

GERMANY



CLIMATE TRANSPARENCY REPORT: COMPARING G20 CLIMATE ACTION TOWARDS NET ZERO

2021

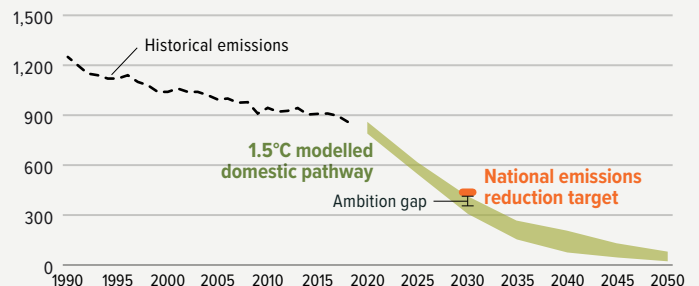
NOT ON TRACK FOR A 1.5°C WORLD

1.5°C

Germany's national target is to reduce emissions 65% below 1990 levels, or to approximately 437 MtCO₂e, by 2030. To keep below the 1.5°C temperature limit, Germany's 2030 emissions would need to be around 354 MtCO₂e (or 72% below 1990 levels), leaving an ambition gap of 83 MtCO₂e. All figures exclude land use emissions.

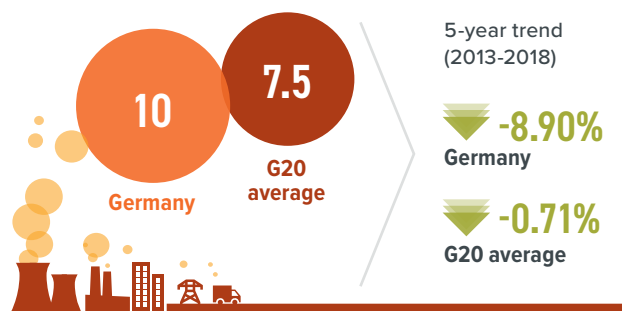
Gütschow et al., 2021; Climate Analytics, 2021

1.5°C compatible emissions pathway (MtCO₂e/year)¹



PER CAPITA GREENHOUSE GAS (GHG) EMISSIONS ABOVE G20 AVERAGE

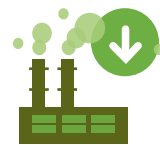
GHG emissions (incl. land use) per capita (tCO₂e/capita)² in 2018



Germany's per capita emissions are 1.34 times the G20 average. Total per capita emissions have decreased by just under 9% between 2013 and 2018.

Climate Action Tracker, 2021; Gütschow et al., 2021; United Nations, 2019

KEY OPPORTUNITIES FOR ENHANCING CLIMATE AMBITION



Accelerating coal phase-out to before 2030, followed by natural gas phase-out by 2035, complemented with a rapid scale-up of renewables development.



Moving back the date of the ban on installing oil heating to 2022 and broadening it to include gas heating. **A ban on the operation of existing oil heating by 2030 and natural gas by 2035 should be considered.**



Decarbonising the transport sector by promoting public transport, electromobility, cycling and walking. Investment in railway infrastructure could accelerate a modal shift from emissions-intensive modes of transport.

RECENT DEVELOPMENTS



In June 2021 the German parliament adopted an amendment of the Climate Protection Law, **increasing the 2030 emissions reduction target from 55% to 65%** and bringing forward the goal of reaching "climate neutrality" to 2045.



The **Climate Protection Emergency Programme 2022** provides EUR 8bn to decarbonise industry and transport, and increase the energy efficiency of buildings.



The government **failed to propose an amendment of the Renewable Energy Act** that would accelerate the development of renewables to reflect the new emissions reduction goal.

Deutscher Bundestag, 2021; Die Bundesregierung, 2021a



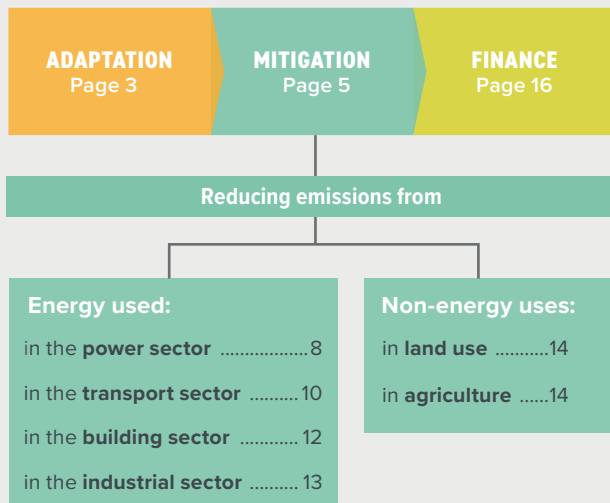
CORONAVIRUS RESPONSE AND RECOVERY

Germany allocated approximately USD 100bn, equivalent to 2.6% of the country's GDP, to recovery efforts. Green spending accounted for 47% of the country's recovery spending. The largest allocation has been towards the creation of "green markets", clean energy infrastructure development, and incentives for electric vehicles (EVs).

Global Recovery Observatory, 2021

CONTENTS

We unpack Germany's progress and highlight key opportunities to enhance climate action across:



LEGEND

Trends show developments over the past five years for which data are available. The colour-coded arrows indicate assessment from a climate protection perspective: Orange is bad, green is good.



Decarbonisation Ratings³ assess a country's performance compared to other G20 countries. A high score reflects a relatively good effort from a climate protection perspective but is not necessarily 1.5°C compatible.

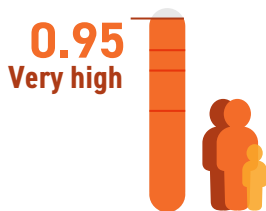


Policy Ratings⁴ evaluate a selection of policies that are essential pre-conditions for the longer-term transformation required to meet the 1.5°C limit.



SOCIO-ECONOMIC CONTEXT

Human Development Index (HDI)

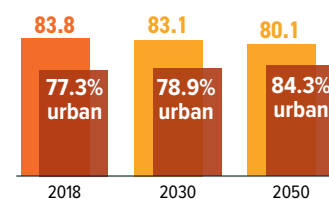


The HDI reflects life expectancy, level of education, and per capita income. Germany ranks very high.

Data for 2019. UNDP, 2020

Population and urbanisation projections

(in millions)

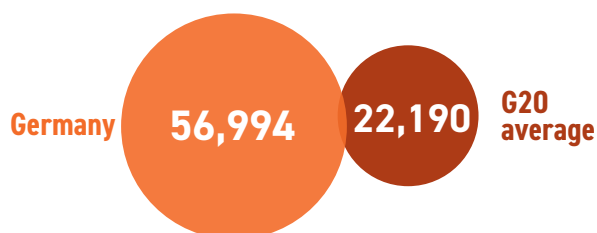


Germany's population is projected to decrease by 4% by 2050, and become more urbanised. Climate change-related risks such as floods have increased in the areas close to water basins in Germany. This could lead to an increase in migration towards relatively less risk-prone urban areas.

United Nations, 2019; United Nations, 2018

Gross Domestic Product (GDP) per capita

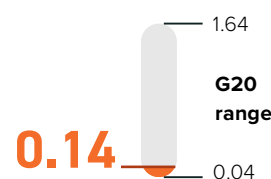
(PPP constant 2015 international \$) in 2019



World Bank, 2021; United Nations, 2019

Death rate attributable to air pollution

Ambient air pollution attributable death rate per 1,000 population per year, age standardised in 2019



Over 29,300 people die in Germany every year as a result of outdoor air pollution due to stroke, heart disease, lung cancer and chronic respiratory diseases. Compared to total population, this is still one of the lowest levels in the G20.

Institute for Health Metrics and Evaluation, 2020

This source differs from the source used in last year's profiles and, therefore, the data are not comparable.

A JUST TRANSITION

Within the framework of its coal phase-out, in July 2020 the German government agreed to support affected regions with up to EUR 40bn until 2038. The support is directed at the development of regional infrastructure, especially relating to connectivity (e.g. new railway connections, broadband development), recultivation of post-coal areas to increase their tourist potential, and the improvement of social, scientific, and educational facilities. The regions will also receive support aimed at encouraging the creation or location of new businesses in the affected regions to help diversify their economies.

Since the resources have only recently begun to be distributed, the assessment of the impact on the local economies and mitigation of the social impacts of coal phase-out cannot yet be assessed.

BMU, 2020; Deutscher Bundestag, 2020b



ADAPTATION

ADDRESSING AND REDUCING VULNERABILITY TO CLIMATE CHANGE



Increase the ability to adapt to the adverse effects of climate change and foster climate resilience and low-GHG development.



Germany is vulnerable to climate change and adaptation actions are needed.



With global warming, Germany would likely experience **heat stress, especially in cities, and water shortages.**



Loss of life and damage to buildings and infrastructure has been caused by **heavy rains and flash floods.**

ADAPTATION NEEDS

Climate Risk Index

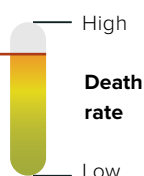
Impacts of extreme weather events in terms of fatalities and economic losses that occurred. All numbers are averages (1999-2018).

Annual weather-related fatalities

537
Deaths

0.66
PER 100,000
INHABITANTS

RANKING:
4th
in the G20



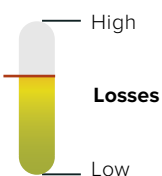
Based on Germanwatch, 2019

Annual average losses (US\$ millions PPP)

4,162
\$

0.13
PER UNIT
GDP (%)

RANKING:
7th
in the G20



Based on Germanwatch, 2019

Exposure to future impacts at 1.5°C, 2°C and 3°C

Impact ranking scale:



			1.5°C	2°C	3°C
WATER	% of area with increase in water scarcity				
	% of time in drought conditions				
HEAT AND HEALTH	Heatwave frequency				
	Days above 35°C				
AGRICULTURE	Maize	Reduction in crop duration			
		Hot spell frequency			
		Reduction in rainfall			
	Wheat	Reduction in crop duration			
		Hot spell frequency			
		Reduction in rainfall			

Water, Heat and Health: own research; Agriculture: Arnell et al., 2019

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



CORONAVIRUS RESPONSE AND RECOVERY

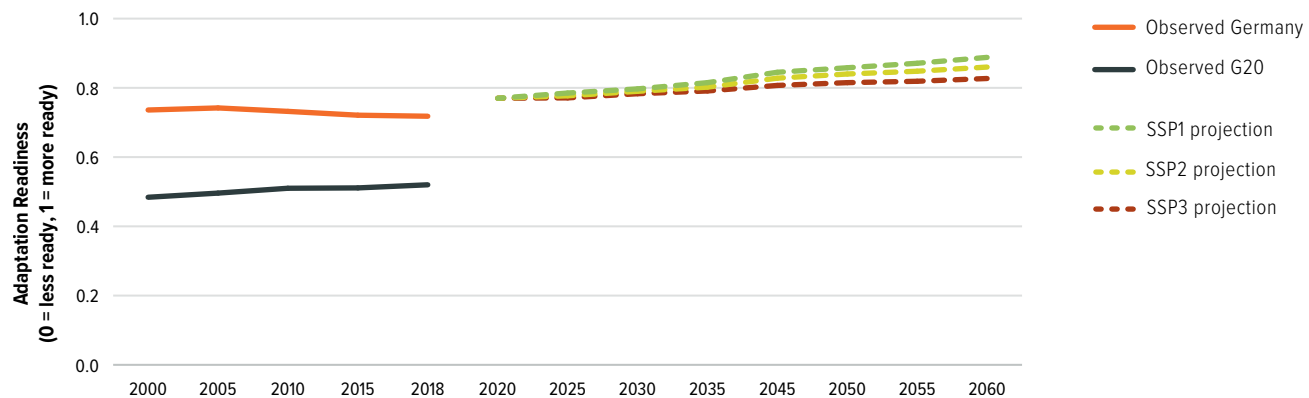
As part of the COVID-19 fiscal stimulus, the German Federal Ministry of the Environment aims to strengthen the resilience of social institutions (such as hospitals, nursing homes, schools and day care centres) against already noticeable consequences of climate change, such as periodic heat waves, with a new EUR 150m funding programme from 2020 until 2023.

Platform for REDESIGN, 2020

Adaptation Readiness

The figure shows 2000-2018 observed data from the Notre Dame Global Adaptation Initiative (ND-GAIN) Index overlaid with projected Shared Socioeconomic Pathways (SSPs) from 2020 to 2060.

Notre Dame Global Adaptation Initiative (ND-Gain) Readiness Index



Germany was well above the G20 average in 2018 in terms of adaptation readiness. Adaptation challenges still exist, but the country is well-positioned to adapt. Implementing measures compatible with SSP1 would increase Germany's adaptation readiness sooner and better than measures compatible with SSP2 and SSP3.

The readiness component of the Index created by the ND-GAIN encompasses social (social inequality, information and communications technology infrastructure, education and innovation), economic, and governance indicators to assess a country's readiness to deploy private

and public investments in aid of adaptation. The index ranges from 0 (low readiness) to 1 (high readiness).

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

Based on Andrijevic et al., 2020; ND-Gain Index, 2021

ADAPTATION POLICIES

National Adaptation Strategies

Document name	Publication year	Fields of action (sectors)												Monitoring & evaluation process
		Agriculture	Biodiversity	Coastal areas and fishing	Education and research	Energy and industry	Finance and insurance	Forestry	Health	Infrastructure	Tourism	Transport	Urbanism	
German Strategy for Adaptation to Climate Change (DAS)	2008		●	●		●	●	●	●	●	●		●	
Adaptation Action Plan APA I	2011													Updated every 5 years with "progress reports"
Progress report to the DAS	2015	●	●				●		●	●			●	●

Nationally Determined Contribution (NDC): Adaptation

TARGETS

Not mentioned in the EU's NDC to which Germany contributes.

ACTIONS

Not mentioned

MITIGATION

REDUCING EMISSIONS TO LIMIT GLOBAL TEMPERATURE INCREASE



Hold the increase in the global average temperature to well below 2°C above pre-industrial levels and pursue efforts to limit to 1.5°C, recognising that this would significantly reduce the risks and impacts of climate change.

EMISSIONS OVERVIEW



Germany's GHG emissions dropped by 31% (1990-2018), with a further 8.7% decline between 2019 and 2020. This decline has been partially attributed to the economic and social shutdowns precipitated by the COVID-19 pandemic, and some rebound is likely. The government's targets for 2030 (65% below 1990 levels) and 2045 (net zero emissions) are still **not in line with a 1.5°C pathway**.

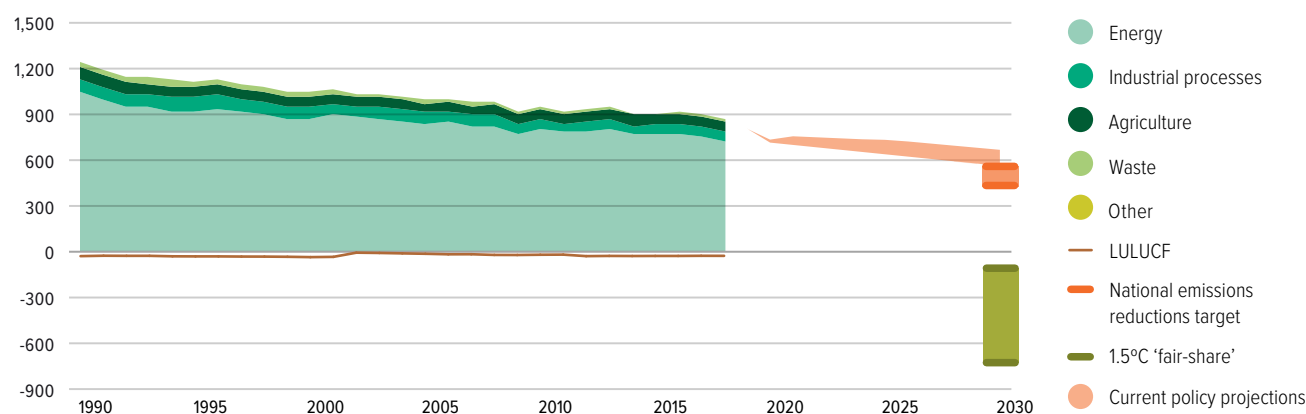


In 2030, global CO₂ emissions need to be 45% below 2010 levels and reach net zero by 2050. Global energy-related CO₂ emissions must be cut by 40% below 2010 levels by 2030 and reach net zero by 2060.

Rogelj et al., 2018

GHG emissions across sectors and CAT 1.5°C 'fair-share' range (MtCO₂e/year)⁵

Total GHG emissions across sectors (MtCO₂e/year)

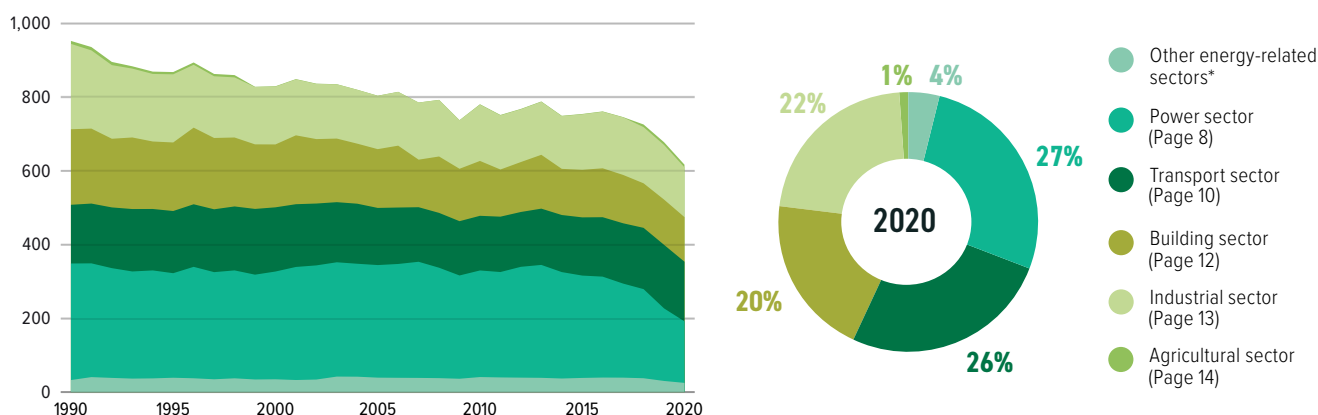


Germany's emissions (excl. land use) decreased by 31% between 1990 and 2018 to 860 MtCO₂e. Between 2019 and 2020, emissions dropped 9% (or 36% from 1990 levels by 2019). When considered by category, decreases have been seen in all sectors, except for transport, over the timeframe. While a step in the right direction, Germany's 2030 target is not sufficient as a 'fair-share' contribution to reducing emissions in line with the Paris Agreement. A 'fair-share' contribution would require it to scale up domestic climate action and, in addition, provide more substantial support for emissions reductions in developing countries than its current levels.

Gütschow et al., 2021; Climate Action Tracker, 2020a, 2021

Energy-related CO₂ emissions by sector

Annual CO₂ emissions from fuel combustion (MtCO₂/year)



The largest driver of overall GHG emissions are CO₂ emissions from fuel combustion. The power sector produces the largest share of emissions (27%), followed closely by the transport sector (26%). Over the last 30 years the power, buildings and industry sectors decreased emissions by over 40% per sector; transport sector emissions, by contrast were relatively stable, growing by 2%. COVID-19 related restrictions on movement in 2020 forestalled emissions growth, reducing transport sector emissions to 2016 levels instead.

Enerdata, 2021

Due to rounding, some graphs may sum to slightly above or below 100%

Other energy-related sectors covers energy-related CO₂ emissions from extracting and processing fossil fuels.

ENERGY OVERVIEW



The share of coal in Germany's energy supply dropped **from 66% in 1990 to 16% in 2020, and the share of nuclear decreased from just over 11% to 6% over that period.** Despite the increase in the share of renewable energy, the carbon intensity of the energy sector has decreased fairly slowly – **approximately 17% in 30 years.**

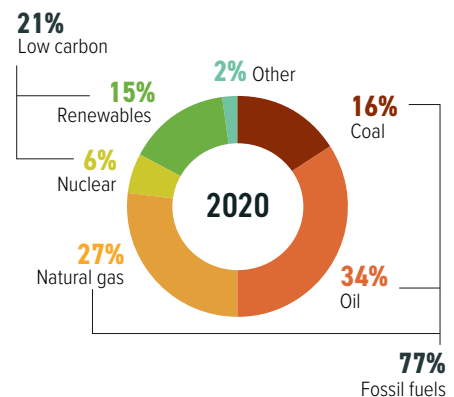
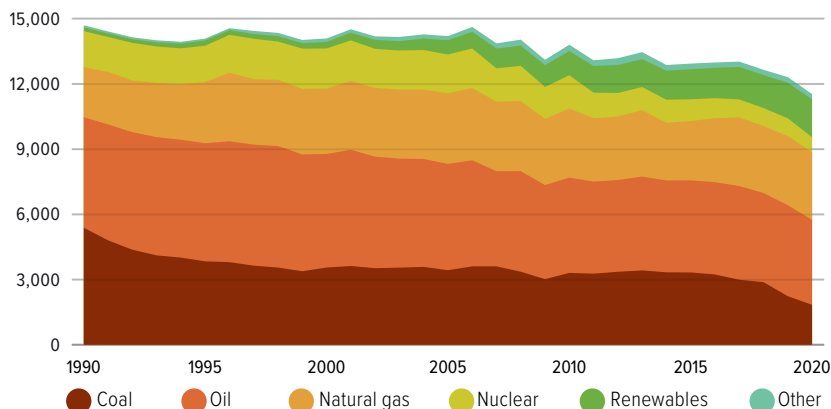


The share of fossil fuels globally needs to fall to 67% of global total primary energy by 2030 and to 33% by 2050, and to substantially lower levels without carbon capture and storage (CCS).

Rogelj et al., 2018

Energy mix

Total primary energy supply (TPES) (PJ)



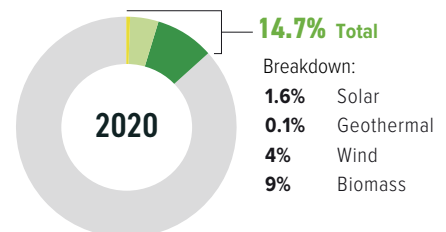
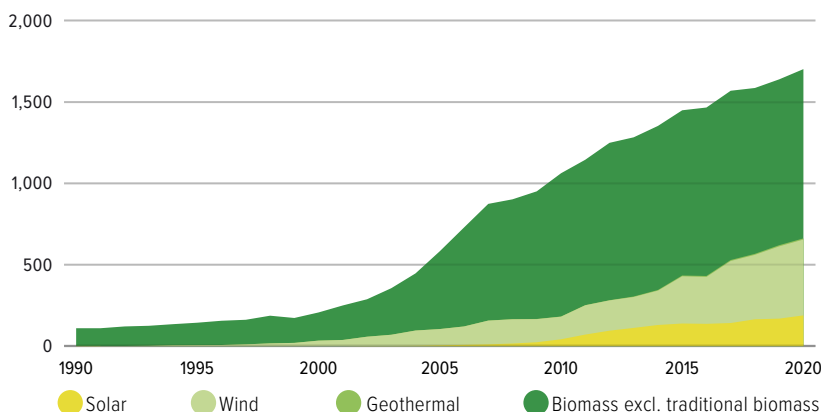
This graph shows the fuel mix for all energy supply, including energy used not only for electricity generation, heating, and cooking, but also for transport fuels. Fossil fuels (oil, coal, and gas) make up 77% of the German energy mix, which is lower than the G20 average of 82% in 2020. Renewable energy was the only energy form that increased in absolute terms in 2020, while coal's share in German primary energy supply fell to a historic low of 16%.

Enerdata, 2021

Due to rounding, some graphs may sum to slightly above or below 100%

Solar, wind, geothermal, and biomass development

TPES from solar, wind, geothermal and biomass (PJ)



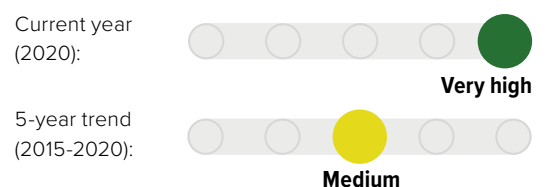
Solar, wind, geothermal and biomass account for nearly 15% of Germany's energy supply – the G20 average is 7%. The share in total energy supply has increased by around 32% in the last five years in Germany (2015-2020). Bioenergy (for electricity and heat) makes up the largest share. However, the contribution of wind and solar power in the German power mix have also increased, with the share of wind growing more dramatically over recent years.

Enerdata, 2021

Due to rounding, some graphs may sum to slightly above or below 100%

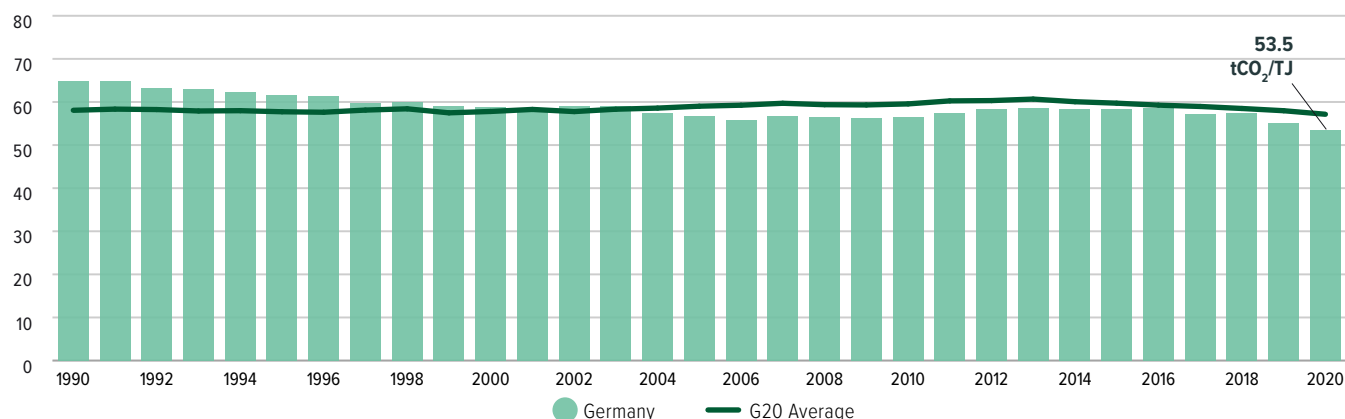
Note: Large hydropower and solid fuel biomass in residential use are not reflected due to their negative environmental and social impacts.

Decarbonisation rating: Renewable energy share of TPES compared to other G20 countries



Carbon intensity of the energy sector

Tonnes of CO₂ per unit of TPES (tCO₂/TJ)

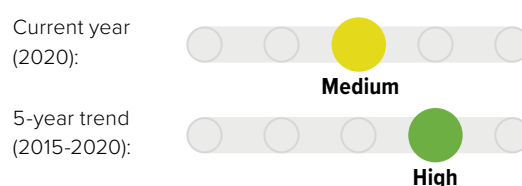


Carbon intensity is a measure of how much CO₂ is emitted per unit of energy supply.

The carbon intensity of Germany's energy sector (54 tCO₂/TJ) was relatively close to the G20 average (57 tCO₂/TJ) in 2020. Germany's carbon intensity has declined more rapidly (9%) than that of G20 average (4%) over the past five years.

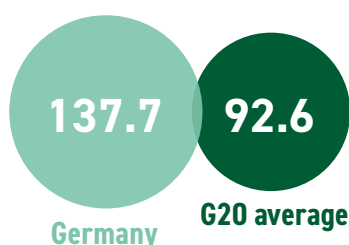
Enerdata, 2021

Decarbonisation rating: carbon intensity of the energy sector compared to other G20 countries



Energy supply per capita

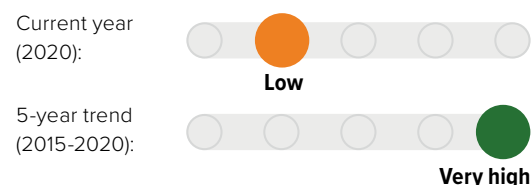
TPES per capita (GJ/capita) in 2020



TPES per capita (GJ/capita):
5-year trend (2015-2020)



Decarbonisation rating: energy supply per capita compared to other G20 countries

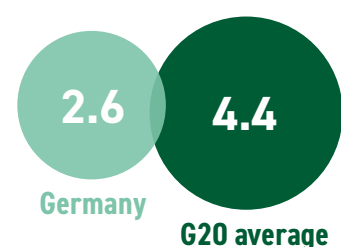


The level of energy use per capita is closely related to economic development, climatic conditions and the price of energy. In 2020, energy use per capita in Germany was, at 138 GJ/capita, well above the G20 average, but has been decreasing faster at a rate of nearly 13% between 2015 and 2020, in contrast to the slight decrease in the G20 average of 0.12% over the same period.

Enerdata, 2021; United Nations, 2019

Energy intensity of the economy

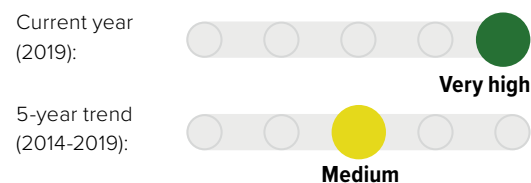
(TJ/million US\$2015 GDP) in 2019



Energy intensity of the economy:
5-year trend (2014-2019)



Decarbonisation rating: energy intensity compared to other G20 countries



This indicator quantifies how much energy is used for each unit of GDP. This is closely related to the level of industrialisation, efficiency achievements, climatic conditions or geography. Germany's energy intensity is lower than the G20 average and has been decreasing at 12% (2014-2019) – a slightly higher rate than the G20's rate of decrease.

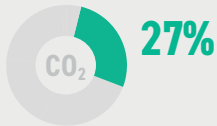
Enerdata, 2021; World Bank, 2021

POWER SECTOR

Emissions from energy used to make electricity and heat



Germany produced 25% of its electricity from coal in 2020. Germany aims to reduce coal in its power sector in phases, and to completely phase it out by 2038 at the latest. By 2035, Germany aims to increase the share of renewable energy sources in its power mix to 65%, but **this goal does not reflect the recently-increased emissions reduction goal.**



Share of energy-related CO₂ emissions from electricity and heat production in 2020.

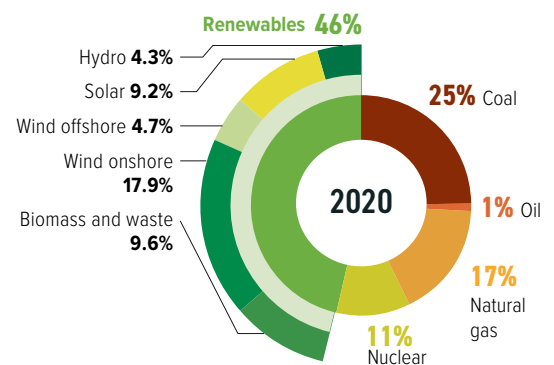
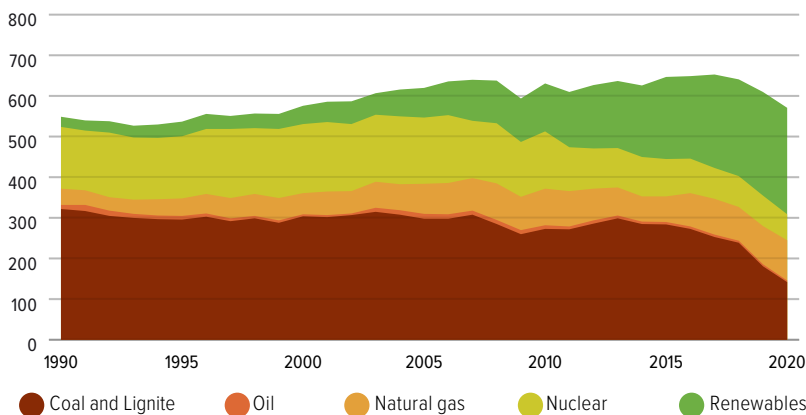


Worldwide, coal use for power generation needs to peak by 2020, and between 2030 and 2040, all the regions of the world need to phase out coal-fired power generation. By 2040, the share of renewable energy in electricity generation has to be increased to at least 75%, and the share of unabated coal reduced to zero.

Rogelj et al., 2018; Climate Action Tracker, 2020b

Electricity generation mix

Gross power generation (TWh)



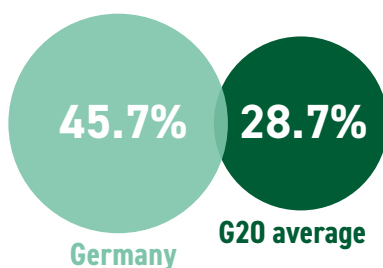
Germany generated **43% of its electricity from fossil fuels (coal, oil, natural gas) in 2020**. The share of renewable energy sources in Germany's power sector has been increasing in recent years, reaching 46% in 2020.

Enerdata, 2021

Due to rounding, some graphs may sum to slightly above or below 100%

Share of renewables in power generation

(incl. large hydro) in 2020

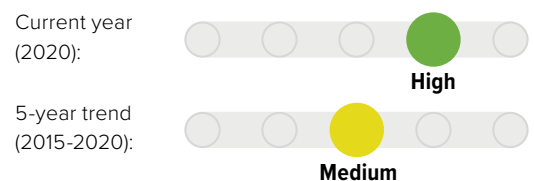


Share of renewables in power generation:
5-year trend (2015-2020)

+48.75%
Germany

+24.49%
G20 average

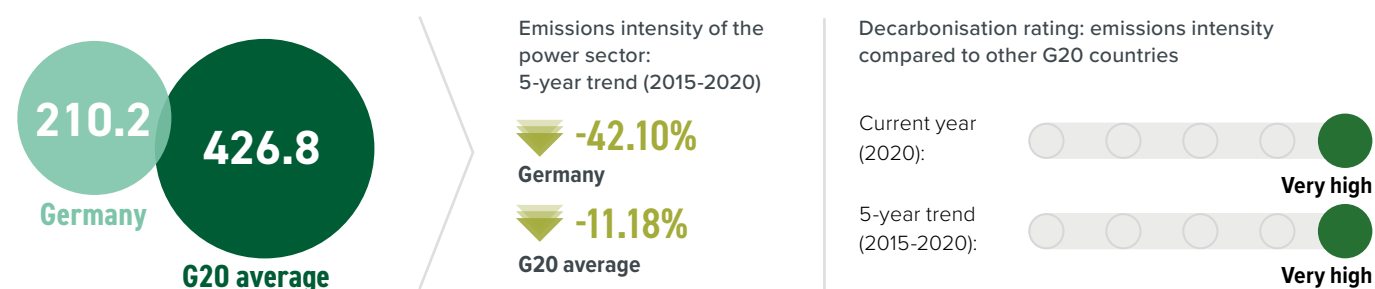
Decarbonisation rating: share of renewables compared to other G20 countries



Enerdata, 2021

Emissions intensity of the power sector

(gCO₂/kWh) in 2020



For each kilowatt hour of electricity generated, 210 g of CO₂ is emitted in Germany. The emissions intensity of power generation has declined by 42% over the past five years, primarily due to the sharp rise in renewable energy installations and a concomitant decline of coal's share in the mix. Electricity generation from coal and gas, however, remains substantial in absolute terms. There has also been a decline in electricity generation from nuclear power plants as Germany aims to shut down all of its nuclear plants by 2022.

Enerdata, 2021

POLICY ASSESSMENT

Renewable energy in the power sector



Despite a strengthening of its 2030 emissions reduction goal, the German government failed to modify the Renewable Energy Law to adequately meet even its previous emissions reduction goal. The prescribed share of renewables in 2030 remains at 65%. It also severely underestimated the increase in the consumption of electricity that would reflect electrification of other sectors, especially transport and buildings. According to a recent study, electricity consumption in 2030 will be between 11 and 15% higher than assumed by the government. This means the installed renewable energy capacity should also be correspondingly higher, to match energy demand.

Clean Energy Wire, 2020a; Deutscher Bundestag, 2020a; Balser, 2021b

Coal phase-out in the power sector



In January 2019 a multi-stakeholder commission recommended decommissioning approximately 25% of current coal capacity by 2022, another 25% by 2030, and a complete coal phase-out by 2038 at the latest. The goal was enshrined in law in July 2020 as part of Germany's "Kohleausstieg" or coal exit plan. Research suggests, however, that OECD countries should phase out coal by 2030 to be in line with 1.5°C Paris Agreement compatible energy transformation pathways.

Until 2027 the operators of coal-fired power plants can compete in an auction to bid for compensation for the capacity they decommission. So far, three rounds of auctions have taken place, with a combined capacity bid for the phase-out at around 8.7GW. The operators received up to EUR 150,000 for each MW of installed capacity that will be phased out by the end of 2022.

Climate Analytics, 2019; Bundesrat, 2020; Clean Energy Wire, 2020b; Europe Beyond Coal, 2021

CORONAVIRUS RESPONSE AND RECOVERY

As part of the COVID-19 recovery stimulus package launched by the German government in July 2020, investment grants of EUR 50bn will be channelled into sustainable mobility, energy transition, digitalisation, public health, and research and education projects. Mobility and energy transition funds are specifically aligned with Germany's Climate Action Package 2030.

In addition, Germany's recovery and resilience plan, approved by the European Council in July 2021, sets out plans to spend 42% of the EUR 25.6bn on climate action. Areas of focus include energy efficiency in buildings, support for clean mobility, and hydrogen development.

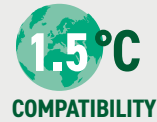
Platform for REDESIGN, 2020; European Commission, 2021

TRANSPORT SECTOR

Emissions from energy used to transport goods and people



Emissions from transport were on the rise in Germany in the last decade until the COVID-19 pandemic led to a temporary dip in 2020. **Over 89% of passenger transport and 79% of freight transport is by road.** EVs made up just under 14% of passenger new cars sold in 2020.



The share of low-carbon fuels in the transport fuel mix globally must increase to between 40% and 60% by 2040 and 70% to 95% by 2050.

Rogelj et al., 2018; Climate Action Tracker, 2020b

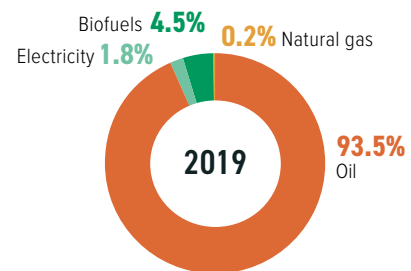
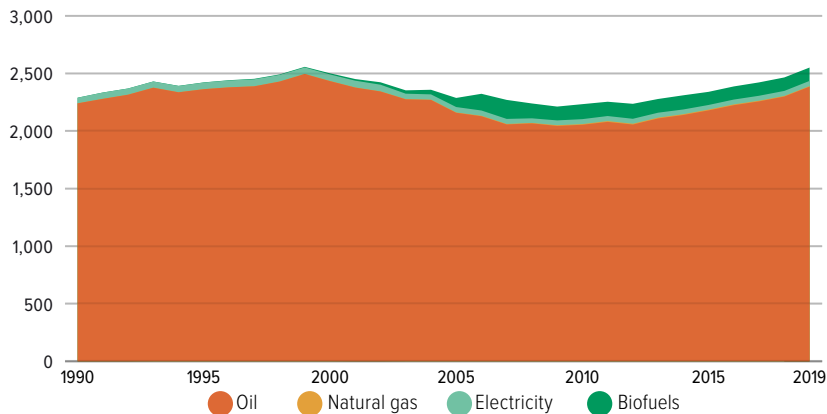


0.69%
Indirect emissions
26.22%
Direct emissions

Share of transport in energy-related CO₂ emissions

Transport energy mix

Final energy consumption of transport by source (PJ/year)



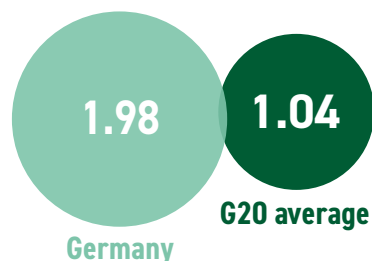
Electricity and biofuels make up only 6.3% of the energy mix in transport.

Enerdata, 2021

Due to rounding, some graphs may sum to slightly above or below 100%

Transport emissions per capita

excl. aviation (tCO₂/capita) in 2020



Transport emissions:
5-year trend (2015-2020)

+1.2%
Germany

-4.3%
G20 average

Decarbonisation rating: transport emissions
compared to other G20 countries

Current year
(2020):



5-year trend
(2015-2020):

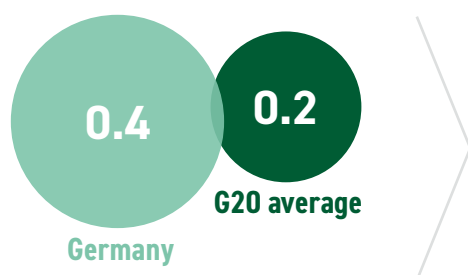


Reductions in transport emissions per capita in 2020, and concomitant changes in the 5-year trends and decarbonisation ratings, reflect widespread economic slowdowns and transport restrictions imposed in response to the COVID-19 pandemic. For a discussion of broader trends in the G20 and the rebound of transport emissions in 2021, please see the Highlights Report at www.climate-transparency.org

Enerdata, 2021; United Nations, 2019

Aviation emissions per capita⁶

(tCO₂/capita) in 2018



Aviation emissions:
5-year trend (2013-2018)

+16.90%
Germany

+21.25%
G20 average

Decarbonisation rating: aviation emissions
compared to other G20 countries

Current year
(2018):



5-year trend
(2013-2018):



Enerdata, 2021; International Energy Agency, 2020; United Nations, 2019

Motorisation rate

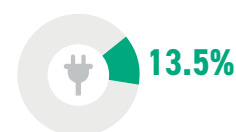


569 VEHICLES
per 1,000 inhabitants in
2019 in the Germany*

Enerdata, 2021

Market share of electric vehicles in new car sales (%)

Share of EV sales in 2020
was 13.5%.



IEA, 2021

Passenger transport

(modal split in % of passenger-km) in 2018*



Enerdata, 2021

Freight transport

(modal split in % of tonne-km) in 2018*



Enerdata, 2021

Freight transport by air,
pipelines and waterways are
excluded due to lack of data.

*Owing to the variety of sources and data years available, these data are not comparable across G20 countries.

POLICY ASSESSMENT

Phase out fossil fuel cars



Between 1990 and 2019 emissions from Germany's transport sector increased by 8%, contrary to the overall trend of emissions decreasing over the same period.

The promotion of electromobility and strengthening of emissions standards driven by the EU legislation has been counterbalanced by increasing sale of SUVs. Germany has not set a phase-out date for all fossil fuel cars.

While Germany joined the International Zero Emission Vehicle Alliance (IZEVA) in 2015 and, therefore, implicitly agreed to the Alliance's goal to make all new passenger vehicle sales zero-emission by 2050, this commitment has not yet been reflected in legislation nor facilitated by regulations as of July 2021.

Platform for REDESIGN, 2020; BMU, 2021a; Wappelhorst and Cui, 2020

Phase out fossil fuel heavy-duty vehicles



According to European regulations, average emissions from new heavy-duty vehicles (HDVs) must fall by 15% from 2025 and 30% from 2030 in comparison to average emissions of HDVs sold between 1 July 2019 and 30 June 2020. Notably, this is not a phase-out date, but an emissions reduction target. To facilitate the decarbonisation of HDVs, Germany is piloting motorways with overhead power lines. The German hydrogen strategy announced in June 2020 introduced measures that would facilitate the decarbonisation of HDVs using green hydrogen.

European Parliament and the Council of the European Union, 2019; BMWi, 2020; eHighway SH, 2021

Modal shift in (ground) transport



Despite increased investment in railways, between 2009 and 2020 the German government was still spending more on new motorways than railway tracks. This should change in the coming years due to additional funding commitments. Part of this funding is slated to be spent on public transport infrastructure as the country tries to recover from the COVID-19 crisis. The Immediate Programme Climate Protection 2022 includes measures to shift freight transport from road to shipping and the development of low carbon ships. The Programme also includes measures to improve cycling infrastructure, including the development of charging stations for e-bikes.

Balser, 2021, Deutsche Bahn, 2021; Die Bundesregierung, 2021a; MDR, 2021

BUILDING SECTOR

Emissions from energy used to build, heat and cool buildings



Between 1990 and 2020 direct emissions from the building sector decreased by 41%, slightly faster than total emissions. While the pandemic resulted in a 13% decrease in emissions from energy use in commercial buildings, it also contributed to slightly higher emissions from private buildings.



By 2040, global emissions from buildings need to be reduced by 90% from 2015 levels,

and be 95-100% below 2015 levels by 2050, mostly through increased efficiency, reduced energy demand, and electrification in conjunction with complete decarbonisation of the power sector.

Rogelj et al., 2018; Climate Action Tracker, 2020b



18.6%

Direct emissions

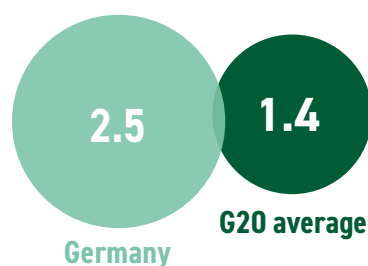
13.4%

Indirect emissions

Share of buildings in energy-related CO₂ emissions. Building emissions occur directly (burning fuels for heating, cooking, etc) and indirectly (grid-electricity for air conditioning, appliances, etc.)

Building emissions per capita

(incl. indirect emissions) (tCO₂/capita) in 2020



Building emissions:
5-year trend (2015-2020)

-26.76%
Germany

-2.91%
G20 average

Decarbonisation rating: building emissions
compared to other G20 countries

Current year
(2020):



5-year trend
(2015-2020):



Building-related emissions per capita are nearly 56% higher than the G20 average in 2020. This reflects the high fossil fuel share, especially natural gas and oil, for heat generation. In contrast to the G20 average, Germany has managed to reduce buildings emissions intensity by 27% (2015-2020).

Enerdata, 2021; United Nations, 2019

POLICY ASSESSMENT

Near zero energy new buildings



European legislation requires all new buildings within member states to be nearly zero energy buildings (NZEB). However, how NZEB is defined is left to the member states. The German building codes rank in the upper mid-range among all member states, with an efficiency requirement of 65 kWh/m². Germany offers various support programmes to this end. However, it still allows the installation of oil and natural gas heating in new buildings.

The European Parliament and the Council of the European Union, 2018; ZEBRA 2020, 2021

Renovation of existing buildings



The Federal Cabinet adopted the Long-Term Renovation Strategy (LTRS) in June 2020. This implements EU law and outlines a pathway to reduce emissions from the building sector. The LTRS outlines measures designed to incentivise the energy-related retrofitting of private and public residential and non-residential buildings and to reduce the consumption of non-renewable primary energy in the sector, from nearly 3,300 petajoules (PJ) to 2,000 PJ by 2030.

In May 2021, Germany amended its Climate Change Act to require a reduction, by two-thirds (compared to 1990 levels) of the GHG emissions in the building sector. The following month, over half of the additional funds from the 2022 Immediate Climate Action Programme were earmarked for financing change in the building sector.

Die Bundesregierung, 2020, 2021a; Deutscher Bundestag, 2021

INDUSTRY SECTOR

Emissions from energy use in industry



Industry makes up 21.9% of direct emissions and 11.2% of indirect electricity-related CO₂ emissions in Germany. Direct emissions from this sector declined by 37% between 1990 and 2020, only slightly less than the overall emissions reduction. **Two-thirds of industry emissions come from manufacturing**, with cement, steel and iron production each contributing a further 10% share of industry emissions.



Industrial emissions need to be reduced by 65-90% from 2010 levels by 2050.

Rogelj et al., 2018



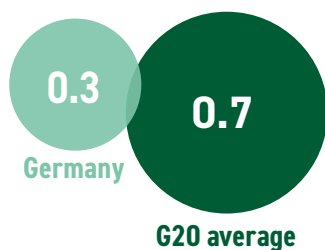
21.91%
Direct emissions

11.24%
Indirect emissions

Share of industry in energy-related CO₂ emissions.

Industry emissions intensity⁷

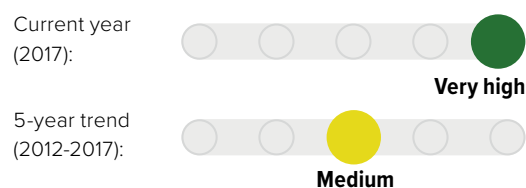
(tCO₂e/USD2015 GVA) in 2017



Industry emissions intensity:
5-year trend (2012-2017)



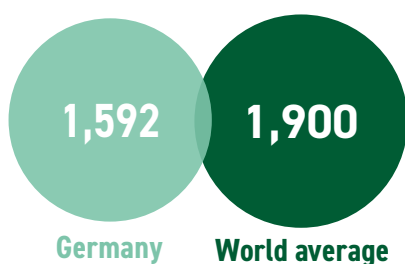
Decarbonisation rating: industry emissions intensity compared to other G20 countries



Enerdata, 2021; World Bank, 2021

Carbon intensity of steel production⁸

(kgCO₂/tonne product) in 2016



Steel production and steelmaking are significant GHG emissions sources, and challenging to decarbonise.

World Steel Association, 2018; Climate Action Tracker, 2020c

POLICY ASSESSMENT

Energy efficiency



The main driver of emissions reduction in the sector is the EU Emissions Trading Scheme (ETS), the impact of which was slightly weakened by the initial provision of a number of free allowances.

In June 2020, the German government proposed a **Hydrogen Strategy to develop green hydrogen to facilitate decarbonisation of the hard-to-abate steel sector**. Under the 2022 Immediate Climate Action Programme (June 2021) a pilot scheme to offset the higher operating costs of low- and zero-emission industrial processes would be extended and maintained, thereby providing further incentives for companies and industries to decarbonise their processes.

European Parliament and the Council of the European Union, 2014; BMWI, 2020

LAND USE SECTOR

Emissions from changes in the use of the land



To stay within the 1.5°C limit, Germany **needs to stimulate the land use and forest sector as a net sink of emissions**, e.g., by converting cropland into wetlands, and by creating new forests.

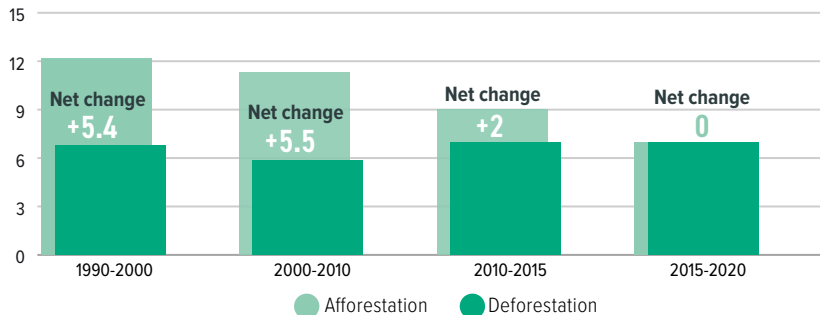


Global deforestation needs to be halted and changed to net CO₂ removals by around 2030.

Rogelj et al., 2018

Annual forest expansion, deforestation and net change

Forest area change in 1,000 ha/year



Between 2015-2020, Germany did not lose any forest area: the afforestation rate was equal to deforestation during this period. This is in contrast to the net gains to forest area due to afforestation experienced between 1990 and 2015.

Global Forest Resources Assessment, 2020

Note: There is a change of source and methodology for measuring this indicator from last year's profiles, which means the two years may not be directly comparable.

POLICY ASSESSMENT

Target for net zero deforestation



Germany plans to increase its LULUCF carbon sink from 16.5 MtCO₂e in 2020 to at least 25 MtCO₂e/yr in 2030, 35 MtCO₂e/yr in 2040, and 40 MtCO₂e/yr in 2045. Forests have been supported in the framework of the Forest Climate Fund since 2013. In November 2020 the Fund was equipped with an additional EUR 1.5bn. The Climate Protection Emergency Programme 2022 introduces additional measures to increase the sink, e.g., spending over EUR 330m for the protection of moors, sustainable forest management, and the maintenance and development of soil.

Die Bundesregierung, 2021b; BMU, 2021a

AGRICULTURE SECTOR

Emissions from agriculture



Agriculture emissions constitute 9% of Germany's total GHG emissions. Emissions from this sector decreased by about 24% between 1990 and 2020, slower than the overall decline in emissions. The recently amended Climate Law requires an emissions reduction of 36% by 2030 below 1990 levels, **the least ambitious of Germany's sectoral targets.**

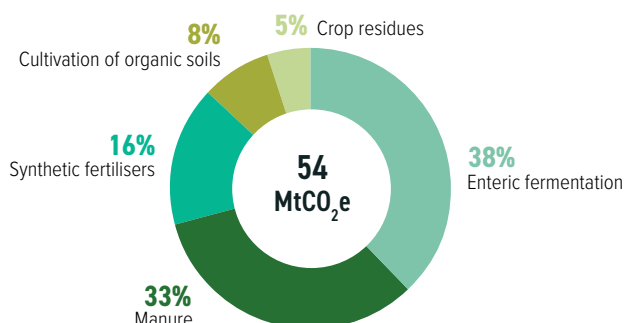


Methane emissions (mainly enteric fermentation) need to decline by 10% by 2030 and by 35% by 2050 (from 2010 levels). Nitrous oxide emissions (mainly from fertilisers and manure) need to be reduced by 10% by 2030 and by 20% by 2050 (from 2010 levels).

Rogelj et al., 2018

Emissions from agriculture (excluding energy)

Emissions from the agriculture sector in 2018



In Germany, the largest sources of GHG emissions in the agriculture sector are from enteric fermentation (digestive processes) from livestock (38%), manure (33%), and use of synthetic fertilisers (16%). Cultivation of organic soils and crop residues account for 8% and 5% of agriculture-related emissions, respectively. Dietary changes and efficient use of fertilisers as well as reductions in food waste could help reduce emissions from this sector.

FAO, 2021

Due to rounding, some graphs may sum to slightly above or below 100%

MITIGATION: TARGETS AND AMBITION

WARMING OF

2.4°C

The combined mitigation effect of Nationally Determined Contributions (NDCs) assessed by April 2021 is **not sufficient and will lead to a warming of 2.4°C by the end of the century**. This highlights the urgent need for all countries to submit more ambitious targets by COP26, as they agreed to do in 2015, and to **urgently strengthen their climate action to align to the Paris Agreement's temperature goal**.

Climate Analytics, 2021a

AMBITION: 2030 TARGETS

Nationally Determined Contribution (NDC): Mitigation

TARGETS

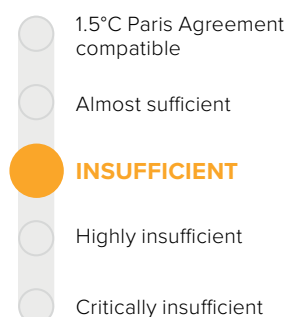
Germany contributes to the EU-wide target of reducing net GHG emissions by at least 55% by 2030 below 1990 levels. In June 2021 it adopted its national mitigation goal of 65% by 2030 below 1990 levels, with targets for each of the major sectors.

ACTIONS

As an EU member state, Germany is committed to contributing to the EU's NDC.

Climate Action Tracker (CAT) evaluation of targets and actions

GERMANY'S OVERALL RATING



This CAT evaluation is a **new, overall rating**, that combines the several, separately rated elements, of policies and actions, domestic and internationally supported targets, 'fair-share target' and the country's contribution to climate finance. The CAT rates Germany's overall climate targets, policies and finance as "Insufficient". The "Insufficient" rating indicates that Germany's climate policies and commitments need substantial improvements to be consistent with the Paris Agreement's 1.5°C temperature limit.

We rate Germany's newly adopted 2030 emissions national reduction target as "Almost sufficient" when compared to modelled emissions pathways, consistent with 2°C of warming. While the proposed national 2030 target represents a significant improvement on the previous one, Germany's new target is not stringent enough to limit warming to 1.5°C and needs further improvements. We rate Germany's target as "Insufficient" when compared with its fair-share contribution to climate action. Germany should both further increase its emissions reduction target and provide significantly more and predictable finance to other countries to meet its fair-share contribution. To achieve its target, Germany needs to enhance its policies and actions. For the full assessment of the country's target and actions, and the explication of the methodology see www.climateactiontracker.org

Climate Action Tracker, 2021

TRANSPARENCY: FACILITATING AMBITION

Countries are expected to communicate their NDCs in a clear and transparent manner in order to ensure accountability and comparability. The NDC Transparency Check has been developed in response to Paris Agreement decision 1/CP.21 and the Annex to decision 4/CMA.1, which sets out the "information to facilitate clarity, transparency and understanding" as crucial elements of NDCs.

NDC Transparency Check recommendations

The EU submitted its NDC to the UNFCCC in 2016 and updated it on 29 December 2020. Germany, as an EU member state, is committed to contributing to achievement of the EU NDC.

A comparison of the 2016 and 2020 NDCs reveals some additional information has been provided. There is still room to improve comparability, transparency, and understanding in future EU future NDCs by:

- Explicitly detailing the circumstances under which the EU will update the values of the reference indicators and the information on sources.
- Outlining how the EU plans to implement and account for its NDC target(s).
- Presenting mitigation potential assessments to sustain the EU's assertion that the recent NDC's target is more ambitious than the targets in the previous NDC.

For more visit www.climate-transparency.org/ndc-transparency-check

AMBITION: LONG-TERM STRATEGIES

The Paris Agreement invites countries to communicate mid-century, long-term, and low-GHG emissions development strategies by 2020. Long-term strategies are an essential component of the transition toward net zero emissions and climate-resilient economies.

Status	Climate Action Programme 2030 adopted in December 2019
Interim steps	65% below 1990 by 2030
Sectoral targets	Yes
Net zero target	Yes
Net zero year	Carbon neutrality by 2045

FINANCE

MAKING FINANCE FLOWS CONSISTENT WITH CLIMATE GOALS



Make finance flows consistent with a pathway towards low-GHG emissions and climate-resilient development.



Germany spent USD 4.8bn on fossil fuel subsidies in 2019, largely on coal. Germany's power and industry sectors have been covered by the EU ETS since 2005. From 2021, the transport and building sectors will join the EU ETS. The carbon price will start at EUR 25/tonne and increase to EUR 55 by 2025.



Investment in green energy and infrastructure needs to outweigh fossil fuel investments by 2025.

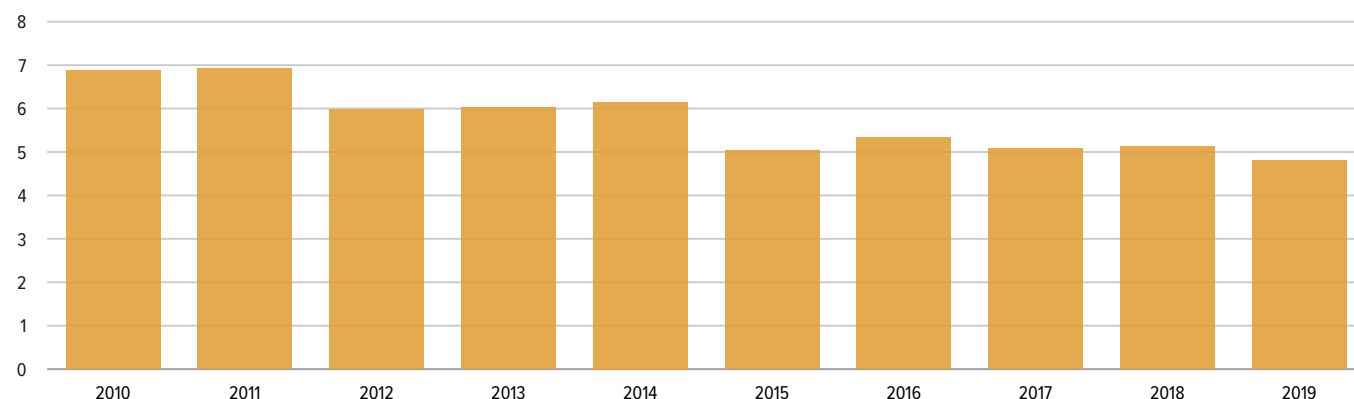
Rogelj et al., 2018

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, climate-resilient activities by reflecting externalities in the price.

Fossil fuel subsidies

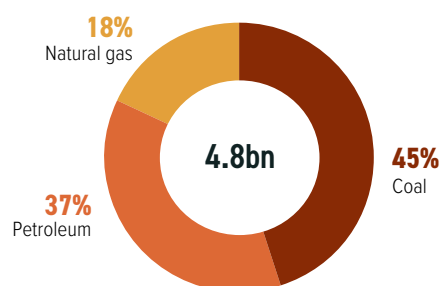
(USD billions)



OECD-IEA Fossil Fuel Support database, 2020

Fossil fuel subsidies by fuel type

USD in 2019



Over the past decade (2010-2019), Germany's fossil fuel subsidies have slowly but steadily declined, reaching their minimum historical value of USD 4.8bn in 2019. Over this period, most of the subsidies were directed to support the production and consumption of coal and petroleum.

Comparable data is not available yet for 2020. However, according to the Energy Policy Tracker, during 2020 Germany has pledged at least USD 27bn to fossil fuel energy as part of its energy-related funding commitments and COVID-19 economic response. Of these, USD 10.3bn and USD 5.48bn were directed to the bailouts of the national airline Lufthansa and the carrier TUI, respectively; neither bailout had any green strings attached. In the context of Germany's effort to wean off coal by 2038, a USD 5bn package was approved as a compensation for utilities operating lignite power stations to accelerate the shutdown of their assets.

Energy Policy Tracker, 2021; OECD-IEA Fossil Fuel Support database, 2020

Due to rounding, some graphs may sum to slightly above or below 100%



CORONAVIRUS RESPONSE AND RECOVERY

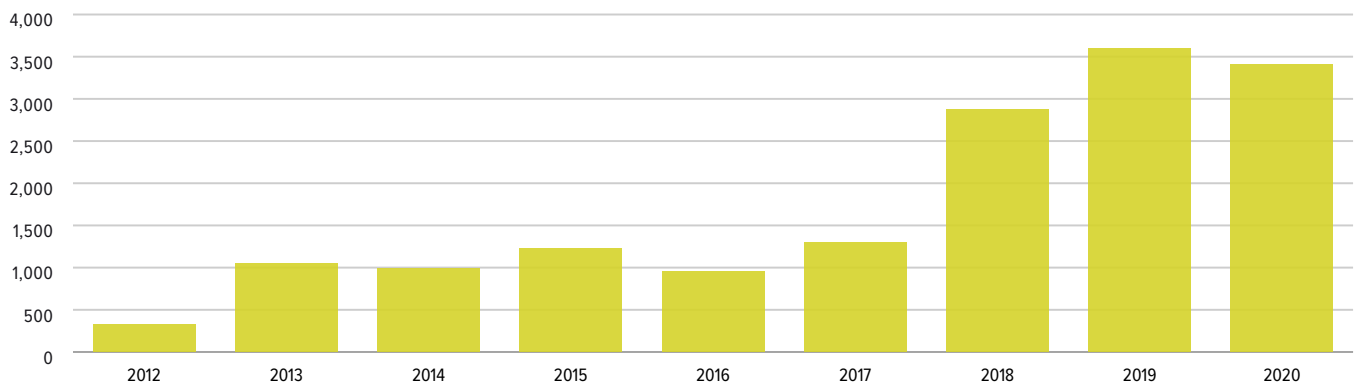
In June 2020, Germany unveiled a EUR 130bn economic stimulus package to strengthen demand, support the unemployed, and help the economy to emerge from the COVID-19 crisis in a more climate-resilient form. This was supplemented with support to the mobility sector in November 2020.

Grants from the fund for mobility and energy transition projects in particular, are aligned with Germany's Climate Action Package 2030, although not actually linked to specific long-term targets or climate-positive conditions. This leads to concerns of possible "green-washing" of the recovery. The recovery measures add up to EUR 140.3bn or 4% of domestic GDP.

Platform for Redesign, 2020; Green Recovery Tracker, 2021

Carbon pricing and revenue

(USD millions)



In 2019, the German government established a national level explicit carbon price in the heating and road transport sectors (which are currently not covered by the EU ETS). The scheme was officially launched in January 2021, with a price of USD 30/tCO₂e and is set to continuously rise to USD 60/tCO₂e in 2025, and decided at auction from 2026 onwards. Around half of Germany's emissions are currently covered under the EU ETS, which generated USD 2.9bn in revenue in 2020 in Germany alone.

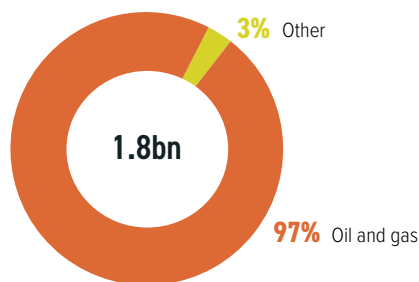
I4CE, 2021; Energy Policy Tracker, 2021

PUBLIC FINANCE

Governments steer investments through their public finance institutions, including via development banks both at home and overseas, and green investment banks. Developed G20 countries also have an obligation to provide finance to developing countries, and public sources are a key aspect of these obligations under the UNFCCC.

Public finance for fossil fuels

USD per annum (2018-19 average)



Between 2018 and 2019, Germany provided an average of USD 1.8bn per year in public finance for fossil fuels, almost entirely directed to the oil and gas sector, mainly provided by German Investment & Development Corporation, KfW IPEX-Bank and Euler Hermes. The largest sum of financing provided was a USD 2.9bn loan in 2018 by Euler Hermes for the Russian state-owned energy group, Gazprom, for the development of the Amur gas processing plant in Russia.

Oil Change International, 2020

Due to rounding, some graphs may sum to slightly above or below 100%

Provision of international public support

USD millions, annual average 2017 and 2018

Bilateral, regional and other channels

Annual average contribution:

7,025.94

Multilateral climate finance contributions

Annual average contribution:

393.80

Core / General Contributions

Annual average contribution:

978.48

Germany provided the second largest amount of climate finance bilaterally, in absolute and GDP relative terms, and the fourth largest amount through multilateral climate funds, in absolute terms. Since the 2015/16 period, both bilateral and multilateral flows have increased. Climate finance channeled through KfW accounts for around half of its bilateral finance. Germany doubled its original contributions to the Green Climate Fund during its first replenishment and, at the G7 meeting in mid 2021, the country committed to increase that by EU 2bn to EUR 6bn (USD 7.26bn) a year by 2025 at the latest.

FINANCIAL POLICY AND REGULATION

Financial policy and regulation

Through policy and regulation, governments can overcome challenges to mobilising green finance, including real and perceived risks, insufficient returns on investment, capacity and information gaps.



Germany has had some major developments in green finance over the past two to three years.

The Accelerating Sustainable Finance Initiative (Deutsche Börse) and the Green Finance Cluster Frankfurt (established by the

Ministry of Economics for the State of Hesse) merged in April 2018 to form the Green and Sustainable Finance Cluster Germany. The aim was to collectively address sustainable activities in the financial sector and strengthen focus on climate protection and sustainable investments.

In September 2019, Germany's Federal Financial Supervisory Authority (BaFin) released a guidance notice on dealing with sustainability risks.

In August 2020, the Federal Ministry of Finance published the Green Bond Framework to make Germany's green budget spending transparent and strengthen the country's position on sustainable finance. Soon after, the Finance Agency also launched the very first 10-year green federal bond in September 2020.

In June 2019, the German federal government created a Sustainable Finance Committee (SFB) to advise on the development and implementation of its Sustainable Finance Strategy. In June 2020 the SFB welcomed a joint commitment from 16 banks to align their activities with the Paris Climate Agreement. In May 2021, the SFB adopted the first German Sustainable Finance Strategy, with 26 measures to mobilise investments that are urgently needed for climate action and sustainability while also addressing the climate risks relevant to the financial system.

Federal Financial Supervisory Authority, 2019; Finanzagentur, 2020; BMF, 2021; Green Finance Platform, 2021

Nationally Determined Contribution (NDC): Finance

Conditionality	
Investment needs	Not applicable
Actions	As an EU member state, Germany is committed to contributing to the EU's NDC
International market mechanisms	

ENDNOTES

Where referenced, “Enerdata, 2021” refers to data provided in July 2021. For more detail on the sources and methodologies behind the calculation of the indicators displayed, please download the Technical Note at: www.climate-transparency.org/g20-climate-performance/g20report2021

1 The ‘1.5°C compatible pathway’ is derived from global, cost-effective pathways assessed by the IPCC’s SR15, selected based on sustainability criteria, and defined by the 5th–50th percentiles of the distributions of such pathways achieving the long-term temperature goal of the Paris Agreement. Negative emissions from the land sector, and novel negative emissions technologies are not included in the assessed models, which consider one primary negative emission technology (BECCS). In addition to domestic 1.5°C compatible emissions pathways, the ‘fair-share’ emissions reduction range would almost always require a developed country to provide enough support through climate finance, or other means of implementation, to bring the total emissions reduction contribution of that country down to the required ‘fair-share’ level.

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

3 The Decarbonisation Ratings assess the current year and average of the most recent five years (where available) to take account of the different starting points of different G20 countries.

4 The selection of policies rated and the assessment of 1.5°C compatibility are primarily informed by the Paris Agreement and the IPCC’s 2018 SR15. The table below displays the criteria used to assess a country’s policy performance.





5 The 1.5°C ‘fair-share’ ranges for 2030 are drawn from the CAT, which compiles a wide range of perspectives on what is considered fair, including considerations such as responsibility, capability, and equality. Countries with 1.5°C ‘fair-share’ ranges reaching below zero, are

expected to achieve such strong reductions by domestic emissions reductions, supplemented by contributions to global emissions reduction efforts via, for example, international finance. On a global scale, negative emissions technologies are expected to play a role from the 2030s onwards, compensating for remaining positive emissions. In order to maintain comparability across all countries, this report harmonises all data with PRIMAP, 2021 dataset to 2018. However, note that Common Reporting Format (CRF) data is available for countries which have recently updated GHG inventories. Where countries submitted updated NDC targets before August 2021, these have been analysed and included.

6 This indicator adds up emissions from domestic aviation and international aviation bunkers in the respective country. In this Country Profile, however, only a radiative forcing factor of 1 is assumed.

7 This indicator includes only direct energy-related emissions and process emissions (Scope 1) but not indirect emissions from electricity.

8 This indicator includes emissions from electricity (Scope 2) as well as direct energy-related emissions and process emissions (Scope 1).

On endnote 4.	 Low	 Medium	 High	 Frontrunner
Renewable energy in power sector	No policies to increase the share of renewables	Some policies	Policies and longer-term strategy/ target to significantly increase the share of renewables	Short-term policies + long-term strategy for 100% renewables in the power sector by 2050 in place
Coal phase-out in power sector	No targets and policies in place for reducing coal	Some policies	Policies + coal phase-out decided	Policies + coal phase-out date before 2030 (OECD and EU28) or 2040 (rest of the world)
Phase out fossil fuel cars	No policies for reducing emissions from light-duty vehicles	Some policies (e.g. energy/emissions performance standards or bonus/ malus support)	Policies + national target to phase out fossil fuel light-duty vehicles	Policies + ban on new fossil fuel-based light-duty vehicles by 2035 worldwide
Phase out fossil fuel heavy-duty vehicles	No policies	Some policies (e.g. energy/emissions performance standards or support)	Policies + strategy to reduce absolute emissions from freight transport	Policies + innovation strategy to phase out emissions from freight transport by 2050
Modal shift in (ground) transport	No policies	Some policies (e.g. support programmes to shift to rail or non-motorised transport)	Policies + longer-term strategy	Policies + longer-term strategy consistent with 1.5°C pathway
Near zero energy new buildings	No policies	Some policies (e.g. building codes, standards or fiscal/financial incentives for low-emissions options)	Policies + national strategy for near zero energy new buildings	Policies + national strategy for all new buildings to be near zero energy by 2020 (OECD countries) or 2025 (non-OECD countries)
Energy efficiency in industry	No policies	Mandatory energy efficiency policies cover more than 26–50% of industrial energy use	Mandatory energy efficiency policies cover 51–100% of industrial energy use	Policies + strategy to reduce industrial emissions by 75–90% from 2010 levels by 2050
Retrofitting existing buildings	No policies	Some policies (e.g. building codes, standards or fiscal/financial incentives for low-emissions options)	Policies + retrofitting strategy	Policies + strategy to achieve deep renovation rates of 5% annually (OECD) or 3% (non-OECD) by 2020
Net zero deforestation	No policies or incentives to reduce deforestation in place	Some policies (e.g. incentives to reduce deforestation or support schemes for afforestation/ reforestation in place)	Policies + national target for reaching net zero deforestation	Policies + national target for reaching zero deforestation by 2020s or for increasing forest coverage

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For more information on the country profile for Germany, please contact:
Germanwatch e.V. – Jan Burck, burck@germanwatch.org

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