent, but only at very low prices in countries such as Japan, or in the case of the US only at the local or regional level. In most cases, however, carbon prices are way below the levels that would be needed to incentivise rapid decarbonisation. Carbon prices therefore **need to rise** across the board.

The missing economic incentives for decarbonisation are exacerbated by the fact that governments continue to support the production or use of fossil fuels through **fossil fuel subsidies**. Such financial support for fossil fuels, e.g. for oil and gas in the US and Canada, slows the transition away from fossil fuels and reinforces existing path dependencies. Reforming existing fossil fuel subsidies would also free up public resources for investments in a recovery from the pandemic compatible with net-zero targets. The G7 provides an appropriate forum to establish the transparency and clear commitments needed to phase out fossil fuel subsidies. G7 countries should **set out clear definitions of fossil fuel subsidies** that should be phased out, alongside concrete dates, subject to **periodic peer-review**.

It is recommended that Japan and the US join the rest of the G7 in announcing a nationwide phase-out date for the sale of ICE vehicles, and possibly envisage dates for driving bans. Phase-out targets for the sale of ICE vehicles could also be extended to include the production of these vehicles in order to avoid their deployment in countries with less ambitious climate action. Looking ahead, phase-out dates could also be helpful for ending fossil fuel extraction and fossil fuel boilers. So far, only few jurisdictions have made such pledges.

Those G7 countries with substantial coal endowments have **Just Transition policies** to align the coal phase-out with the goals of decent employment opportunities and regional economic futures. G7 countries can demonstrate leadership on coal transition and can provide policy and financial support for coal transition in other countries as has, for example, been the case for the South African transition initiative. Despite their leadership in phasing out

The G7 need to phase-out fossil fuels, end fossil fuel subsidies and provide support for coal transitions in other countries.

coal, G7 countries do not seem to be sufficiently prepared to deal with the labour market challenges of transforming other economic sectors, such as the car industry which would affect a substantially higher number of people than a coal phase-out. For such a transformation, policy makers need to **promote economic alternatives** — alternative employment opportunities, alternative sources of income and revenue, and alternative perspectives for the affected regions — as well as provide **credible long-term commitment to a net-zero pathway**. Inclusive just transition planning processes should be immediately strengthened or put in place by all G7 countries, building on already existing policies and initiatives.

Tackling **energy poverty** in a political moment where energy security is the paramount policy concern: All G7 countries have some form of policy in place to protect poor households from high energy prices. In many cases these policies have been expanded in the wake of the recent energy price hikes. In seeking ways to avoid energy poverty, policy-makers need to **design measures in ways that do not undermine incentives for emission reductions**. Hence there is a clear hierarchy of solutions to address the distributional impacts of climate policies: above all, measures to **promote energy efficiency and switch to low-carbon alternatives** help vulnerable households to reduce their exposure to rising energy prices. Direct income support can alleviate some hardships from increasing energy prices, constituting an appropriate short-term remedy that can be deployed more quickly than schemes to change the structure of energy use patterns. The G7 can act as a forum to exchange experiences of well-targeted support policies in order to ensure that financial support accrues to those most in need. Price caps for fossil fuels, on the contrary, are extremely inefficient as they weaken the incentive to conserve energy; and since they are not targeted at vulnerable households — they instead benefit everyone at the cost of the environment.

G7 countries have made some progress but are still behind in achieving the target of USD 100 bn (EUR 91 bn) per year of **climate finance**. Assessing responsibility for the provision of climate finance is a normative issue and hence to some extent subjective. Several concepts for quantifying ‘fair shares’ of climate finance suggest a particular need for the US to increase their contribution. Those countries that are on track with respect to the amounts of climate finance indicated by their shared effort only provide a relatively small share of their climate finance in the form of grants. Hence, **scaling up the absolute amount, increasing the share of grant financing and achieving a more appropriate balance** between climate finance targeted at mitigation, adaptation and loss and damage, respectively, is recommended.

The EU plans to adopt a **carbon border adjustment mechanism** to reduce the risk of carbon leakage; the UK, Canada and the US are considering similar proposals. CBAMs can be important as enablers of domestic carbon prices if they are implemented as **alternatives to existing anti-leakage measures**, such as the free allocation of emission permits. But CBAMs should neither be introduced as a policy to provide additional protection for energy-intensive





CBAMs need to replace existing anti-leakage measures, such as the free allocation of emission permits.

industries, nor should they be used to force climate policies on other countries. Rather, such border measures need to be designed in a way that does not harm low-income countries, for instance through exemptions and recycling of revenues to support the transformation towards net-zero in these countries.

All G7 countries are members of various **multi- as well as bilateral agreements and partnerships related to climate policy**. Coordinated actions by G7 countries in these forums could provide additional momentum for global climate policy, for instance by harmonising dates to phase out coal and internal combustion engines. Germany's G7 Presidency has raised the possibility of turning the G7 into a climate club, with the details still to be fleshed out. Such a club should be an **open climate club built on a spirit of cooperation**. Hence its membership should not be restricted to G7 countries, but should allow all countries that show a willingness to move forward on climate policy to join. Members should be required to implement ambitious climate policies and apply CBAMs to safeguard the competitiveness of their trade- exposed, energy- intensive industries. These efforts could be strengthened by **cooperation on domestic policies**, such as reforming subsidies of fossil fuels or minimum carbon prices and joint support for other countries, for instance in the design of coal phase-out policies and by providing climate finance.

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