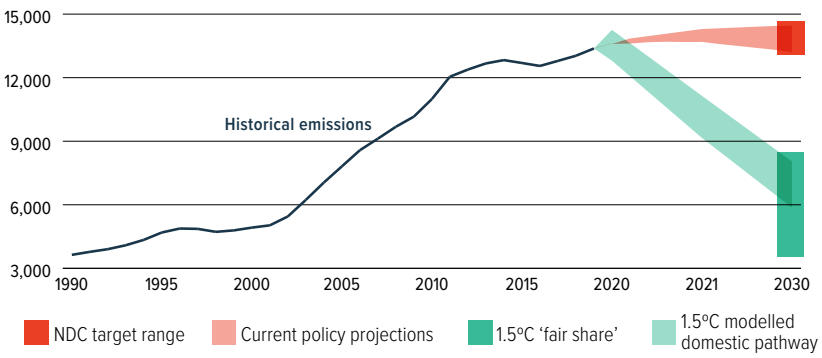
CHINA

Climate Transparency

CLIMATE TRANSPARENCY REPORT: COMPARING G20 CLIMATE ACTION 2022

NOT ON TRACK FOR A 1.5°C WORLD

1.5°C compatible emissions pathway ($MtCO_2e$/year)[1]

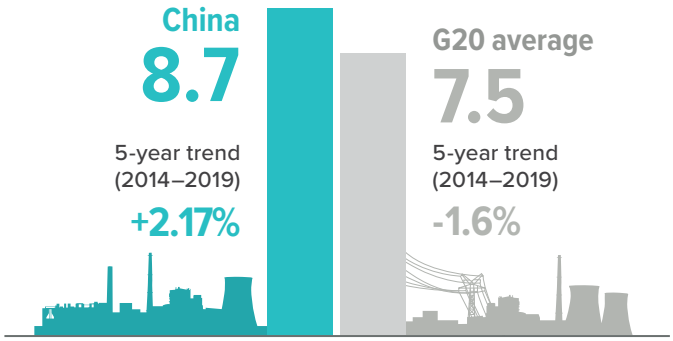


China's NDC target would increase emissions by at least 260% above 1990 levels, or between approximately 13,113–14,659 $MtCO_2e$ (excl. LULUCF). To keep below the 1.5°C temperature limit, analysis by the 1.5°C Pathways Explorer shows that its emissions would need to be around 6,400 $MtCO_2e$ by 2030, leaving a minimum ambition gap of about 6,713 $MtCO_2e$. China would need to strengthen its target to be in line with its 1.5°C 'fair share' contribution to the Paris Agreement.

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

PER CAPITA GREENHOUSE GAS (GHG) EMISSIONS ABOVE G20 AVERAGE

tCO_2e/capita[2] in 2019



China's per capita emissions were 1.17 times the G20 average in 2019. Total per capita emissions have increased by 2.2% from 2014 to 2019.

Gütschow et al., 2021; World Bank, 2022

RECENT DEVELOPMENTS

China submitted its updated NDC in October 2021, strengthening targets and **adding a new renewable energy capacity target**. The updated Long-Term Strategy (LTS) was also submitted, establishing a 2060 carbon neutrality target.

China seems to have **reversed its stance on strictly controlling coal consumption**. Several of the 14th Five-Year Plan's targets focused on guaranteeing production capacity of fossil fuels, rather than capping their use.

Installed solar and wind capacity **surpassed 1,000 GW in 2021**. China is likely to overperform on its NDC target of 1,200 GW installed solar and wind capacity by 2030.

KEY OPPORTUNITIES FOR ENHANCING CLIMATE AMBITION

China's dual carbon targets (peaking before 2030 and neutrality before 2060), if implemented, could result in **significant emissions reductions and energy efficiency improvements** across China's economic sectors.

China announced **strict control of coal consumption until 2025** and a gradual phase down thereafter. For 1.5°C compatibility, China needs to phase out coal before 2040.

China's **growth in wind and solar power generation** over the last decade needs to be maintained and matched by increased electrification of end-use sectors and the uptake of renewable district heating.

Contents

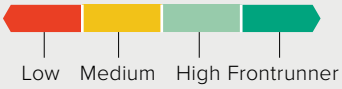
We unpack China's progress and highlight key opportunities to enhance climate action across:

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.

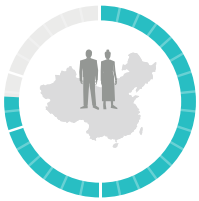
Decarbonisation Ratings[3] assess a country's performance compared to other G20 Members. A high score reflects a relatively good effort from a climate protection perspective but is not necessarily 1.5°C compatible.

Policy Ratings[4] 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



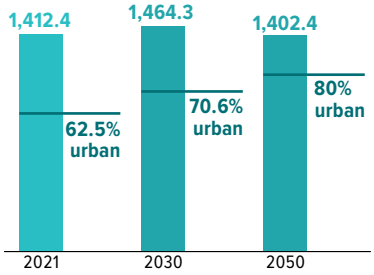
The Human Development Index (HDI) reflects life expectancy, level of education, and per capita income. China ranks high.

0.76 **High**

Data for 2019. UNDP, 2020

Population and urbanisation projections

(in millions)

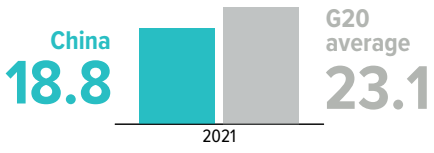


China's population is projected to peak in early 2030 and decrease by 1% from current levels by 2050. The heat island effect of urbanisation has been a major contributor to the warming experienced in the increasingly urbanising country over the last decades.

Feng and Hubacek, 2016; Sun et al., 2016; United Nations, 2018; World Bank, 2022

Gross Domestic Product (GDP) per capita

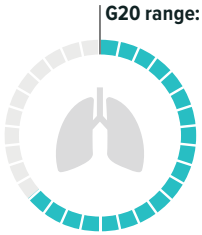
(thousand PPP constant 2015 international $ per person) in 2021



World Bank, 2021

Death rate attributable to ambient air pollution

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



1.06
per 1,000 people per year

Over 1.8 million people die in China every year due to stroke, heart disease, lung cancer and chronic respiratory diseases as a result of outdoor air pollution. Compared to total population, this is one of the higher levels in the G20.

Institute for Health Metrics and Evaluation, 2020

A JUST TRANSITION

Coal jobs in China have declined by roughly half since reaching a peak of 5.3 million in 2013. Recent analysis shows that coal jobs could decline by another half by 2025 under the country's carbon neutrality goal. On the other hand, renewable energy jobs increased from 2.6 million in 2013 to 4.7 million in 2021. The decline in coal employment is not unexpected. Diverting subsidies away from coal and towards skills development in the renewable sector would create job opportunities and, thus, alleviate economic impacts from job losses in the coal sector. A transition away from coal also affects China's rural households, which rely on coal for heating. Policies to restrict coal used for this purpose would need to consider how to supply affordable heating alternatives to those affected.

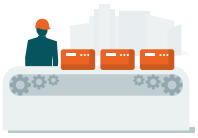
Clark and Zhang, 2022; He et al., 2020; IRENA, 2014, 2021; Li and Zhang, 2021

ADAPTATION

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

China's average temperature and sea levels **have risen faster than the global average**. An estimated 43 million people in China live on land that could be under water by the end of the century if the global average temperature rises by 2°C.

Retreating glaciers **will likely lead to water shortages** throughout South and East Asia due to the melting of the 'Third Pole' in eastern China. It provides water to more than 2 billion people, or 30% of the world's population.



By mid-century, climate change is predicted to **reduce production in China's manufacturing industry by 12%**, resulting in a 4% decline in annual GDP. Furthermore, by the end of the century, 14.2% of the country's electricity infrastructure could be at risk due to climate change.

ADAPTATION NEEDS

Impacts of a changing climate

Exposure to warming

0.7°C
Higher

Between 2017 to 2021, the average summer temperatures experienced by people in China were 0.7°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

44bn **Labour hours lost**
25% **decrease**

In 2021, heat exposure in China led to the loss of almost 44 billion potential labour hours, a 25% decrease from the average levels in 1990–1999.

Loss of earnings from heat-related labour capacity reduction

150bn **Loss in labour capacity (USD)**
1% **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 was USD 150 billion, or slightly under 1% of 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**: +3.6% at 1.5°C warming	1.6 times	1.9 times	2.3 times
Local **snowfall**: -10.4% at 1.5°C warming	1.6 times	2.1 times	2.7 times

Local precipitation is projected to increase by 3.6% above the from the reference period of 1986–2006, if global temperature rises by up to 1.5°C. More warming is projected to increase precipitation further: under a 3°C warming scenario, precipitation is projected to increase by 2.3 times the precipitation rise projected at 1.5°C. Local snowfall is expected to decrease under a 1.5°C scenario by 10.4% from the reference period's snowfall. At 3°C of warming, the decrease is expected to be 2.7 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: +4.6% at 1.5°C warming	1.5 times	1.5 times	1.9 times
River discharge: +2.8% at 1.5°C warming	1.2 times	1.1 times	1.3 times
Total **soil moisture content:** +0.2% at 1.5°C warming	0.5 times	-5.4 times	-5.2 times

Surface run-off due to decreased soil absorption capacity is projected to increase by 4.6%, if global temperature rises by up to 1.5°C above pre-industrial levels. At 3°C of warming, the increase is expected to be 1.9 times what the decrease would be under a 1.5°C scenario. Soil moisture content is expected to increase slightly with moderate warming but decrease significantly with warming above 2.5°C.

Agriculture	At 2°C	At 2.5°C	At 3°C
Reduction in **maize yield**: -0.2% at 1.5°C warming	4.1 times	19.0 times	26.9 times

Agricultural yields tend to decrease as the temperature increases. Maize yield is expected to decrease by 0.2% below the average over the baseline period of 1986–2006, at 1.5°C of warming and projected to be 27 times greater at 3°C of warming.

Hazards	At 2°C	At 2.5°C	At 3°C
Number of people annually exposed to **heatwaves:** 13,976,928 at 1.5°C warming	2.4 times	5.2 times	8.0 times
Number of people annually exposed to **wildfires:** 2,034,829 at 1.5°C warming	1.3 times	1.4 times	1.7 times

The number of people annually exposed to hazards is expected to rise as the temperature increases. At 1.5°C of warming, nearly 14 million people more than the reference period average are projected to be exposed to heatwaves annually, a number that is multiplied by 8 under 3°C of warming. Wildfires are projected to affect just over 2 million people more than the reference period average, at 1.5°C of warming and 1.7 times that number at 3°C of warming.

Economic	At 2°C	At 2.5°C	At 3°C
Annual expected damage from **tropical cyclones:** +5.6% at 1.5°C warming	2.1 times	3.0 times	3.4 times
Annual expected damage from **river flood:** +22.2% at 1.5°C warming	2.4 times	3.9 times	4.5 times
Labour productivity due to heat stress: -1.9% at 1.5°C warming	1.7 times	2.5 times	3.3 times

Annual expected damage from tropical cyclones is expected to increase by 5.6% under 1.5°C of warming and further increase with greater warming. Damage from river flooding is expected to see an even greater increase of 22% under 1.5°C of warming. Warming is also expected to result in decreasing labour productivity and will decrease steadily as temperatures rise.

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	Water	
National Strategy for Climate Change Adaptation 2035	2022	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	

Nationally Determined Contribution (NDC): Adaptation

TARGETS

N/A

ACTIONS

Develop the National Strategy for Climate Change Adaptation 2035. Pursuant to this, a strategy was released in June 2022.

MITIGATION

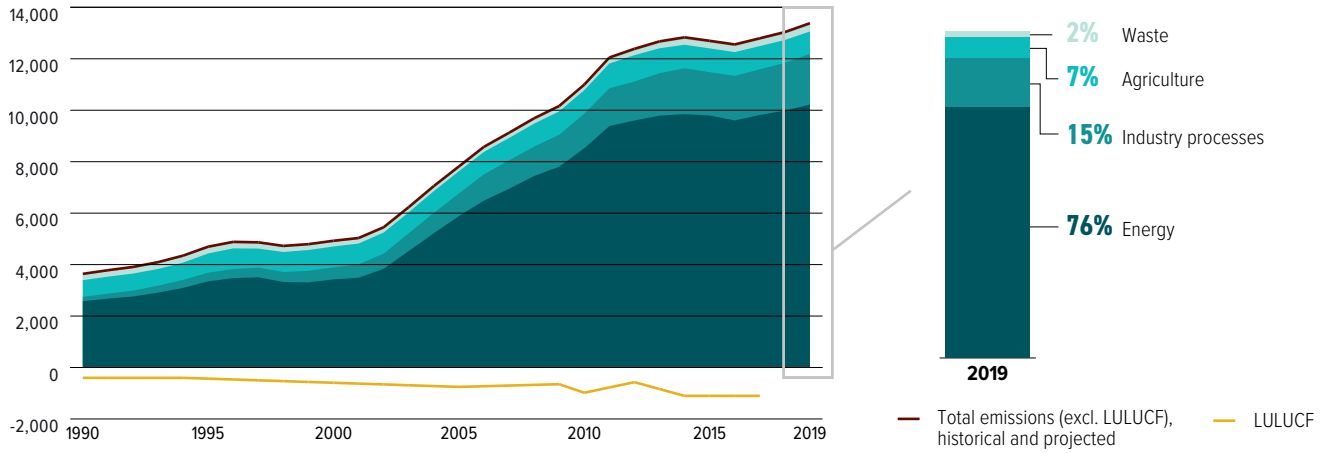
Paris Agreement: Hold the increase in the global average temperature to well below 2°C above pre-industrial levels and pursue efforts to limit to 1.5°C, recognising that this would significantly reduce the risks and impacts of climate change.

EMISSIONS OVERVIEW

China's total greenhouse gas emissions (excl. LULUCF) have **increased by 268%** (1990–2019). In the same period, its total **methane emissions (excl. LULUCF) have increased by 66%**.

GHG emissions across sectors[5]

Total sectoral GHG emissions ($MtCO_2e$/year)

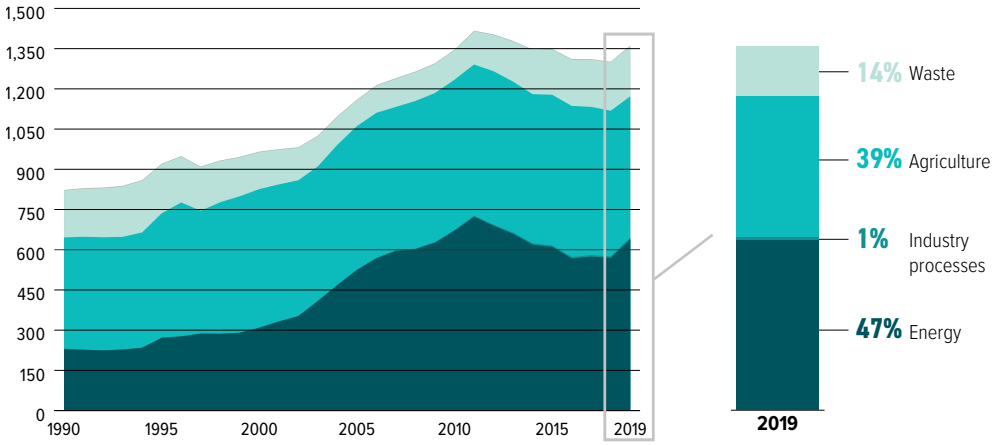


China's emissions (excl. LULUCF) increased by 268% from 1990 to 13,378 $MtCO_2e$/yr in 2019. When considered by category, the overall increase was largely due to sharp growth in both energy- and industrial-process-related emissions between 2002 and 2012, and sustained, but slower, growth thereafter. Increases are seen in all sectors between 1990 and 2019.

Gütschow et al., 2021

Methane emissions by sector

Total CH_4 emissions ($MtCO_2e$/year)



China did not sign the Global Methane Pledge at COP26 in November 2021.

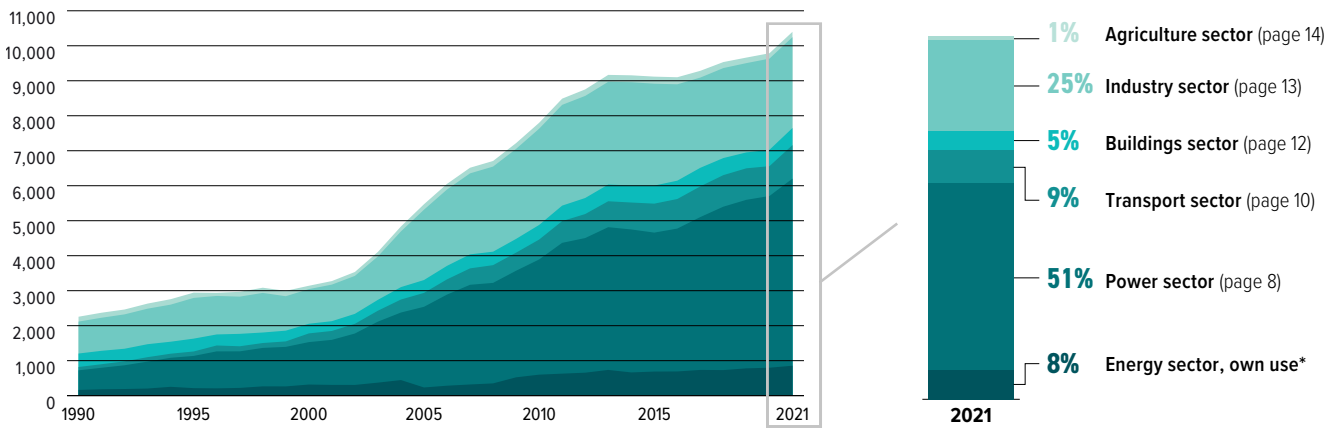
Participating countries pledged to undertake voluntary actions to contribute to a collective reduction of global methane emissions by at least 30% from 2020 levels by 2030. Further scrutiny of plans and implementation will be required.

Methane is a potent, though short-lived, greenhouse gas, accounting for an estimated third of global warming. China's methane emissions (excl. LULUCF) increased by 66% between 1990 and 2019 to 1,362 $MtCO_2e$/yr, although actual emissions are likely to be higher than reported. The majority of China's methane emissions came from the energy sector in 2019, which overtook agriculture as the dominant producer of methane in 2006.

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

Energy-related CO_2 emissions by sector

Annual CO_2 emissions ($MtCO_2$/year)



The largest driver of overall greenhouse gas emissions are CO_2 emissions from fuel combustion. At 51%, electricity generation is the largest contributor of emissions, followed by the industry and transport sectors, which produce 25% and 9% of emissions, respectively.

Enerdata, 2022

**Includes energy-related CO_2 emissions from extracting and processing fossil fuels.*

ENERGY OVERVIEW

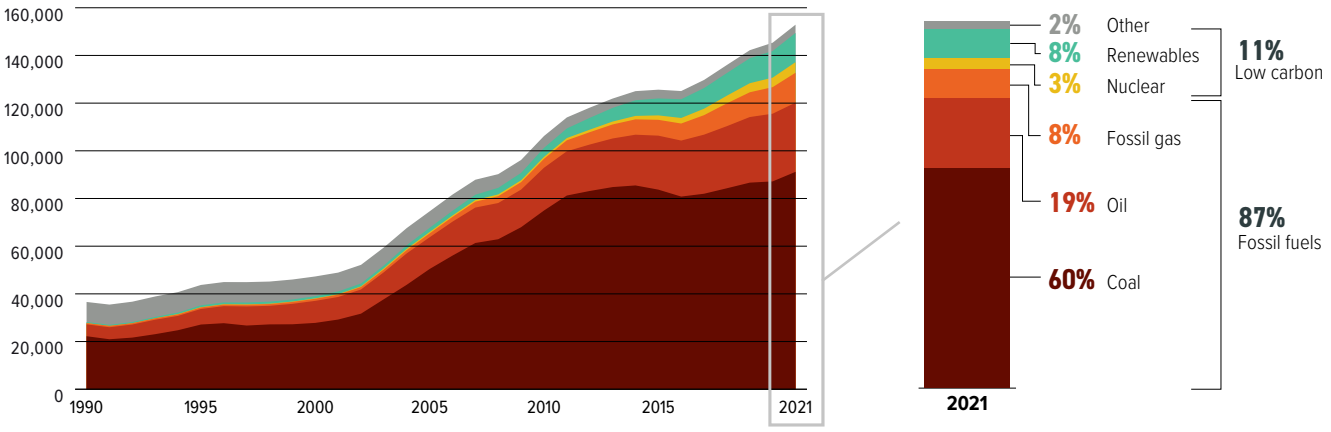
China's primary energy mix is dominated by fossil fuels, with coal making up 60% of the total, and fossil gas and oil another 27% in 2021. While the country has seen rapid development of "non-fossil-fuel energy" (including large hydro and nuclear) over the last decade, these sources still only account for 11% of the total energy mix.

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)

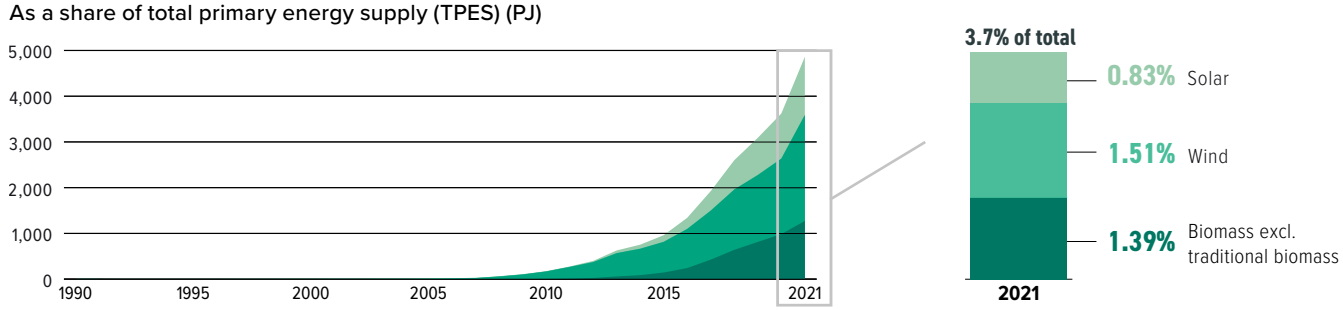


This graph shows the fuel mix for all energy supply, including energy used not only for electricity generation, heating and cooking, but also for transport fuels. Fossil fuels (oil, coal, and gas) make up almost 87% of the energy mix in China, which is slightly higher than the G20 average of 81%. The increase in energy supply observed between 2002 and 2012 was primarily due to greater use of coal and oil as the proportion of fossil gas and nuclear remained small and stable through this period. Since 2012, energy supply from coal and oil has plateaued, and while the use of renewables has been on the rise, it still plays a marginal role in the energy mix.

Enerdata, 2022

Solar, wind, geothermal and biomass development

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

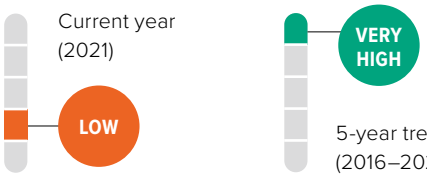


Solar, wind, geothermal and biomass (excluding traditional biomass) account for 3.7% of China's energy supply – the G20 average is 7.5%. The share of new renewables in total energy supply has shown an increasing trend of around 93% over the last 5 years in China (2016–2021) from a very low base.

Enerdata, 2022

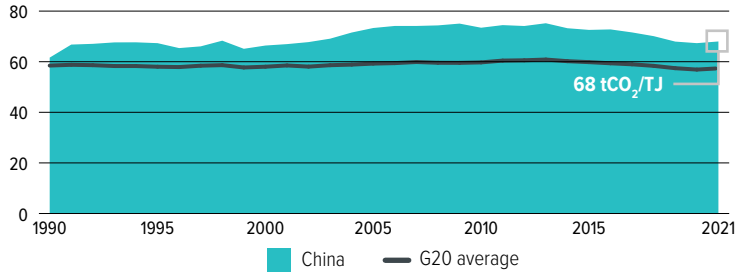
Note: Large hydropower and solid fuel biomass in residential use are not reflected due to their negative environmental and social impacts.

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



Carbon intensity of the energy sector

Tonnes of CO_2 per unit of TPES (tCO_2/TJ)



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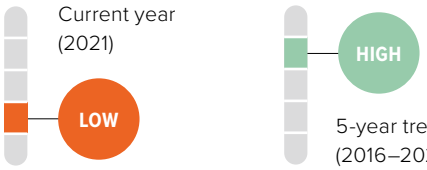


Carbon intensity is a measure of how much CO_2 is emitted per unit of energy supply. China's emissions intensity of primary energy is currently 68 tCO_2/TJ, about 19% above the G20 average. Emissions intensity has been decreasing at a faster rate (7.6%) than the G20 average rate of decrease (4%).

Enerdata, 2022

Energy supply per capita

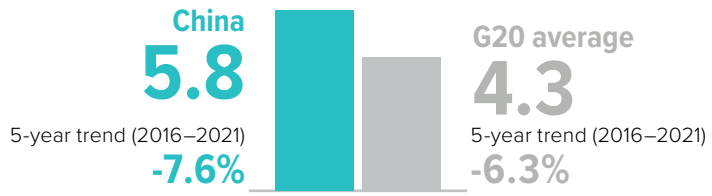
TPES per capita (GJ/capita) in 2021

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 China was 108 GJ, above the G20 average of 99 GJ. China's supply per capita has increased at a rate of 19.8% between 2016 and 2021. This is by far the highest rate among G20 Members, many of which have seen a decrease, and is much higher 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



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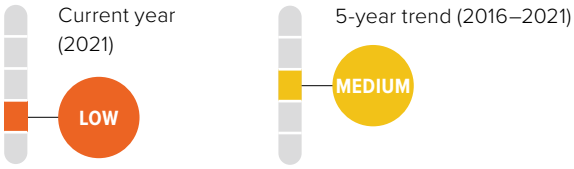


This indicator quantifies how much energy is used for each unit of GDP. This is closely related to the level of decarbonisation, efficiency achievements, climatic conditions or geography. China's energy intensity is higher than the G20 average but has been decreasing at the faster rate of 7.6% (2016–2021) compared to the G20's average decrease of 6.3%.

Enerdata, 2022; World Bank, 2021

POWER SECTOR

Emissions from energy used to make electricity and heat

China produced **63% of its electricity from coal in 2021**. Given the current high coal share and plans to install further coal capacity, the country's generation mix is not compatible with a 1.5°C pathway. Plans to develop renewable energy rapidly and reduce fossil fuel use could, however, result in significant emissions reduction.

Power generation's share of energy-related CO_2 emissions in 2021:

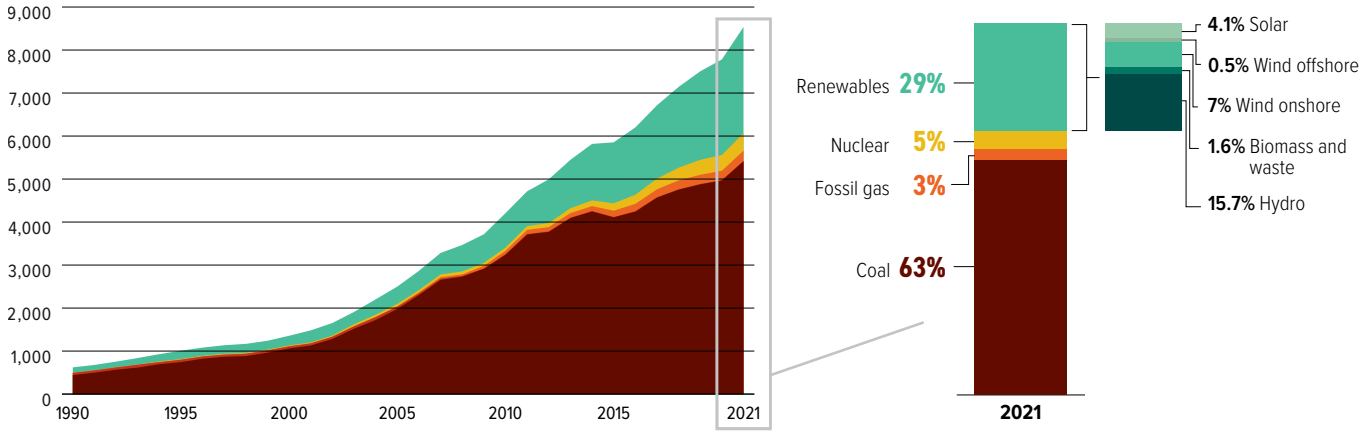
51% Direct

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)

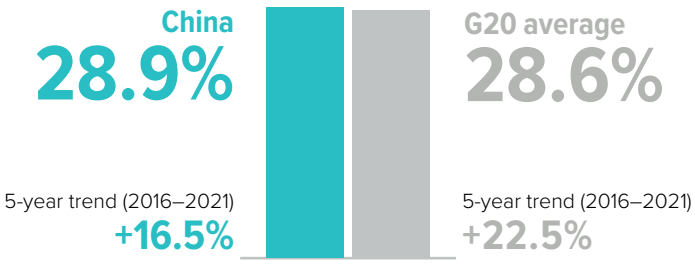


China generated 66% of its electricity from fossil fuels (predominantly coal) and approximately 29% from renewable energy (mostly hydro) in 2021. In the last 5 years, however, the share of renewables in power generation has increased 16.5%, well under the G20 average increase of 22.5% for the same period. China's share of non-hydro renewables in power generation has increased at almost double the G20 rate over this period (110% compared to 68%).

Enerdata, 2022

Share of renewables in power generation

(incl. large hydro) in 2021



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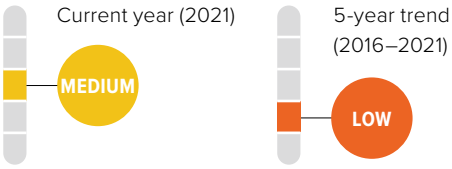
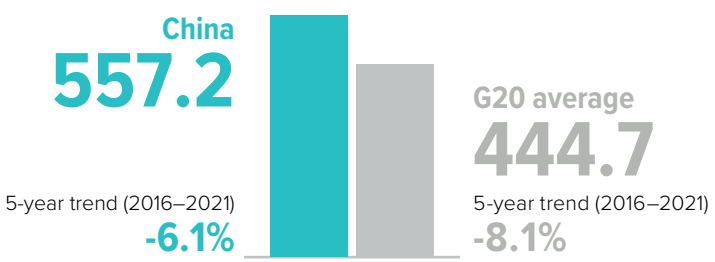


Enerdata, 2022

Emissions intensity of the power sector

(gCO_2/kWh) in 2021



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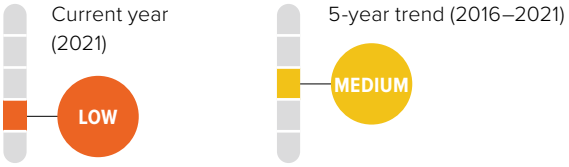


For each kilowatt hour of electricity produced, 557 g of CO_2 is emitted in China. Continued reliance on coal for power generation has resulted in little change in emissions intensity over the 5 years from 2016–2021 (a reduction of 6%). The G20 average has declined slightly faster, at 8%.

Enerdata, 2022

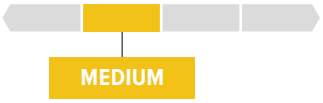
POLICY ASSESSMENT

Renewable energy in the power sector

China's updated NDC includes targets for a 25% share of "non-fossil fuels" in primary energy and at least 1,200 GW of solar and wind capacity by 2030. Already in 2021, the country reported 1,000 GW of installed wind and solar capacity. The recently released 14th Five-Year Plan for the energy sector sets a target for renewables to make up more than 50% of new power demand over the period 2021–2025, and for total renewable energy output to increase by 47% from 2020 levels by 2025.

Carbon Brief, 2022; Climate Action Tracker, 2022; IEA, 2021b; Min, 2022

Coal phase-out in the power sector

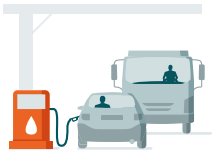


In April 2021, President Xi announced that China would strictly control coal consumption over the next 5 years and begin "phasing down" coal from 2026; however, coal production and consumption increased in 2021. Coal power capacity also increased by an additional 25 GW in that year, in contrast to the global need to phase out coal-fired power generation. The China Electric Council forecasts that 150 GW of coal capacity will be added between 2020 and 2025, and another 30 GW by 2030. This represents about two-thirds of the global coal capacity pipeline.

Climate Action Tracker, 2022; Global Energy Monitor et al., 2022; Xinhua, 2021a

TRANSPORT SECTOR

Emissions from energy used to transport goods and people



Emissions from transport resumed their upward trajectory in 2021 after a brief decline in 2020 – a year of reduced travel for most due to pandemic response measures. Over the past 5 years (2016–2021) **transport emissions per capita increased at a rate of 10%** in contrast to the G20 average decrease of 7.6%. The fuel mix continues to be dominated by oil (86%).

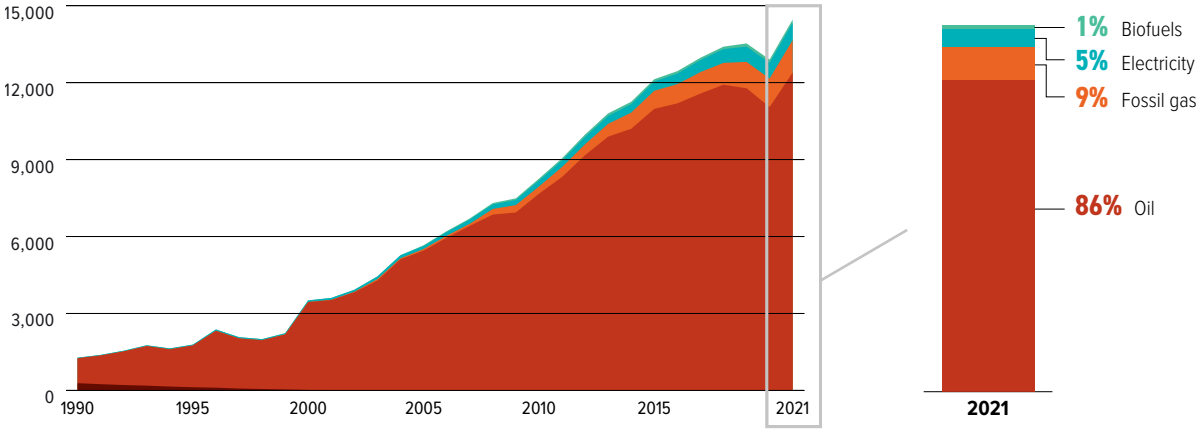
Transport's share of energy-related CO_2 emissions in 2021: **9.2%** Direct **1.2%** Indirect

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 energy mix

Final energy consumption by source (PJ/year)

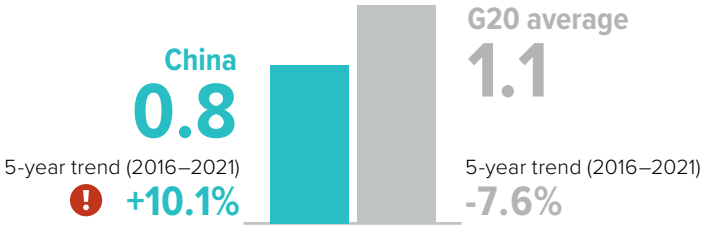


Electricity and biofuels make up only 5.6% of the energy mix in transport.

Enerdata, 2022

Transport emissions per capita

(excl. aviation) (tCO_2/capita) in 2021



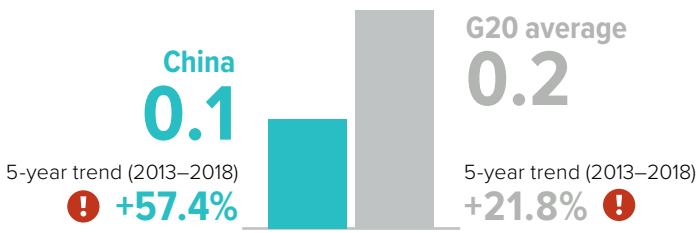
Decarbonisation: a high rating indicates more effort to decarbonise compared to other G20 Members

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.

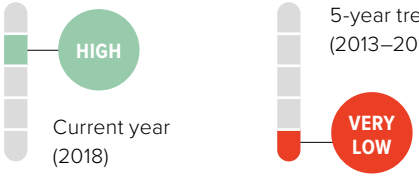
Enerdata, 2022; World Bank, 2022

Aviation emissions per capita[6]

(tCO_2/capita) in 2018



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



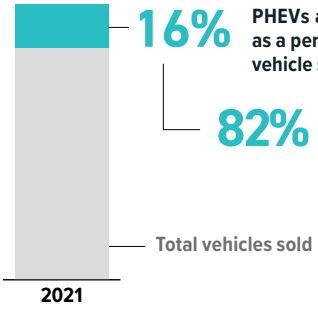
Enerdata, 2022; IEA, 2021a; World Bank, 2022

Motorisation rate

171
vehicles per 1,000 inhabitants in 2019

Enerdata, 2022

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

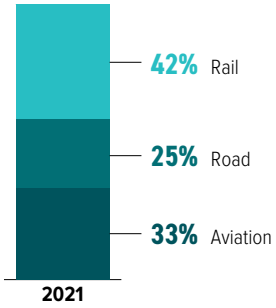


Battery-Electric Vehicles (BEVs) have greater emissions mitigation potential when they are powered by electricity produced by renewables because they have no internal combustion engine (ICE), whereas plug-in hybrids (PHEVs) still produce emissions when using the ICE.

IEA, 2022

Modal split passenger transport

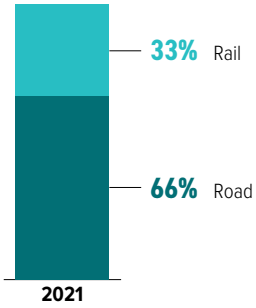
(% of passenger-km): road, rail and air



Enerdata, 2022

Modal split freight transport

(% of tonne-km): road, rail

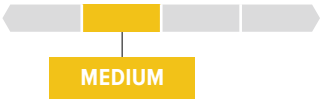


Due to data availability, only road and rail transport are included in the freight transport category. Other freight modes, e.g. waterways, are excluded due to lack of data for all countries.

Enerdata, 2022

POLICY ASSESSMENT

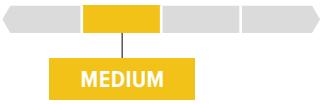
Phase out fossil fuel cars



In its Action Plan for Carbon Dioxide Peaking Before 2030, the Chinese government sets a target for new energy vehicles (NEVs) to make up 40% of new vehicle sales by 2040, and for oil consumption for land transport to peak before 2030. Already in 2021, EV's market share had reached 16%. An earlier development plan has set out targets for NEVs to account for 20% of new car sales by 2025 and for BEVs to become the "mainstream" of new vehicle sales by 2035.

Chu, 2021; Climate Action Tracker, 2021b; IEA, 2022b; Xinhua, 2021b

Phase out fossil fuel heavy-duty vehicles

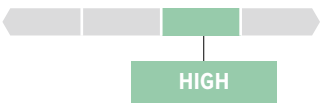


In July 2021, China implemented its Stage 3 fuel consumption standards to all new heavy commercial vehicles. Fuel consumption limits for new tractors (15%), trucks (14%), and buses (16%) have been increased from the previous Stage 2 standard. In 2021, China saw just under 13,000 electric trucks and 86,000 electric buses sold. As in previous years, this was the vast majority of these vehicles sold worldwide.

China currently has no plan to reduce absolute emissions from the freight sector.

IEA, 2022a; Mao et al., 2021; Transport Policy, 2018; Zhang and He, 2022

Modal shift in (ground) transport

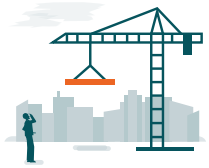


China's Action Plan for Carbon Dioxide Peaking Before 2030 seeks to promote a modal shift in both passenger and freight transport. It sets targets to increase the volume of freight transportation by rail and ship by 15% over the 14th Five-Year Plan period (2021–2025) and to ensure that no less than 70% of travel within major cities (population of 1 million or more) will be conducted through "environmentally-friendly" means. The State Council has set further targets to increase access to rail at ports and industrial enterprises.

Xinhua, 2021b; Xue and Liu, 2022

BUILDINGS SECTOR

Emissions from energy used to build, heat and cool buildings



Direct emissions and indirect emissions from the buildings sector in China account for 4% and 15% of total energy-related CO_2 emissions, respectively. In 2021, per capita emissions from the building sector (1.7 tCO_2) were slightly higher than the G20 average of 1.5 tCO_2 per capita.

Buildings sector's share of energy-related CO_2 emissions in 2021:

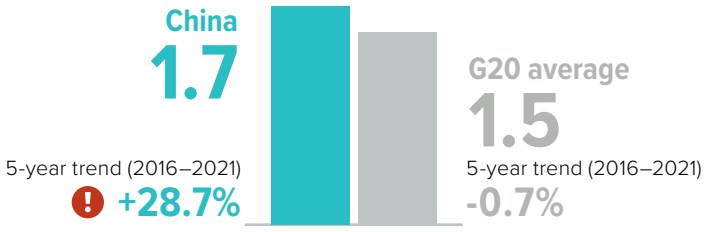
3.9% Direct **15.1%** Indirect

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.

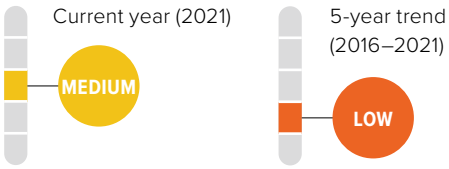
Climate Action Tracker, 2020; Rogelj et al., 2018

Buildings sector emissions per capita

incl. indirect emissions (tCO_2/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.). In contrast to the 0.7% decline in the G20 average, the emission as intensity of the buildings sector in China has increased at a rate of 29% between 2016–2021. This reflects the continued dependence on fossil fuels in the primary energy mix and rapid urbanisation.

Enerdata, 2022; World Bank, 2022

POLICY ASSESSMENT

Near zero energy new buildings

China has a multi-pronged policy approach to near zero energy new buildings. For instance, China's LTS states that by 2025, 100% of new urban buildings will implement green building standards and that renewables will account for 8% of the alternative to conventional energy used in buildings. Further, rooftop photovoltaic coverage of new public buildings and factories will reach 50%. China's NDC states that as of 2019 green buildings represented 65% of the newly constructed urban civil buildings and that the cumulative area of urban green buildings exceeded 5bn m².

Climate Action Tracker, 2022; People's Republic of China, 2021a, 2021b

Renovation of existing buildings

China's Ministry of Housing and Urban-Rural Development (MoHURD) has sought to steadily increase the energy performance of existing buildings. By the end of the 12th Five-Year Plan (2011–2015), 990m m² of floor space had been retrofitted in North China and another 70.9m m² in other regions. Under the 13th Five-Year Plan (2016–2020), the goal was to retrofit an additional 500m m² and finish retrofits in North China. It is unclear whether this goal has been reached, but the overall energy intensity of urban heating has decreased from 17 kg to 14.6 kg of standard coal per m² between 2015 and 2019.

People's Republic of China, 2021a; Zhou et al., 2020

INDUSTRY SECTOR

Emissions from energy use in industry

Direct emissions and indirect emissions from industry in China make up 25% and 29% of energy-related CO_2 emissions respectively. In 2018, industry emissions intensity was 1.3 $kgCO_2$/USD, almost double the G20 average of 0.7 $kgCO_2$/USD; however, China has set a target to reduce CO_2 intensity of GDP by 18% over the 14th Five-Year Plan (2021–2025) period.

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

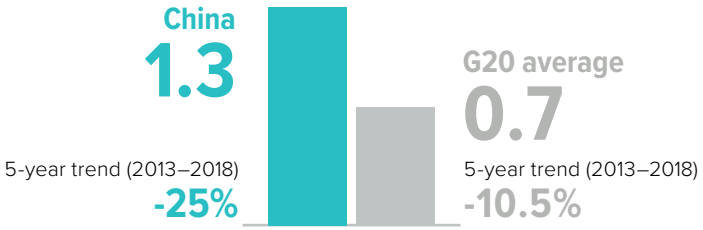
Rogelj et al., 2018

Industry sector's share of energy-related CO_2 emissions in 2021:

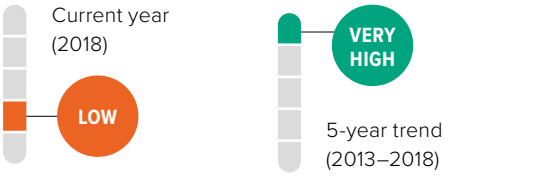
25% Direct **29.2%** Indirect

Industry emissions intensity[7]

($kgCO_2e$/USD2015 GVA) in 2018



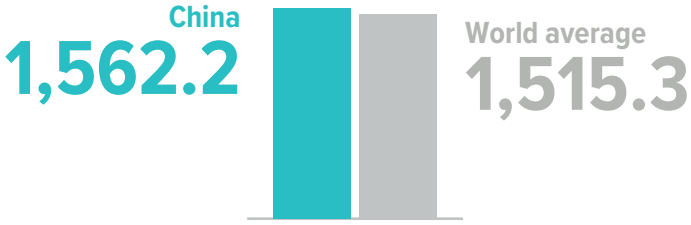
Decarbonisation: a high rating indicates more effort to decarbonise compared to other G20 Members



Enerdata, 2021; World Bank, 2022

Carbon intensity of steel production[8]

($kgCO_2$/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

In 2018, 75% of China's industrial sector was covered under mandatory energy efficiency policies. Still, around 70% of the country's coal consumption goes to direct energy use in the sector. Steel, aluminium, and cement, three key emitting sub-sectors. The 14th Five-Year Plan sets a target for 18% reduction in carbon intensity (GDP) and 13.5% reduction in energy intensity over the 2021–2025 period. The government has recently released its Action Plan for Carbon Dioxide Peaking Before 2030.

China Dialogue, 2022; IEA, 2021c; Liu et al., 2021; Ministry of Industry and Information Technology et al., 2022; Xinhua, 2021a; Y. Xue, 2022

LAND USE SECTOR

Emissions from land use change and forestry

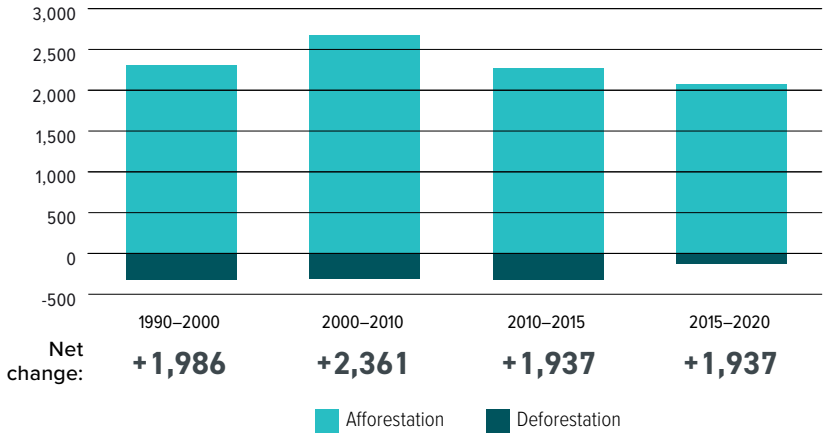
To stay within the 1.5°C limit, China needs to ensure that its land use and forestry sector continues to constitute a net sink of emissions, e.g., by converting farmlands to forests, restoring degraded forests and discontinuing further degradation.

Global deforestation needs to be halted and changed to net CO_2 removals by around 2030.

Rogelj et al., 2018

Annual forest expansion, deforestation and net change

Forest area change in 1,000 ha/year

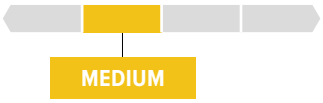


Between 2015–2020, China gained 1,937 kha of forest area per year. The increased forest cover in China is due to both regeneration of natural forests and through reforestation and afforestation occurring in planted forests.

Global Forest Assessment, 2020

POLICY ASSESSMENT

Target for net zero deforestation



China's NDC includes a target to increase forest stock by 6bn m³ by 2030 compared to 2005 levels. This would result in a total forest stock volume of around 19bn m³ by 2030 and represent around a 1.5bn m³ increase from 2014–2018 levels. The Action Plan for Carbon Dioxide Peaking Before 2030 targets forest coverage of around 25% of the country's total land area by 2030, up from around 23% in 2018. At COP26, China signed the forestry pledge to end deforestation by 2030.

Climate Action Tracker, 2022; National Forestry and Grassland Administration, 2019; Xinhua, 2021b

AGRICULTURE SECTOR

Emissions from agriculture

China's agricultural emissions are produced by the digestive processes of livestock, use of synthetic fertilisers, cultivation of rice, and the manure of livestock.

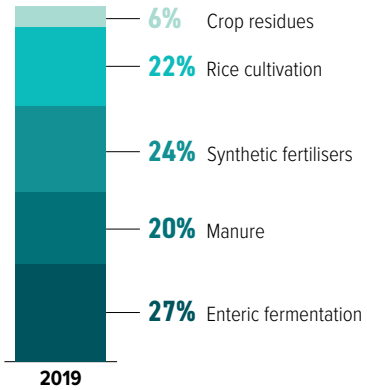
Methane emissions need to decline by 10% by 2030 and by 35% by 2050 (from 2010 levels). Nitrous oxide emissions (mainly from fertilisers and manure) need to be reduced by 10% by 2030 and by 20% by 2050 (from 2010 levels).

Rogelj et al., 2018

Emissions from agriculture

excluding energy emissions, in 2019

669
$MtCO_2e$ in 2019



In China, enteric fermentation (27%), use of synthetic fertilisers (24%), rice cultivation (22%) and manure (20%), are the four largest sources of GHG emissions in the agriculture sector. Adapting and improving the diets of animals, reducing or more efficiently using synthetic fertilisers, switching to farming techniques that facilitate soil carbon sequestration, improving manure storage and handling, and continuing efforts to reduce 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

- Peak CO_2 emissions before 2030 and achieve carbon neutrality before 2060.
- Non-fossil fuel share in primary energy use: ~ 25% by 2030.
- Forest stock: ~6bn m³ increase over 2005 levels by 2030.
- Increase wind and solar capacity to 1,200 GW by 2030.
- Carbon intensity of GDP: over 65% below 2005 by 2030 (the role of LULUCF is unclear).

ACTIONS

Planned in industry, buildings, transport, forestry, waste, agriculture sectors.

Climate Action Tracker (CAT) evaluation of targets and actions

Critically insufficient	**Highly insufficient**	Insufficient	Almost sufficient	1.5°C Paris Agreement compatible

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 gives China an overall rating of "highly insufficient".

China's climate commitments in 2030 are also rated as "highly insufficient" as emissions levels expected under the most binding peaking NDC targets are compatible with warming levels of between 3°C and 4°C by the end of the century, if all countries followed this ambition.

To improve on its rating and become compatible with the Paris Agreement's 1.5°C limit, China would need to reduce emissions as early as possible and well before 2030, decrease coal and other fossil fuel consumption at a much faster rate than currently planned, and set clear phase-out timelines.

This CAT analysis was updated in May 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	Submitted to UNFCCC, last update in 2021
Net zero target	"Carbon neutrality" before 2060
Interim steps	Peak carbon dioxide emissions before 2030
Sectoral targets	Yes

FINANCE

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

In 2020, China spent USD 28bn on fossil fuel subsidies, 87% on petroleum. A nation-wide ETS was implemented in 2021 covering the power sector and around 40% of the country's emissions. However, the resulting carbon price remains low, with allowances traded at an average of USD 9/tonne so far in 2022 (compared to USD 90/tonne for the EU-ETS).

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

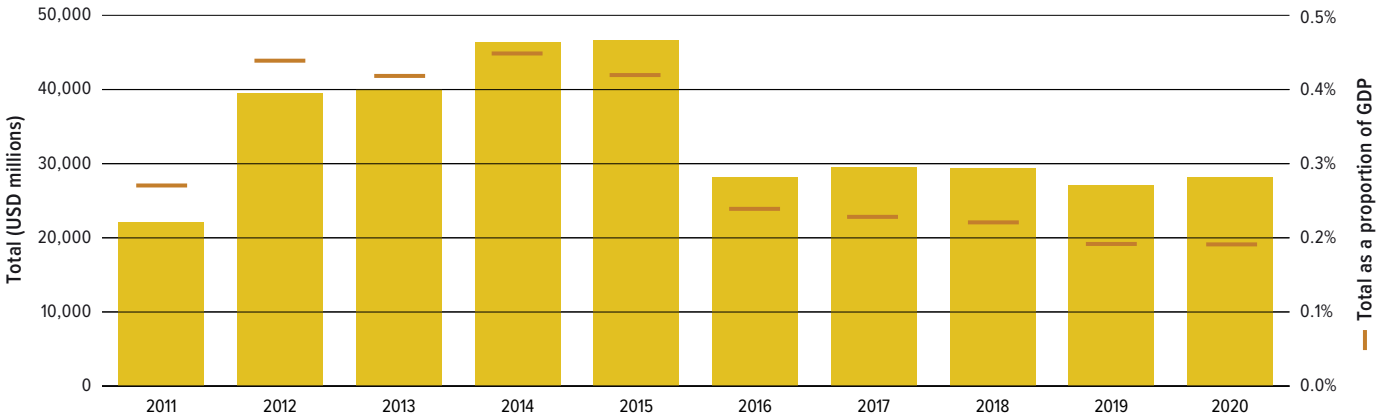
Rogelj et al., 2018

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

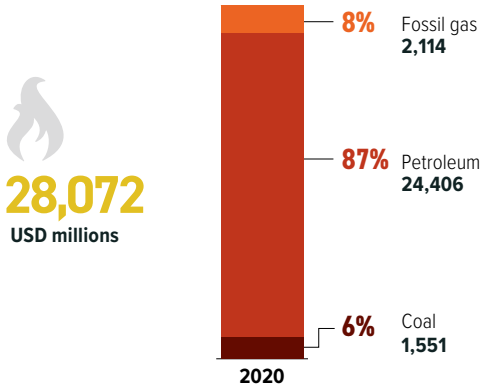
(USD millions)



OECD-IEA Fossil Fuel Support Database, 2022

Fossil fuel subsidies by fuel type

(USD millions) in 2020



Subsidies to fossil fuels in China have remained steady since a drop in 2016, at USD 28bn in 2020. Of this support, 84% was directed at consumption, and the remainder to production. Subsidies to petroleum accounted for USD 24.4bn, while fossil gas and coal received the rest.

By far the largest subsidy measures have been the Petroleum Fuels Price-Reform Support Programmes for "professional" users of fuel -- passenger transport in urban and rural areas, users in the forestry and fisheries sectors. This support / subsidy was introduced as a buffer against the 2009 petroleum price reforms and was slated to be tapered off from 2014 to 2020, with future steps to be decided after 2020. The data, however, indicates that while gasoline (excl. biofuels) subsidies ended in 2015; natural gas / diesel (excl. biofuels) subsidies were reduced by more than a half from their 2015 highs, but did not decline to zero by 2020.

In June 2022, the government announced that it would offer subsidies to oil refineries if global oil prices consistently exceeded USD 130 a barrel for two consecutive months, and further announcements would follow as international market prices were tracked.

Energy Policy Tracker, 2022; Ministry of Finance, National Development and Reform Commission, 2022; OECD-IEA Fossil Fuel Support Database, 2022; Reuters, 2022a

Carbon pricing and revenue

China has been working on the implementation of its national ETS since its official announcement in December 2017. The mechanism was launched in July 2021, with a transition phase during which the pilot regional mechanisms will cease coverage of the power generation sector and the latter will become part of the national mechanism. The mechanism made little progress during 2021, as the country grappled with the management of the COVID-19 crisis. No auctioning of allowances took place at a national level, and only the secondary market was active, with an average settlement price of USD 7/tCO_2. The mentioned subnational pilot schemes deployed in nine cities and provinces since 2013 covering various sectors priced emissions between USD 2–10/tCO_2e. Revenue estimates resulting from these schemes are only available for a few jurisdictions.

I4CE, 2022; Reuters, 2021

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.

China is taking steps to green its financial system. From February 2022, it has implemented mandatory environmental disclosure for companies that include some climate measures – notably carbon emissions. Financial institutions will face mandatory environmental disclosure nationwide (it is already compulsory in Shenzhen) in 2025. However, it is not clear what climate disclosures are to be included in the requirements, and they do not extend to Scope 3 emissions.

An executive decision was passed in 2022, stating that by 2030 China will update its financial policy framework, using tools like carbon and pollution trading, to achieve its carbon neutrality goals. The first step is to be achieved by 2025, and this will include enriched fiscal policy tools and a national tax policy framework.

The People's Bank of China completed climate stress tests of 23 major banks in 2021 to explore the climate-risks faced by the thermal power, steel and cement sectors. Reported in 2022, these tests concluded that these sectors faced stranded assets and other transition risks if they did not carry out low-carbon transformation.

China's Green Bonds Endorsed Catalogue, updated in April 2021 to exclude fossil fuel production and consumption projects, provides a list of agreed 'green' activities comparable to the EU Sustainable Finance Taxonomy.

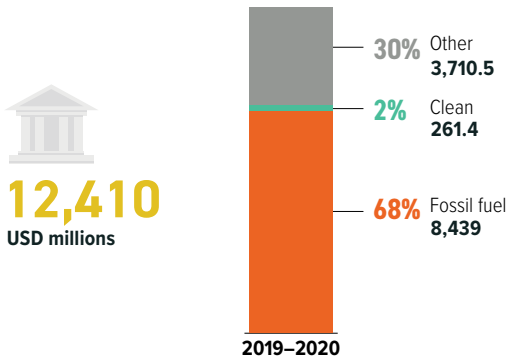
Climate Bonds Initiative, 2021; Fu, 2022; Grantham Research Institute, 2022; Reuters, 2022b

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 and 2020 China provided an average of over USD 12bn per year in public finance to energy projects. Two-thirds of this went to fossil fuels – of which 60% went to gas and 40% to coal projects. USD 2.8bn was loaned to Russia's state-owned energy group, Gazprom, to develop the Amur gas processing plant. Gas pipelines in Nigeria and a coal plant in Vietnam were the next two biggest recipients of Chinese public finance. The largest non-fossil fuel project to receive financing (USD 1.8bn) was intended to develop Ethiopia's electricity transmission and distribution network. The China Development Bank and the Export-Import Bank of China provided most of China's public finance for energy.

Oil Change International, 2022

Provision of international public support

China is not listed in Annex II of the UNFCCC and is not formally obliged to provide climate finance and, therefore, while it may channel international public finance towards climate change via multilateral and other development banks, it has not been included in this report.

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 us	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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