

GERMANY

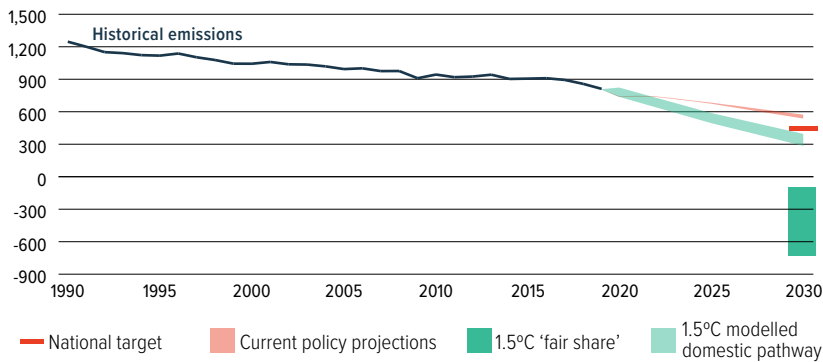
CLIMATE TRANSPARENCY REPORT: COMPARING G20 CLIMATE ACTION

2022



NOT ON TRACK FOR A 1.5°C WORLD

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

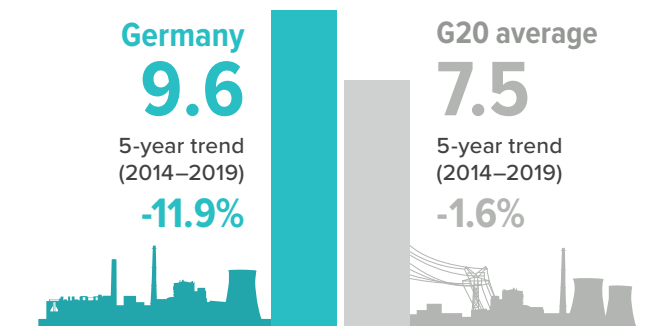


Germany's updated national target would decrease emissions 65% below 1990 levels, or to approximately 435 MtCO₂e (excl. LULUCF). To keep below the 1.5°C temperature limit, analysis by the 1.5°C Pathways Explorer shows that the country's emissions would need to be around 333 MtCO₂e by 2030, leaving an ambition gap of about 102 MtCO₂e. When compared with its 1.5°C 'fair share' contribution, Germany's emissions would need to be significantly lower by 2030.

*Climate Action Tracker, 2022a, 2022b;
Climate Analytics, 2022; Gütschow et al., 2021*

PER CAPITA GREENHOUSE GAS (GHG) EMISSIONS ABOVE G20 AVERAGE

tCO₂e/capita² in 2019



Germany's per capita emissions are 1.3 times the G20 average. Total emissions per capita have decreased by 12% from 2014 to 2019.

Gütschow et al., 2021; World Bank, 2022

RECENT DEVELOPMENTS

- ✓ In July, the government amended the Renewable Energy Act to increase the targeted share of renewables to 80% of electricity consumption by 2030, along with measures to simplify wind farm planning approval.
- ✓ Higher fuel prices and the impact on the cost of living prompted government financial support for public train travel between June and August 2022. Discussions are ongoing between the Federal government and the States to extend this public transport support in 2023.
- ! The inflationary squeeze and higher energy prices have led to legal preparations for the reactivation of coal-fired power plants that were due to be taken offline in 2022 and 2023.

KEY OPPORTUNITIES FOR ENHANCING CLIMATE AMBITION



Decarbonising the transport sector by abolishing company car tax deductions, making a greater investment in public transport, and shifting from road to rail.



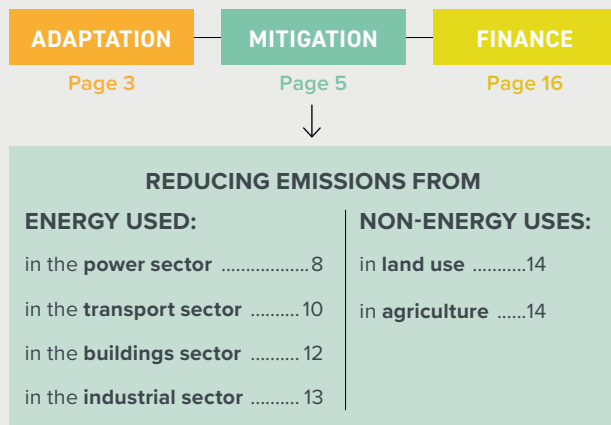
Bring forward bans on new installations of oil and gas heating, and initiate a ban on the continued operation of already installed oil and gas heating systems.



Enshrine in law the coalition's "ideal" coal phase-out of 2030, as well as commit to a fossil gas phase-out to accompany the rapid scaling up of renewables.

Contents

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



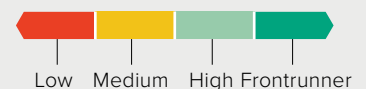
Legend

Trends show developments over the past five years for which data are available. A red exclamation mark indicates negative trends from a climate protection perspective. !

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

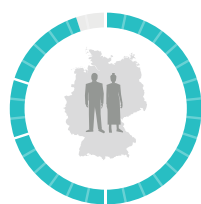


Policy Ratings⁴ evaluate a selection of policies that are essential pre-conditions for the longer-term transformation required to meet the 1.5°C limit.



SOCIO-ECONOMIC CONTEXT

Human Development Index



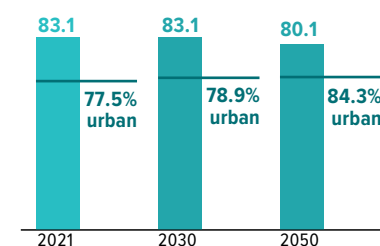
The Human Development Index (HDI) reflects life expectancy, level of education, and per capita income. Germany ranks very high.

0.95 very high

Data for 2019.
UNDP, 2020

Population and urbanisation projections

(in millions)

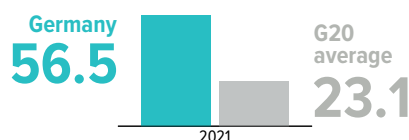


Germany's population is projected to decrease by 4% by 2050, and become more urbanised. Climate change-related risks, such as flooding, could push people to move out of river basin areas towards relatively less risk-prone urban centres. People moving to urban areas, however, are at greater risk of heat stress associated with the urban heat island effect.

UBA, 2021; United Nations, 2018; World Bank, 2022

Gross Domestic Product (GDP) per capita

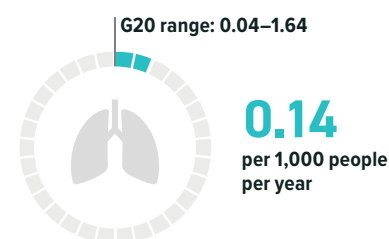
(thousand PPP constant 2015 international \$ per person) in 2021



World Bank, 2021

Death rate attributable to ambient air pollution

(death rate per 1,000 population per year, age standardised) in 2019



per 1,000 people per year

G20 range: 0.04–1.64

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

Institute for Health Metrics and Evaluation, 2020

A JUST TRANSITION

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

Beyond payments to regions dependent on coal, the government has also initiated programmes aimed at relieving the population of the negative knock-on effects of higher electricity and fuel prices caused by the newly implemented transport Emissions Trading Scheme (ETS). Programmes include revenue recycling to reduce the renewables surcharge for electricity consumers (now fully eliminated) as well as additional support to affected businesses.

BMJ, 2020; BMUV, 2021a

ADAPTATION

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



In western Germany, in July 2021, a month's rainfall fell within 48 hours when a storm complex stalled over Europe, leading to deaths from flooding and mudslides.



Approximately 90% of Germany is exposed to compound droughts and heatwave events, heavily impacting agriculture and forestry, and resulting in massive forest fires like those in Saxony and Brandenburg in 2022.



The July 2021 floods and forest fires in the summer of 2022 highlight the increased risk to both life and property from more extreme precipitation and drought events.

ADAPTATION NEEDS

Impacts of a changing climate

Exposure to Warming



1.6°C
Higher

Between 2017 to 2021, the average summer temperatures experienced by people in Germany were 1.6°C higher than the 1986–2005 average global mean temperature increase of 0.3°C.

Changes in the ability to work due to exposure to excessive heat



20m Labour hours lost
31% increase

In 2021, heat exposure in Germany led to the loss of 20 million potential labour hours, a 31% increase from the 1990–1999 average.

Loss of earnings from heat-related labour capacity reduction



525m Loss in labour capacity (USD)
0.01% of GDP

Extreme heat can make it unbearable or even dangerous to work in a range of economically important sectors. The potential income loss in 2021 – in the service industry, manufacturing, agriculture, and construction sectors – from labour capacity reduction due to extreme heat was USD 525m, or 0.01% of its GDP.

Romanello et al., 2022; World Meteorological Organization, 2022

Exposure to future impacts at 1.5°C warming and higher

Different levels of global warming are projected to have a wide range of impacts of varying severity across the world. The percentages at 1.5°C are calculated as an increase/decrease from the reference period of 1986–2006. Using the projected impacts at 1.5°C of warming as a reference, we compare impacts that may occur at higher levels of warming.

Climatic

	At 2°C	At 2.5°C	At 3°C
Local precipitation : +4.2% at 1.5°C warming	0.9 times	0.9 times	0.6 times
Local snowfall : -24.1% at 1.5°C warming	1.6 times	1.8 times	2.2 times

Local precipitation is projected to increase by 4% above the average over the baseline period of 1986–2006, at 1.5°C warming. More warming is projected to increase precipitation slightly: under a 2.5°C warming scenario, by 0.9 times the increase at the 1.5°C scenario. Local snowfall is expected to decrease under a 1.5°C scenario by 24%, from today's snowfall. At 3°C of warming, the decrease is expected to be 2.2 times what the decrease would be under a 1.5°C scenario.

Fresh water

	At 2°C	At 2.5°C	At 3°C
Surface run-off : +1.2% at 1.5°C warming	-2.2 times	-0.6 times	-1.7 times
River discharge : +1.4% at 1.5°C warming	-2.0 times	-2.4 times	-2.8 times
Total soil moisture content : -0.8% at 1.5°C warming	2.6 times	2.4 times	5 times

In Germany, the percentage of surface run-off and river discharge is projected to increase 1.2% and 1.4%, respectively, above the average over the baseline period of 1986–2006, if global temperature rises by up to 1.5°C. However, surface run-off and river discharge are projected to decline 1.7 and 2.8 times, respectively, (from the increase projected at 1.5°C) at 3°C of warming. Such fluctuations complicate future planning. The percentage total soil moisture is projected to decrease by 0.8% at 1.5°C of warming, and decrease by 5 times at 3°C of warming.

Hazards	At 2°C	At 2.5°C	At 3°C
Number of people annually exposed to wildfires : 9,257 at 1.5°C warming	2.9 times	1.6 times	1.4 times

The number of people annually exposed to hazards is expected to rise as the temperature increases. For example, the number of people annually exposed to wildfires in Germany is projected to be over 9,000 more people than the number affected in the reference period, if global warming increases up to 1.5C and 1.6 times greater than that if warming increases to 2.5°C.

Economic	At 2°C	At 2.5°C	At 3°C
Annual expected damage from river flood : +32% at 1.5°C warming	2.7 times	2.5 times	2.8 times
Labour productivity due to heat stress: -0.4% at 1.5°C warming	1.7 times	2.7 times	4.2 times

The annual expected damage from river flooding at 3°C is 2.8 times the anticipated damage under a 1.5°C scenario, which is itself a projected 32% increase above the damages incurred over the baseline period of 1986–2006. Labour productivity is projected to decline 0.4% under 1.5°C of warming, and this decrease would be 2.7 times larger at 2.5°C of warming.

For further assessments of impacts under different warming scenarios, and a detailed explanation of the methodology, go to <https://climate-impact-explorer.climateanalytics.org>

Climate Analytics, 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	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	At the close of each Adaptation Action Plan (APA) cycle, a Monitoring Report is published that assembles information across the Federal Ministries, Länder, and various other governmental bodies.

Nationally Determined Contribution (NDC): Adaptation

TARGETS

Adaptation measures are determined in consultation between the Federal Ministries and State (Länder) governments of Germany.

ACTIONS

Germany’s actions on adaptation are communicated every five years in the APA. The latest APA III, covering the 2020–2024 period, was published in 2020.

MITIGATION

Paris Agreement: 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.

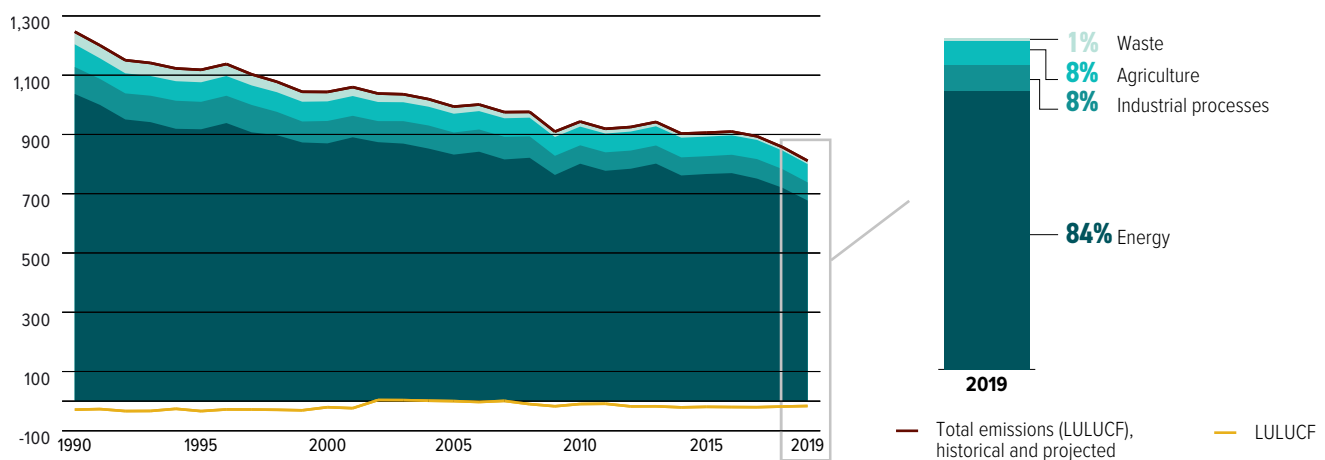
EMISSIONS OVERVIEW



Germany's total **greenhouse gas emissions (excluding LULUCF)** have decreased by **35%** (1990–2019). In the same period, its total methane emissions (excl. land use) have decreased by 58%.

GHG emissions across sectors⁵

Total sectoral GHG emissions (MtCO₂e/year)

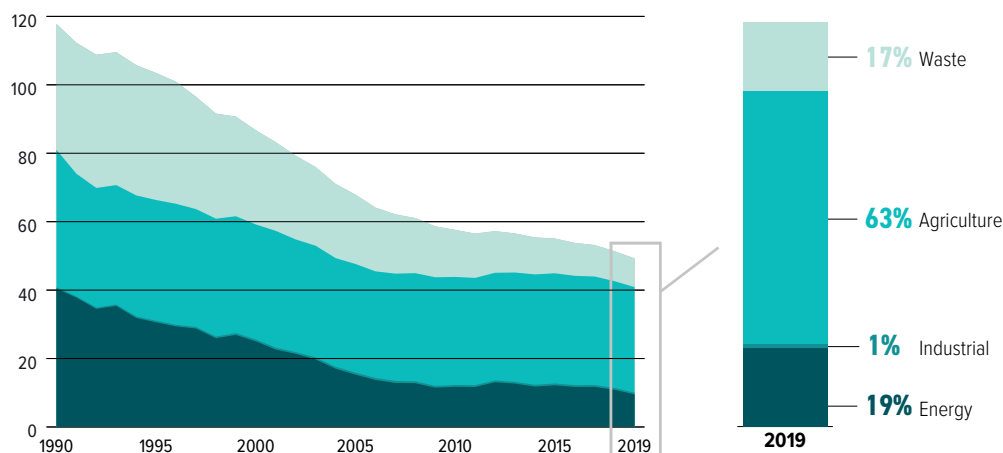


Germany's emissions (excl. LULUCF) decreased by 34.9% between 1990 and 2019 to 811 MtCO₂e/yr. When considered by category, decreases were largely due to a sustained increase in energy-related emission reductions, which decreased by 34.7%. Decreases in emissions are seen in all sectors over the same timeframe.

Gütschow et al., 2021

Methane emissions by sector

Total CH₄ emissions (MtCO₂e/year)



Germany signed the Global Methane Pledge at COP26 in November 2021.

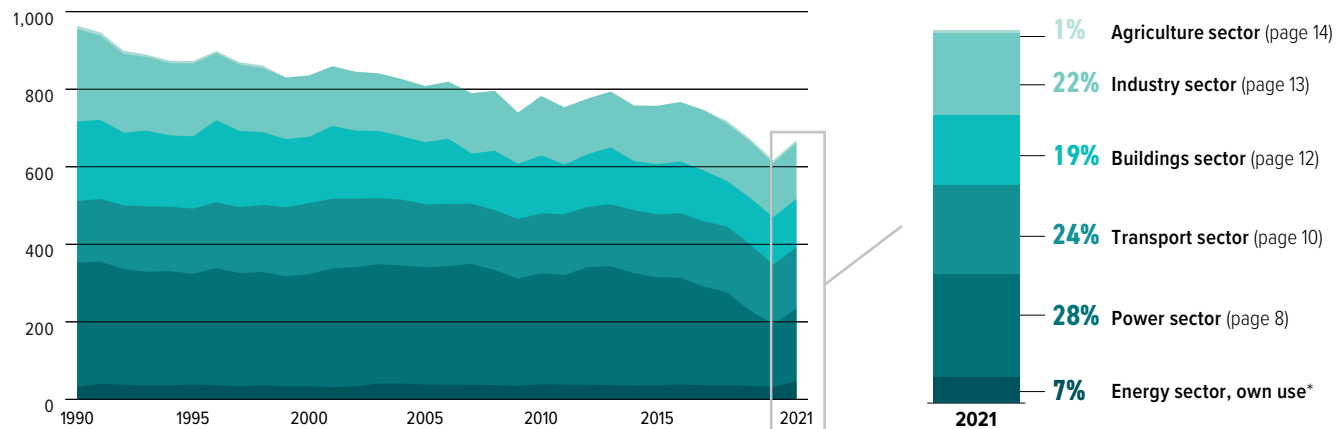
Participating countries pledged to undertake voluntary actions to contribute to a collective reduction of global methane emissions by at least 30% from 2020 levels by 2030. Further scrutiny of plans and implementation will be required.

Methane is a potent, though short-lived, greenhouse gas, accounting for an estimated third of global warming. Germany's methane emissions (excl. LULUCF) decreased by 58.2% between 1990–2019 to 49 MtCO₂e/yr. The majority of Germany's methane emissions came from the agriculture sector in 2019. This is a significant change from 1990, when the energy and agriculture sectors contributed equally to methane emissions. The decline of methane emissions from the energy sector can be ascribed to a reduction of emissions that occur during the production and treatment of fossil gas and through leaks in machinery and pipelines during distribution and storage — so-called diffuse, pre-chain emissions.

Climate and Clean Air Coalition, 2021; DVGW, 2020; Gütschow et al., 2021

Energy-related CO₂ emissions by sector

Annual CO₂ emissions (MtCO₂/year)



The largest driver of overall greenhouse gas emissions are CO₂ emissions from fuel combustion. In Germany, the emissions have been steadily decreasing since 1990, with an average decrease of about 1.2% annually. The increase in 2021 emissions was largely the result of the return to economic activity after pandemic-induced lockdowns, but this nevertheless amounted to lower emissions than produced in 2019. Power generation is the largest contributor (28%), followed by the transport and industry sectors with 24% and 22%, respectively.

Enerdata, 2022

*Includes energy-related CO₂ emissions from extracting and processing fossil fuels.

ENERGY OVERVIEW



In 2021, fossil fuels comprised approximately **77% of Germany's energy mix**, a slightly lower share than the G20 average of 81%. Renewables (excluding traditional biomass) comprise 14% of the energy mix, with an accelerating increase in both solar and wind in the past decade.

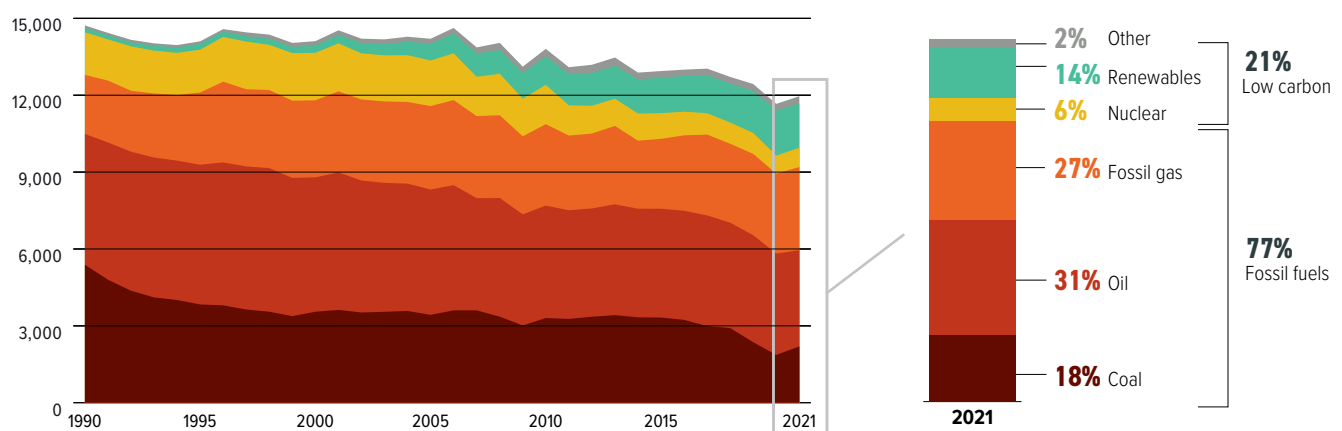


The share of fossil fuels globally needs to fall to **67% of global total primary energy by 2030** and to 33% by 2050, and to substantially lower levels without carbon capture and storage.

Rogelj et al., 2018

Energy mix

Total primary energy supply (PJ)

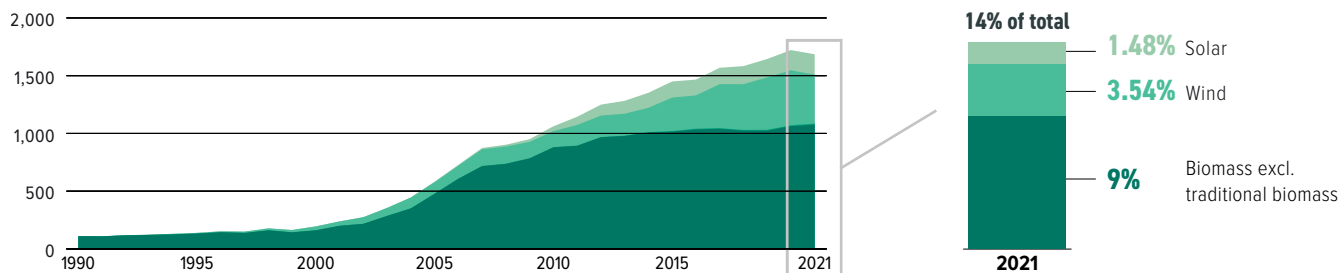


This graph shows the fuel mix for all energy supply, including energy used not only for electricity generation, heating and cooking, but also for transport fuels. In 2021 fossil fuels (oil, coal, and gas) made up almost 77% of the German energy mix, lower than the G20 average. Energy demand was relatively stable until 2008, before it decreased markedly in 2009. After some recovery in 2010, an accelerated decrease in energy demand followed. While the role of coal and oil decreased, the share of fossil gas increased over the whole period. Since 2000 the share of renewables started to increase markedly.

Enerdata, 2022

Solar, wind, geothermal and biomass development

As a share of total primary energy supply (TPES) (PJ)

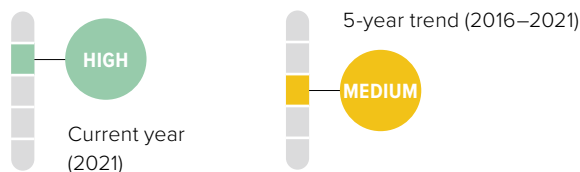


In 2021 solar, wind, geothermal and biomass (excluding traditional biomass) accounted for 14% of Germany's energy supply – the G20 average is 7.5%. The share in total energy supply in Germany has increased by around 29% in the last 5 years (2016–2021), slightly lower than the G20's 31% increase. Biomass (for electricity and heat) makes up the largest share.

Enerdata, 2022

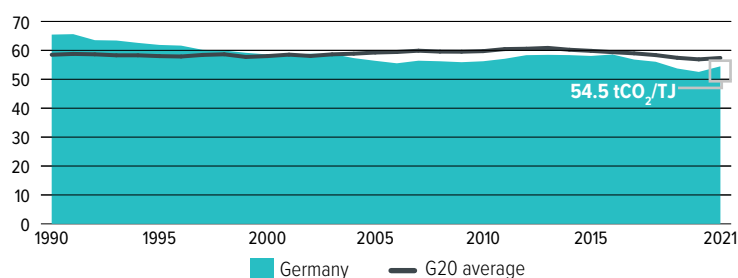
Note: Large hydropower and solid fuel biomass in residential use are not reflected due to their negative environmental and social impacts.

Decarbonisation: a high rating indicates more effort to decarbonise compared to other G20 Members

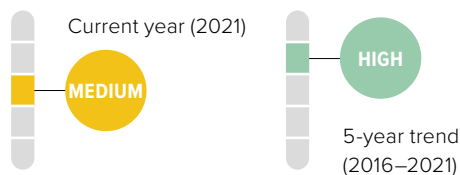


Carbon intensity of the energy sector

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



Decarbonisation: a high rating indicates more effort to decarbonise compared to other G20 Members



Carbon intensity is a measure of how much CO₂ is emitted per unit of energy supply. The carbon intensity of Germany's energy sector, at 54.5 tCO₂/TJ, differs only slightly from the G20 average of 57.4 tCO₂/TJ in 2021. Germany's carbon intensity has declined more rapidly (8.7%) in the past five years (2016–2021) than the decline of the G20 (4.1%) over the same period.

Enerdata, 2022

Energy supply per capita

TPES per capita (GJ/capita) in 2021



The level of energy supply per capita is closely related to economic development, climatic conditions and the price of energy. In 2021, energy supply per capita in Germany was 144 GJ well above the G20 average of 99 GJ, and supply has decreased significantly faster between 2016 and 2021 (11.4%) than the G20 average of 1.6% over the same period.

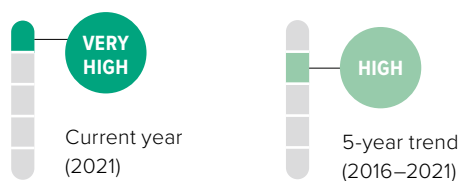
Enerdata, 2022; World Bank, 2022

Energy intensity of the economy

(TJ/million US\$2015 GDP) in 2021



Decarbonisation: a high rating indicates more effort to decarbonise compared to other G20 Members



This indicator quantifies how much energy is used for each unit of GDP. This is closely related to the level of decarbonisation, efficiency achievements, climatic conditions or geography. The energy intensity of the German economy is lower than the G20 average, and has been decreasing at a higher rate of 11.5% (2016–2021) as compared to the G20 decrease of 6%.

Enerdata, 2022; World Bank, 2021

POWER SECTOR

Emissions from energy used to make electricity and heat



Germany produced **29% of its electricity from coal in 2021**. The new federal coalition government has agreed to “ideally” bring forward the coal exit date from the previous target of 2038 to 2030, accelerating power sector decarbonisation plans.

Power generation's share of energy-related CO₂ emissions in 2021:

29% Direct

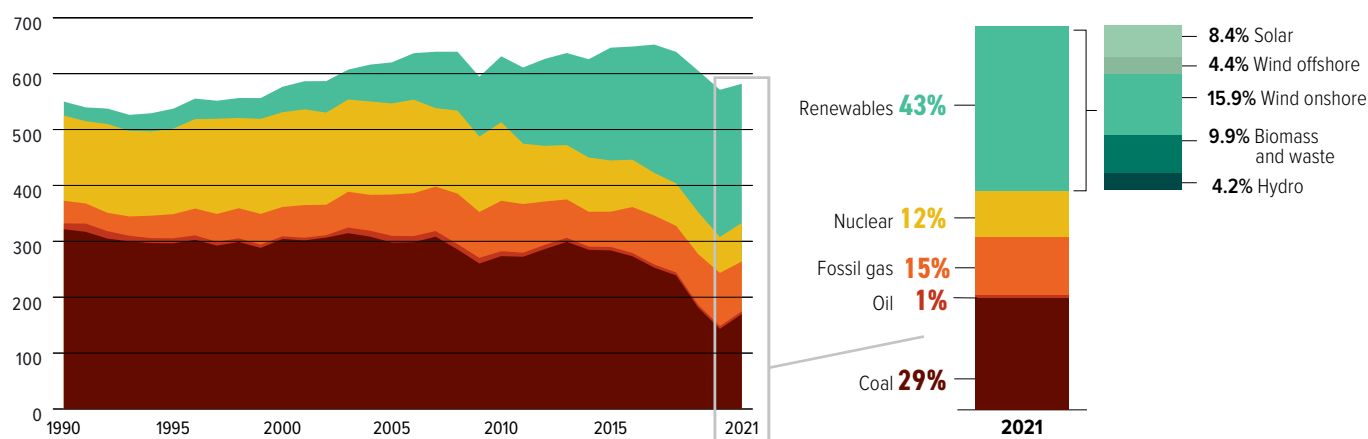


Worldwide, coal use for power generation needs to peak by 2020, and between 2030 and 2040, all the regions of the world need to phase out coal-fired power generation. By 2040, the share of renewable energy in electricity generation has to be increased to at least 75%, and the share of unabated coal reduced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

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

Electricity generation mix

Gross power generation (TWh)

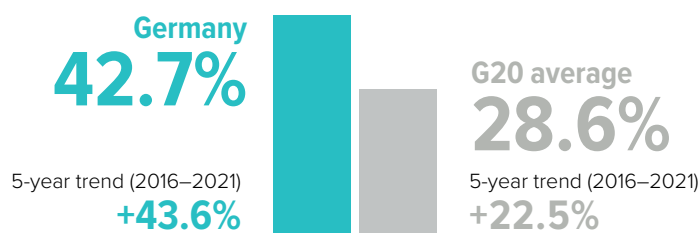


Germany generated 45% of its electricity from fossil fuels in 2021. The share of renewable energy in the power sector increased, to approximately 43% of the power mix in 2021. The drop in share of renewables and accompanying increase in the share of fossil fuel power generation from 2020–2021 is attributed to an increasing demand for electricity after the lifting of COVID-19 restrictions and decreased generation from wind power plants.

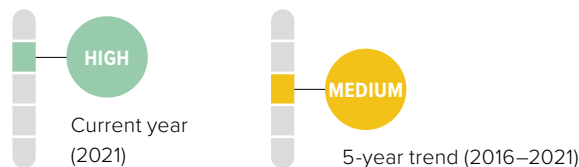
Enerdata, 2022

Share of renewables in power generation

(incl. large hydro) in 2021



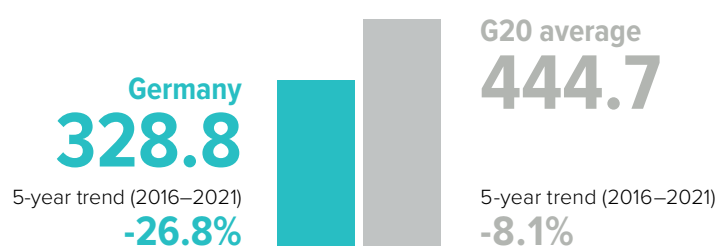
Decarbonisation: a high rating indicates more effort to decarbonise compared to other G20 Members



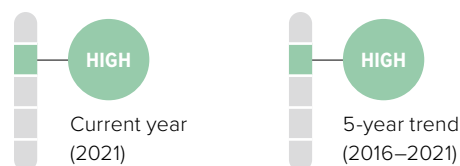
Enerdata, 2022

Emissions intensity of the power sector

(gCO₂/kWh) in 2021



Decarbonisation: a high rating indicates more effort to decarbonise compared to other G20 Members



For each kilowatt hour of electricity generated in Germany in 2021 almost 329 g of CO₂ were emitted. Germany's energy intensity has decreased by almost 27% over the past 5 years, reflecting a drop in the use of coal and lignite of around 38% and an increase in renewable generation, predominantly in offshore wind and solar PV.

Enerdata, 2022

POLICY ASSESSMENT

Renewable energy in the power sector



On 7 July 2022, the German parliament passed several bills of the so-called Easter Package, increasing renewable generation targets to 80% of the electricity mix by 2030, with 2035 as the target for 100% renewable energy. To promote the expansion of renewables, the package also contains simplifications of procedures to install both on and offshore wind turbines, as well as building regulations requiring the installation of rooftop solar to most new buildings.

Clean Energy Wire, 2022a; Deutscher Bundestag, 2022

Coal phase-out in the power sector



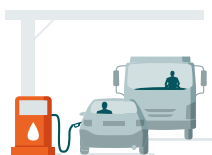
While the German government's coalition agreement stipulates that the coal phase-out (Kohleausstieg) should happen "ideally" by 2030, the Coal Commission's exit date of 2038 remains the legal target.

To achieve coal phase-out, power plant operators can bid in auctions to receive compensation for decommissioning their power plants. Thus far, 5 auctions have held, removing approximately 10 GW of the 11 GW target. The most recently closed round (the fifth) should result in the shutting down of 1,015 MW of coal capacity by 27 May 2024. Proposals (for plants to be closed) for the sixth round of the auction closed on 1 August 2022. The plans to increase the role of coal for electricity generation over (the Northern Hemisphere) winter 2022--2023 may well impact this plan.

Agora Energiewende, 2022; Bundesnetzagentur, 2022; SPD, Bündnis 90/Die Grünen und FDP, 2021

TRANSPORT SECTOR

Emissions from energy used to transport goods and people



Transport emissions declined in 2020 in the wake of COVID-19 response measures, but rebounded in 2021 (and 2022) **continuing the upward trajectory that was evident before the pandemic**. Electric vehicles (EVs) made up about 26% of new car sales. In 2019 around 88% of passengers and 79% of freight were conveyed by road.



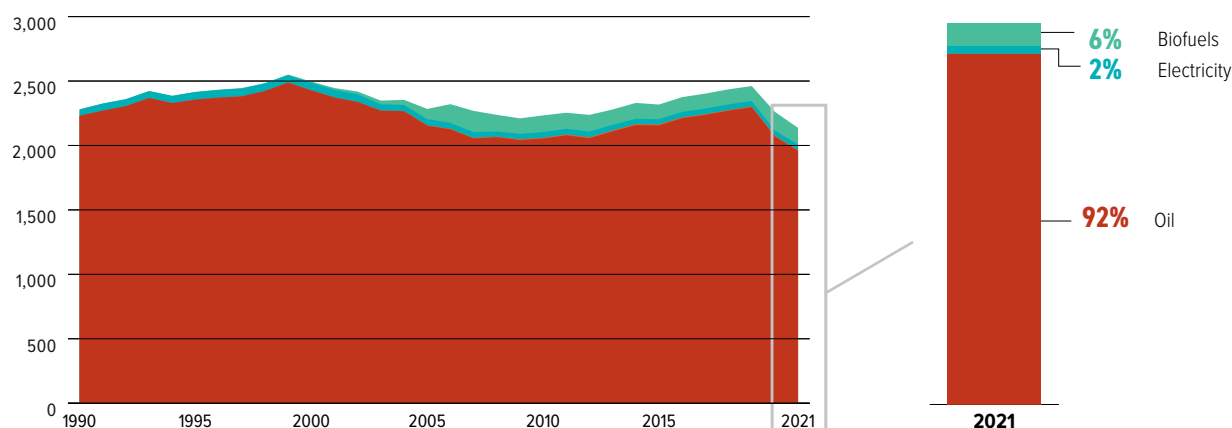
The share of low-carbon fuels in the transport fuel mix must increase to between 40% and 60% by 2040 and 70% to 95% by 2050.

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

Transport's share of energy-related CO₂ emissions in 2021: **24.3%** Direct **0.7%** Indirect

Transport energy mix

Final energy consumption by source (PJ/year)

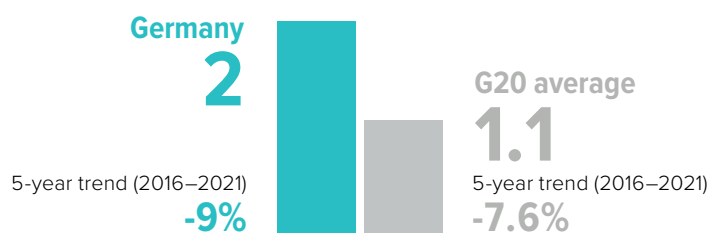


Electricity and biofuels make up only 8% of the energy mix in transport.

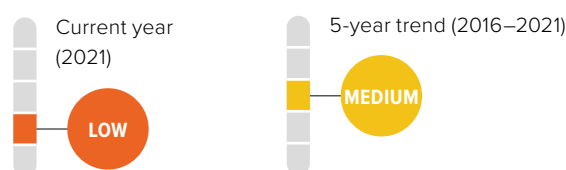
Enerdata, 2022

Transport emissions per capita

(excl. aviation) (tCO₂/capita) in 2021



Decarbonisation: a high rating indicates more effort to decarbonise compared to other G20 Members

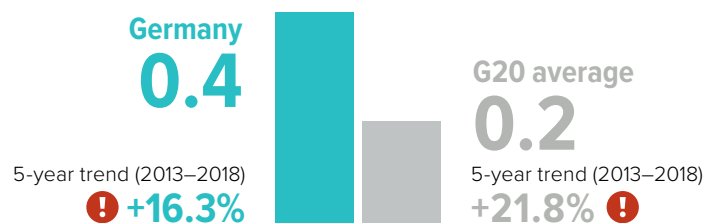


Per capita emissions in 2021 and the 5-year trend have been impacted by COVID-19 pandemic response measures and resulting economic slowdowns. For a discussion of broader trends in the G20 and the rebound of transport emissions in 2022, please see the Highlights Report at www.climate-transparency.org

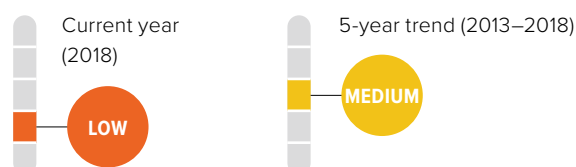
Enerdata, 2022; World Bank, 2022

Aviation emissions per capita⁶

(tCO₂/capita) in 2018

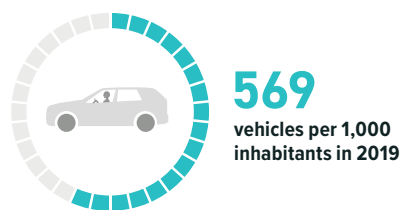


Decarbonisation: a high rating indicates more effort to decarbonise compared to other G20 Members



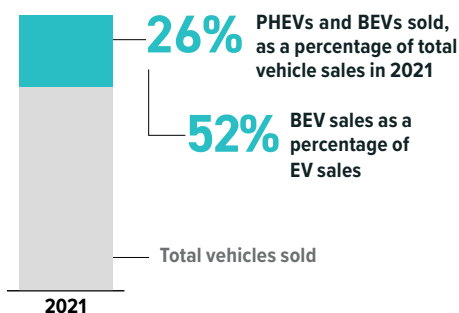
Enerdata, 2022; IEA, 2021a; World Bank, 2022

Motorisation rate



Enerdata, 2022

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

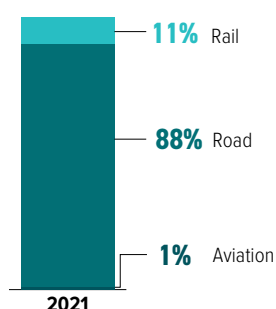


IEA, 2022

Battery-Electric Vehicles (BEVs) have greater emissions mitigation potential when they are powered by electricity produced by renewables because they have no internal combustion engine (ICE), whereas plug-in hybrids (PHEVs) still produce emissions when using the ICE.

Modal split passenger transport

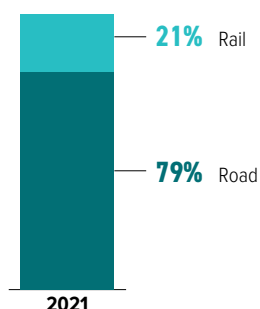
(% of passenger-km): road, rail and air



Enerdata, 2022

Modal split freight transport

(% of tonne-km): road, rail



Enerdata, 2022

Due to data availability, only road and rail transport are included in the freight transport category. Other freight modes, e.g. waterways, are excluded due to lack of data for all countries.

POLICY ASSESSMENT

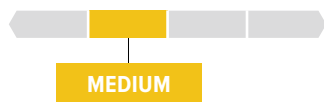
Phase out fossil fuel cars



The German government has not set a date for the phase-out of internal combustion vehicles, despite being bound by EU legislation banning the sale of ICE vehicles by 2035 as part of its "Fit for 55" package. From 1 January 2023 two changes to the German subsidy regime come into effect: first, only BEVs (and not PHEVs) will be eligible for subsidies; and second, the subsidy for BEVs will be reduced from the 2022 amount of EUR 6,000 to EUR 4,500 and then reduced again to EUR 3,000 in 2024--2025. Procurement targets aim for at least 20% of the federal government car fleet to be fully electric.

BMW, 2022a; European Council, 2022; Reuters, 2022

Phase out fossil fuel heavy-duty vehicles



EU regulations stipulate that average emissions from new heavy-duty vehicles (HDVs) must fall 15% by 2025 and 30% by 2030 below the average emissions of HDVs sold between 1 July 2019 and 30 June 2020. However, there is no phase-out date of fossil fuel HDVs. To facilitate these targets, the German Federal Ministry for Transport is subsidising purchases of zero emission vehicles, investing in charging infrastructure, testing motorways with overhead power lines and aiding decarbonisation by supporting green hydrogen solutions.

BMVI, 2020; European Parliament and Council, 2019

Modal shift in (ground) transport



Despite increased investments in railways, between 2009--2020 the German government still spent more on new motorways than railways. Some of the current funds commitment to expanding rail infrastructure will be spent, instead, on repairing damage caused by the flood in July 2021. In its Mehr Fortschritt Wagen (Dare to Make Progress) roadmap document, the coalition government pledged to increase train freight transport by 25% by 2030. The Immediate Action Programme for Climate Protection includes measures to shift freight transport from road to ships, to develop and operate zero emissions ships and to improve cycling infrastructure.

Balser, 2021; Die Bundesregierung, 2021a; Deutsche Bahn, 2021; MDR, 2021; SPD, Bündnis 90/Die Grünen und FDP, 2021

BUILDINGS SECTOR

Emissions from energy used to build, heat and cool buildings



Direct emissions and indirect emissions from **the buildings sector in Germany account for 18% and 14% of total energy-related CO₂ emissions**, respectively. Per capita emissions from the buildings sector are 1.7 times the G20 average.

Buildings sector's share of energy-related CO₂ emissions in 2021:

13.9% Direct **18%** Indirect

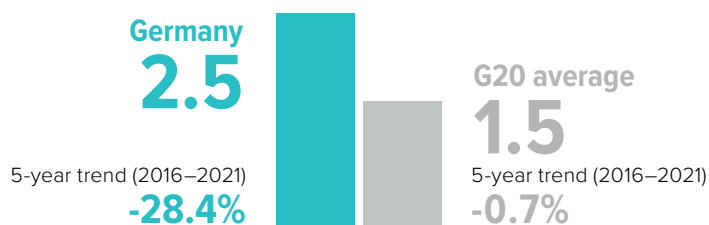


By 2040, global emissions from buildings need to be reduced by 90% from 2015 levels, and be 95–100% below 2015 levels by 2050, mostly through increased efficiency, reduced energy demand and electrification in conjunction with complete decarbonisation of the power sector.

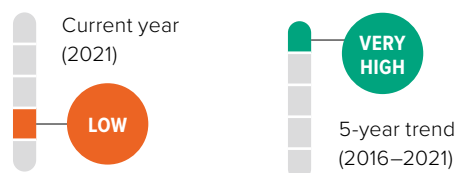
Climate Action Tracker, 2020; Rogelj et al, 2018

Buildings sector emissions per capita

incl. indirect emissions (tCO₂/capita) in 2021



Decarbonisation: a high rating indicates more effort to decarbonise compared to other G20 Members

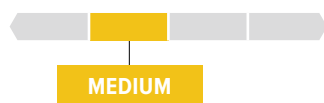


Buildings emissions occur directly (burning fuels for heating, cooking, etc) and indirectly (from grid-electricity for air conditioning, appliances, etc.). Buildings-related emissions per capita are 1.8 times higher than the G20 average as of 2021. This reflects the high fossil fuel share of the electricity mix. Germany has decreased the level of building-related emissions intensity by 28.4% (2016–2021) far faster than the G20 average decline of 0.7% in that period.

Enerdata, 2022; World Bank, 2022

POLICY ASSESSMENT

Near zero energy new buildings



European legislation requires all new buildings within member states to be nearly zero energy buildings (NZEB), but the definition of NZEB is determined by the individual member states. The Buildings Energy Act in Germany stipulates that newbuilds must comply with EH 55 energy efficiency standards (45% reduction in primary energy consumption, 30% reduction in heat loss) from January 2023, and then EH 40 from 2025. Where possible, buildings must contain renewable energy sources, such as rooftop solar. However, the law still permits the installation of oil and gas boilers, until 2026 onwards when oil boilers will be prohibited in new buildings and subsidies for gas boilers discontinued.

BMWSB, 2022; The European Parliament and the Council of the European Union, 2018

Renovation of existing buildings



The July 2022 Budget for Climate Protection and Transformation of Industry allocates over EUR 56bn between 2023–2026 to increase efficiency of existing buildings, with a focus on the 25% least efficient, but does not ban fossil fuel heaters. Germany's long-term strategy for the building sector submitted to the European Commission aims to increase the renovation rate of existing homes from around 1.3% currently to 2% after 2030, significantly slower than what's needed for Paris Agreement compatibility.


Die Bundesregierung, 2021; BMWK, 2022c; Deutscher Bundestag, 2021; Kurmayer, 2022.

INDUSTRY SECTOR

Emissions from energy use in industry

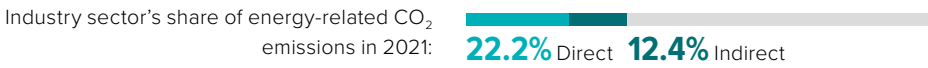


Direct and indirect emissions from industry in Germany made **up 22.2% and 12.4% of energy-related CO₂ emissions, respectively, in 2021**. Additionally, projects for the creation, storage, and transport of green hydrogen are being funded by the German government's Hydrogen Strategy.



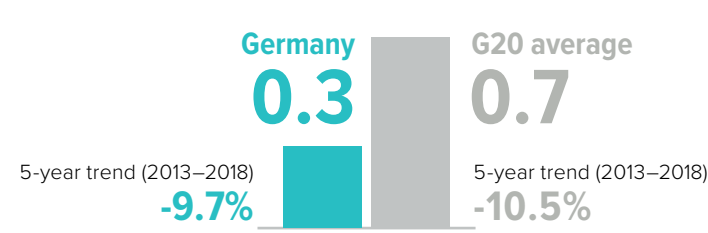
Industrial emissions need to be reduced by 65–90% from 2010 levels by 2050.

Rogelj et al., 2018



Industry emissions intensity⁷

(kgCO₂e/USD2015 GVA) in 2018



Decarbonisation: a high rating indicates more effort to decarbonise compared to other G20 Members

VERY HIGH

Current year (2018)

MEDIUM

5-year trend (2013–2018)

Enerdata, 2021; World Bank, 2022

Carbon intensity of steel production⁸

(kgCO₂/tonne product) in 2019



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

Enerdata, 2022; World Steel Association, 2021

POLICY ASSESSMENT

Energy efficiency



The main driver of emissions reduction in the sector is the EU ETS, despite its weakened impact due to free allocation of certificates through benchmarking. Industry sector emissions covered by the EU ETS could benefit from accessing more funds from the EU's Innovation Fund for energy efficiency projects.

The German government's 2022 Immediate Climate Action Programme also provides funding for decarbonisation of the industry sector. The government also plans to introduce additional measures to reduce energy consumption and facilitate electrification of the sector.

BMWK, 2022b; BMF, 2021a; European Parliament and the Council of the European Union, 2018

LAND USE SECTOR

Emissions from land use change and forestry



To stay within the 1.5°C limit, **Germany needs to make the land use and forestry sector a net sink of emissions**, e.g. by halting the expansion of residential areas, discontinuing the degradation of peatlands converting cropland into wetlands, and by creating new forests.

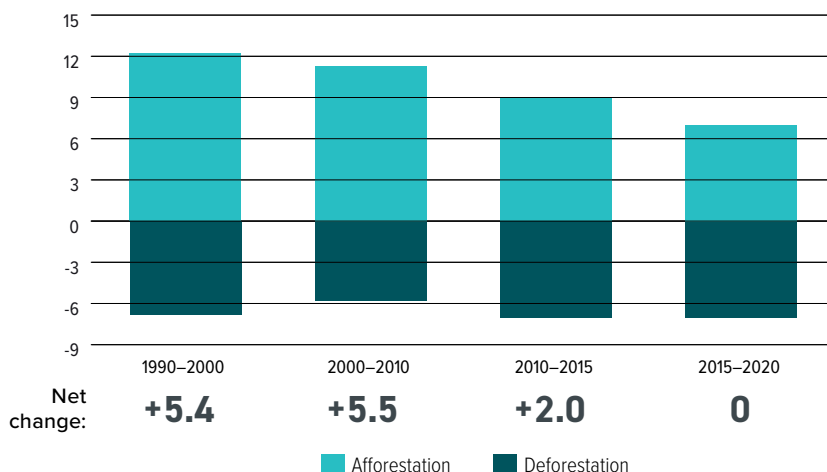


Global deforestation needs to be halted and changed to net CO₂ removals by around 2030.

Rogelj et al., 2018

Annual forest expansion, deforestation and net change

Forest area change in 1,000 ha/year



Between 2015–2020, Germany lost no forest area per year, in stark contrast to the gains experienced in the prior 15 years.

Global Forest Assessment, 2020

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. However, meeting these targets will be challenging: the droughts in 2018 and 2019 significantly worsened the state of German forests. Forests have been supported by the Forest Climate Fund since 2013, topped up by EUR 1.5bn in November 2020. The Climate Protection Emergency Programme 2022 introduces additional measures to increase the sink, e.g., spending over EUR 330m to protect moors, manage forests sustainably, and maintain and develop soils.

BMUV, 2021a, 2021b; Die Bundesregierung, 2021b

AGRICULTURE SECTOR

Emissions from agriculture



Germany's agricultural emissions are primarily from the digestive processes and manure of livestock (mainly cattle). **A 1.5°C compatible pathway requires behavioural and dietary shifts and less fertiliser use.**

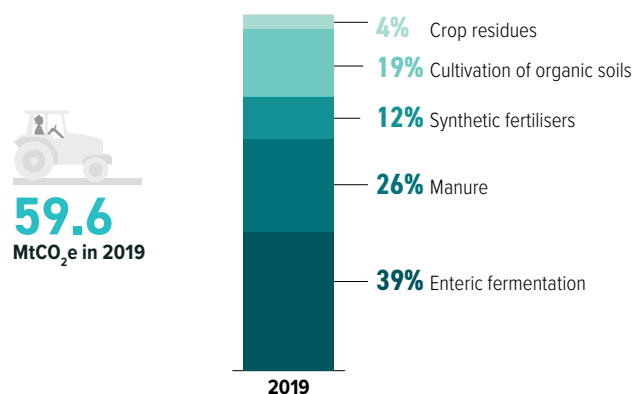


Methane emissions need to decline by 10% by 2030 and by 35% by 2050 (from 2010 levels). Nitrous oxide emissions (mainly from fertilisers and manure) need to be reduced by 10% by 2030 and by 20% by 2050 (from 2010 levels).

Rogelj et al., 2018

Emissions from agriculture

excluding energy emissions, in 2019



In Germany, the largest sources of GHG emissions in the agriculture sector are enteric fermentation (39%), manure (26%), and cultivation of organic soils (19%). Adapting livestock diets improving manure handling and storage, making more efficient use of fertilisers as well as reducing food waste could all help reduce emissions from this sector.

FAO, 2022

MITIGATION: TARGETS AND AMBITION



The science from the IPCC on the risks of exceeding 1.5°C warming is clear. The UN science body has projected that to keep the 1.5°C goal alive, the world needs to roughly halve emissions by 2030.

However, despite the Glasgow Climate Pact (1/CMA.3) agreement to “revisit and strengthen” 2030 targets this year, progress on more ambitious targets has stalled. Without far more ambitious government action, the world is heading to a warming of **2.4°C with the current 2030 targets** and even higher warming of **2.7°C with current policies**.

Climate Action Tracker, 2021a, 2022c; IPCC, 2022; UNFCCC, 2021

AMBITION: 2030 TARGETS

Nationally Determined Contribution: Mitigation

TARGETS

Germany contributes to the EU-wide target of reducing net GHG emissions by “at least 55%” below 1990 levels by 2030. In June 2021 it adopted its national mitigation goal of 65% 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



The CAT evaluates and rates several elements of climate action: policies and actions, targets and a country’s contribution to climate finance (where relevant) and combines these into an overall rating.

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. Germany’s 2030 emissions reduction target is rated as “almost sufficient” when compared to modelled domestic emissions pathways, and is consistent with 2°C of warming. The CAT also rates Germany’s target as “insufficient” when compared with its ‘fair share’ contribution. To improve its rating, Germany would need to increase its emissions reduction target and increase its support for climate action in developing countries.

This CAT analysis was updated in June 2022.
For the full assessment of the country’s targets and actions, and the explication of the methodology, see www.climateactiontracker.org

Climate Action Tracker, 2022a

AMBITION: LONG-TERM STRATEGIES

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

Status	Climate Protection Act adopted 31 August 2021
Net zero target	GHG neutrality by 2045
Interim steps	Yes: at least 65% by 2030 and 88% by 2040
Sectoral targets	Yes

FINANCE

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



While fossil fuel subsidies in Germany have declined in the past decade, 2020 saw an increase of 10% over the previous year to USD 9.6bn. Coal received 53%, of which 61% supported coal miners and coal regions in transition. Of the rest, **the largest single subsidy measure was a tax exemption for coal-powered electricity generation**. The current energy crisis will likely have a significant impact on subsidies.



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

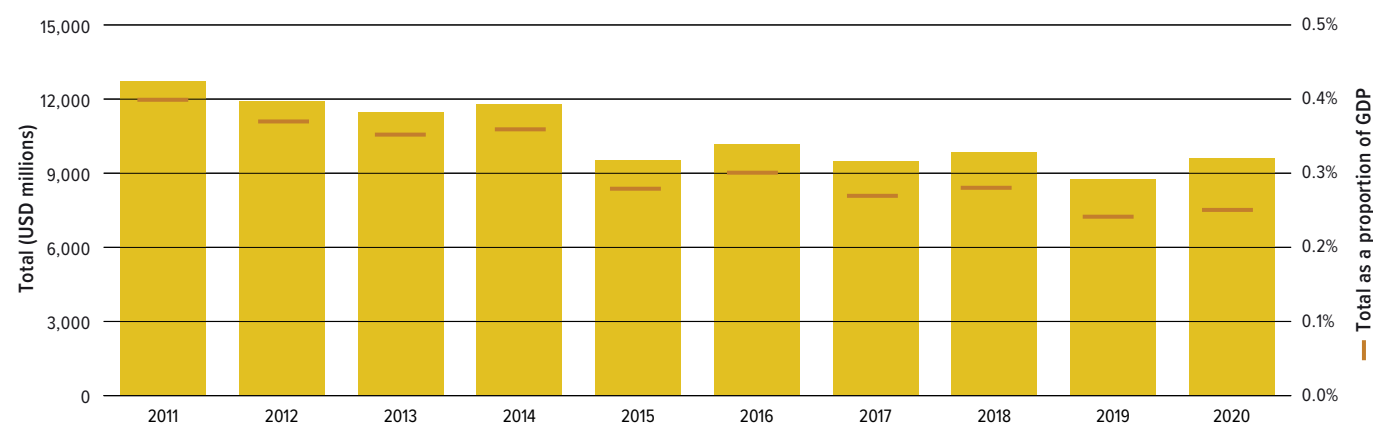
Rogelj et al., 2018

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 relative to national budgets

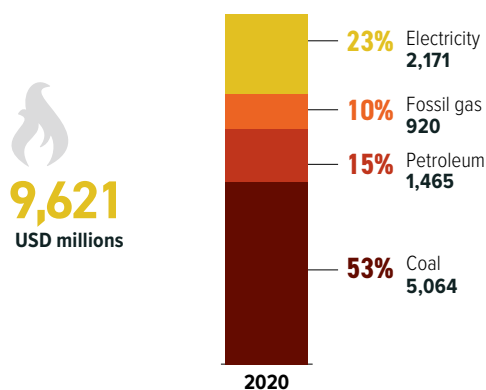
(USD millions)



OECD-IEA Fossil Fuel Support Database, 2022

Fossil fuel subsidies by fuel type

(USD millions) in 2020



Overall, between 2011–2020 fossil fuel subsidies in Germany have slowly declined. However, 2020 saw an increase over the previous year of 10%, reaching USD 9.6bn. It is worth noting that the bottom-up approach of the OECD database likely underestimates the full scale of subsidies for fossil fuels. Subsidies have been evenly split between consumption and production.

Of the 53% going to coal, 61% was to support coal miners and coal mining regions in the energy transition. The rest went to support coal-powered electricity. Other electricity generation and petroleum received the majority of the remaining subsidies.

The largest single subsidy measure was a tax exemption for coal-powered electricity generation, which has slowly been decreasing over the past decade but remains at USD 1.8bn. Some small subsidies (USD 63m) are ostensibly environmentally-friendly, including a tax cut for electricity to trains and trams to 'strengthen environmentally-friendly modes of transport'. Considering that renewables only accounted for 16% of Germany's energy mix in 2020 – roughly the same as coal – this was effectively a fossil fuel subsidy.

Although the effect of the current energy crisis is not visible in the data, it will likely be significant. News reports suggest that renewable subsidies have been reduced by cutting an existing green surcharge on electricity use.

Energy Policy Tracker, 2022; OECD-IEA Fossil Fuel Support Database, 2022

Carbon pricing and revenue

In 2019, the German government established a national level explicit carbon price, anticipating the implementation of the EU ETS2 in the heating and road transport sectors (not currently covered by the EU ETS). Officially launched in January 2021, with a price at EUR 30/tCO_{2e}, this mechanism raised USD 8.5bn in revenue, covering 40% of Germany's emission. Around half of Germany's emissions are currently covered under the EU ETS, which generated USD 7.2bn of revenue in 2021 in Germany alone.

I4CE, 2022 ; Energy Policy Tracker, 2022

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 made strides on green finance in the last few years. The May 2021 Sustainable Finance Strategy sets out a list of requirements for mandatory and comprehensive 'sustainability' reports from corporations. These include transparency on climate risks that will be audited to prevent 'greenwashing'. The strategy also calls for sustainable investments from federal pension funds and development banks and suggests a 'traffic light' form of sustainability labelling so consumers understand the impact of their investments.

The German government is one of the largest issuers of sovereign green bonds. After issuing EUR 11.5bn in 2020, 2021 saw an increase

in volume to EUR 12.5bn. There are further plans to issue more in the third quarter of 2022.

As a member of the EU, Germany is bound by EU policies and regulations. It sees setting financial regulations at EU level as core to its success. Hence, the sustainability labelling proposals are being negotiated as part of the EU Disclosure Regulation. If it is unsuccessful, Germany will propose a national system.

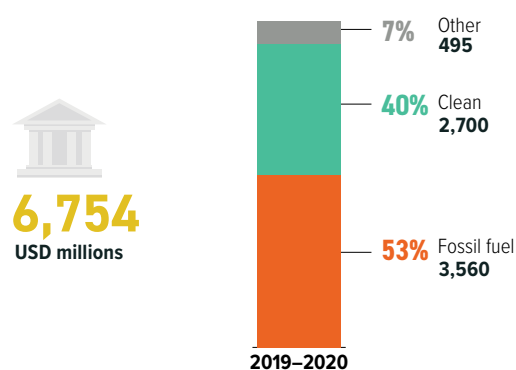
BMF, 2021b; Finanzagentur, 2022

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 Members 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 energy

USD millions (2019–2020 average)



Between 2019–2020 Germany provided an average of USD 6.75bn in public finance to energy projects. Of this amount, 53% went to fossil fuels, almost entirely to fossil gas. The largest single support measure was provided as export credit by Euler Hermes to Russia's state-owned energy group, Gazprom: USD 2.9bn to develop the Amur Gas Processing Plant. Other significant investments included USD 290m to the Viking Link Interconnector – a transmission line connecting England and Denmark under the North Sea – and various projects aimed at building renewables and increasing grid efficiency in India.

At COP26 in Glasgow, alongside over 30 governments, Germany pledged to end direct international public finance to fossil fuels by the end of 2022 and reaffirmed this commitment as part of the G7 in May 2022.

Oil Change International, 2022

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

Annex II countries to the UNFCCC, including Germany, are obligated to provide climate finance and have committed to collectively mobilise USD 100bn a year to 2025, when this goal will be renewed, even though the target has never been met and has been criticised as inadequate.

Of the nine G20 members obligated to provide climate finance Germany provided the second largest amount of climate finance bilaterally, in absolute and GDP relative terms, and fourth largest through multilateral climate funds, in absolute terms. Since the 2015–2016 period, both bilateral and multilateral flows have increased. Climate finance channelled through KfW accounts for around half of its bilateral finance.

Fair share of the USD 100bn climate finance goal:

This fair share analysis allocates responsibility for provision of climate finance to each Annex II country based on their gross national income (GNI), cumulative territorial CO₂ emissions since 1990, and population size. It uses the UNFCCC Biennial Report data for 2017–2018 and climate-related finance data provided by the OECD Development Assistance Committee for 2019 and 2020.

Germany paid its fair share of the USD 100bn climate finance goal in 2019–2020 and in 2017–2018. The country has been providing its fair share of the USD 100bn climate finance goal well before the original deadline of 2020 set in the Copenhagen accords. Most of it remains dedicated to mitigation, failing to achieve a balance with adaptation. In 2017, half of its climate finance came in the form of loans rather than grants, demonstrating a smaller fiscal commitment than what the figures show and implying further debt for the recipient country.

Climate finance provided (USD billion) by Germany and its fair share of the USD 100bn goal:

9.24	2017–2018 average	>	111%	Progress towards fair share
10.05	in 2019	>	121%	Progress towards fair share
9.91	in 2020	>	119%	Progress towards fair share

Looking ahead, the country seems set to keep on paying its fair share of the USD 100bn climate finance goal. Germany doubled its original contributions to the Green Climate Fund during its first replenishment and, at the G7 meeting in mid 2021, committed to provide minimum EUR 4bn (USD 4.7bn), increasing to EUR 6bn (USD 7.1bn), a year by 2025 at the latest.

Colenbrander et al., 2022; COP26 Presidency, 2021

Note: Data on the ‘provision of international public support’ corresponds to 2017–2018 as per the UNFCCC Fourth Biennial Report (BR). Parties are to submit data by December 2022 for subsequent years in the Fifth BR.

Endnotes

For more detail about sources and methodologies, please download the CTR Technical Note at: www.climate-transparency.org/g20-climate-performance/g20report2022

Where referenced, “Enerdata, 2022” refers to data provided in July 2022 and, due to rounding, graphs may sum to slightly above or below 100%.

- 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) data tables, converted to the categories from the IPCC 1996 guidelines, in particular separating Agriculture from LULUCF, which under the 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 5 years (where available) to take account of the different starting points of different G20 Members.

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 Policy Assessment Criteria table below (on page 19) displays the criteria used to assess a country’s policy performance.

5 In order to maintain comparability across all countries, this report harmonises all data with PRIMAP 2021 dataset to 2018. However, note that CRF data is available for countries which have recently updated GHG inventories.

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).

Policy Assessment Criteria

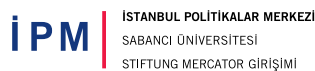
	LOW	MEDIUM	HIGH	FRONTRUNNER
Renewable energy in power sector	No policies to increase the share of renewables	Some policies	Policies and longer-term strategy/ target to significantly increase the share of renewables	Short-term policies + long-term strategy for 100% renewables in the power sector by 2050 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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