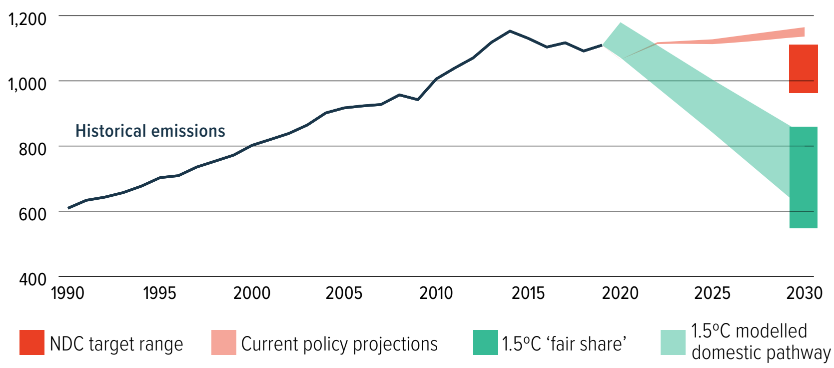
BRAZIL

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]

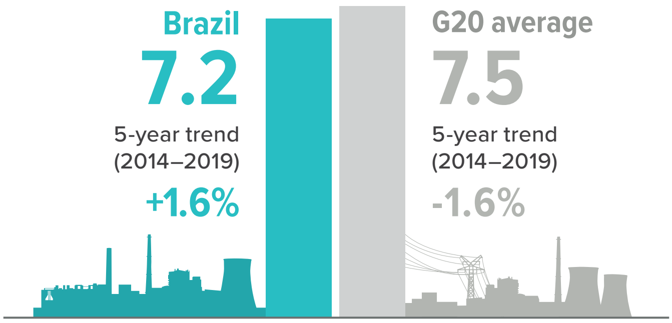


Brazil's updated NDC target would increase emissions 58% above 1990 levels, or to approximately 962 $MtCO_2e$ (excl. LULUCF). To keep below the 1.5°C temperature limit, analysis by the 1.5°C Pathways Explorer shows that its emissions would need to be around 668 $MtCO_2e$ by 2030, leaving an ambition gap of about 294 $MtCO_2e$. When compared with its 1.5°C 'fair share' contribution, Brazil would need to ensure it achieved reductions in line with the bottom of its 2030 NDC range.

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

PER CAPITA GREENHOUSE GAS (GHG) EMISSIONS BELOW G20 AVERAGE

tCO_2e/capita[2] in 2019



Brazil's per capita emissions are 0.96 times the G20 average. Total per capita emissions have increased by 1.58% from 2014 to 2019.

Gütschow et al., 2021; World Bank, 2022

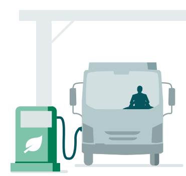
RECENT DEVELOPMENTS

- Investments in fossil fuels are continuing to increase in line with its energy growth plan.
- Despite committing to achieving zero deforestation by 2028 at COP26, deforestation in the Amazon region continues to increase, and is at the highest level since 2006.
- In April 2022 the federal government published a decree creating the national GHG emissions reduction system to support a future carbon market in Brazil.

KEY OPPORTUNITIES FOR ENHANCING CLIMATE AMBITION

Diversification of renewable sources should be prioritised to avoid over-reliance on hydroelectric production, which is increasingly affected by droughts.

Strong policies must be enacted and practical, tangible actions must be taken to rapidly reduce deforestation in Brazil.



Brazil needs to promote energy efficiency in industry and transport, focusing in the short-term on the electrification of public transportation.

Contents

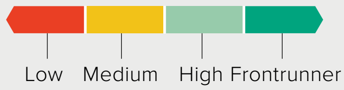
We unpack Brazil's progress and highlight key opportunities to enhance climate action across:

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

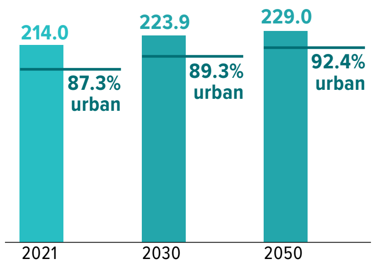
Human Development Index

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

Data for 2019. UNDP, 2020

Population and urbanisation projections

(in millions)



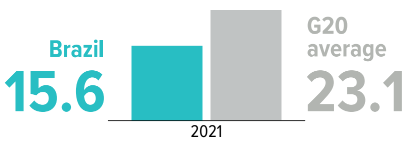
Brazil's population is projected to increase by 7% by 2050 and become more urbanised.

Population growth will lead to an increase in emissions from the transport, waste, and building sectors if no mitigation measures are implemented in these sectors.

United Nations, 2018; World Bank, 2022

Gross Domestic Product (GDP) per capita

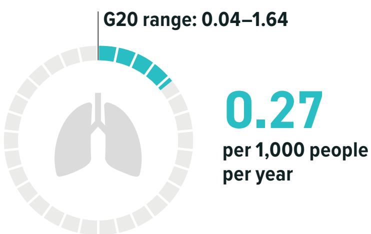
(thousand PPP constant 2015 international $ per person) in 2021



World Bank, 2021

Death rate attributable to ambient air pollution

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



Over 60,900 people die in Brazil 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

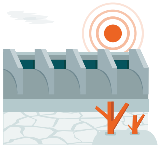
In the past years, the Bolsonaro administration has shown weak commitment to climate action. The freezing of resources from Brazil's climate fund has resulted in the loss of green jobs. Emissions have continued to increase, especially from deforestation, and in those areas of the Amazon where indigenous land is supposed to be protected, violence has arisen.

In October 2022 presidential elections will be held; the outcome could change the course of current weak policy action on climate change.

Fragoso et al., 2021; Government of Brazil, 2022

ADAPTATION

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



Brazil has experienced droughts that affect hydroelectric production; the diversification of renewable sources should be prioritised in energy security.

Sea level rise along its extensive coastline (over 7,400 km) threatens over half Brazil's population, as well as its protective mangrove forests, and is increasingly impacting ecosystems and infrastructure.

Across Brazil, **floods and landslides prompted by intense rainfall cause death, displacement and destruction**, which particularly affect the urban poor.

ADAPTATION NEEDS

Impacts of a changing climate

Exposure to warming

0.3°C
Higher

Between 2017 to 2021, the average summer temperatures experienced by people in Brazil were 0.3°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

5.3bn **Labour hours lost**
12% **decrease**

In 2021, heat exposure in Brazil led to the loss of 5.3 billion potential labour hours, a 12% decrease from 1990–1999.

Loss of earnings from heat-related labour capacity reduction

11.17bn **Loss in labour capacity (USD)**
0.7% **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 11.17bn, or 0.7% 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**: -0.9% at 1.5°C warming	1.3 times	1.1 times	2.1 times

In Brazil, local precipitation is projected to decrease by 0.9% below the average over the baseline period of 1986–2005, at 1.5°C warming. Under a 3°C warming scenario, precipitation is projected to decrease 2 times the decrease under 1.5°C warming.

Fresh water	At 2°C	At 2.5°C	At 3°C
Surface run-off: +3.3% at 1.5°C warming	0.9 times	1.5 times	1.2 times
River discharge: -1.8% at 1.5°C warming	2.8 times	0.4 times	1 time
Total **soil moisture content:** -1.6% at 1.5°C warming	1.4 times	1.4 times	1.6 times

In Brazil, the percentage of surface run-off is projected to increase 3.3% from the average over the baseline period of 1986–2006, under 1.5°C warming conditions; while river discharge and soil moisture content are projected to decrease 1.8% and 1.6%, respectively. At 2.5°C warming, surface run-off is projected to be 1.5 times higher than the run-off at 1.5°C, whereas soil moisture content at 3°C warming is projected to be a 1.6 times greater decrease. River discharge projections fluctuate widely – from a decrease of nearly 3 times the 1.5°C warming's decrease (of 1.8%) at 2°C warming, dipping dramatically at 2.5°C warming, until settling at roughly the same projected discharge levels at 3°C warming as at 1.5°C warming. These kinds of swings make it very difficult for authorities to plan and implement appropriate responses.

Agriculture	At 2°C	At 2.5°C	At 3°C
Reduction in **maize yield**: -1.2% at 1.5°C warming	2.7 times	2.3 times	7 times

Agriculture yields tend to decrease as the temperature increases. For example, maize yield is expected to decrease by 1.2% at 1.5°C of warming. This loss would be 2.3 times greater at 2.5°C warming and 7 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:** 20,188,757 at 1.5°C warming	1.5 times	1.8 times	2.2 times
Number of people annually exposed to **crop failures**: 152,107 at 1.5°C warming	2.5 times	4.8 times	9 times
Number of people annually exposed to **wildfires:** 285,806 at 1.5°C warming	1.4 times	1.6 times	1.8 times

The increases in the number of people annually exposed to hazards that follow are relative to the people affected during the 1986–2006 reference period. For example, the number of people annually exposed to heatwaves in Brazil is projected to be approximately 20 million at 1.5°C of warming, and over double that if warming increases to 3°C. It is projected that over 150,000 people would be exposed to crop failures annually at 1.5°C of warming, with this number escalating sharply – by 9 times – at a 3°C warming projection. The number of people annually exposed to wildfires is projected to be over 280,000 people at 1.5°C of warming and nearly twice that (1.8 times) at 3°C projected warming.

Economic	At 2°C	At 2.5°C	At 3°C
Annual expected damage from **river flood:** +12.9% at 1.5°C warming	1.6 times	4 times	6.4 times
Labour productivity due to heat stress: -4.3% at 1.5°C warming	1.6 times	2.2 times	2.8 times

The annual expected damage from river flooding at 3°C is 6.4 times the projected damage at 1.5°C warming scenario. The labour productivity is projected to decline 4.3% under a 1.5°C of warming scenario, and this decrease would be 2.8 times larger at 3°C of warming and 2.2 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	Water	
National Plan on Climate Change Adaptation	2016	✓	✓	✓		✓		✓	✓	✓		✓	✓	✓	4-year cycles for its implementation and a review exercise in the last year of each cycle. The first implementation period lasted from 2016 to 2020.
The first communication of Adaptation included in 2022 NDC update	2022	✓				✓				✓			✓	✓	AdaptaBrasil system

Nationally Determined Contribution (NDC): Adaptation

TARGETS

Reducing vulnerability in terms of water, energy, food, social and environmental security, thus potentially generating synergies with the implementation of the 2030 Agenda.

ACTIONS

Based on the second cycle of the National Adaptation Plan (NAP):

- strengthening the management of water resources
- diversification of energy sources
- the development of adaptation strategies in the agricultural sector with a view to ensuring food security
- adaptation plans for the urban landscape to ensure the resilience of the population and infrastructure

MITIGATION

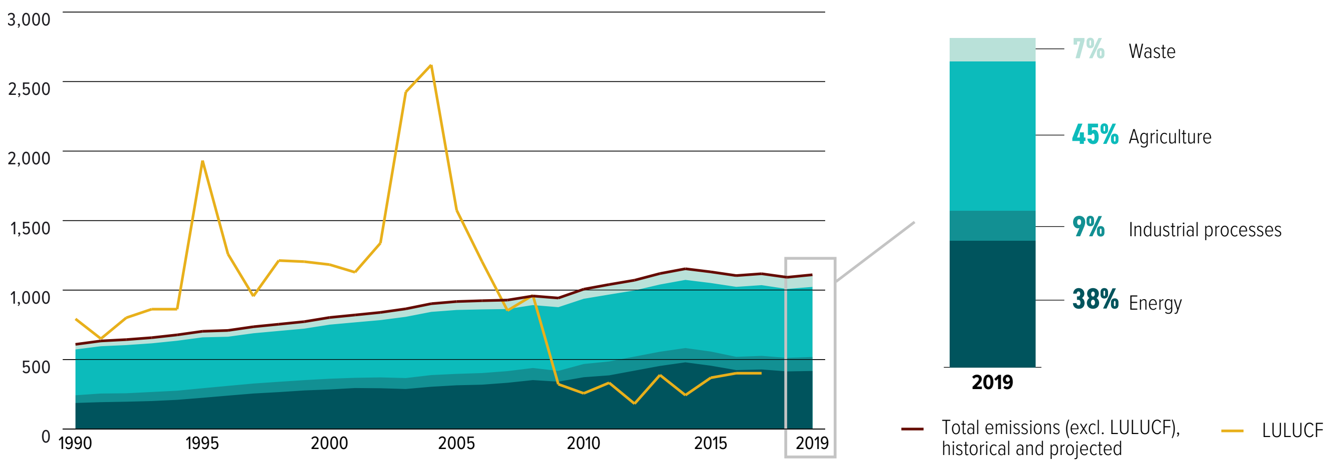
Paris Agreement: Hold the increase in the global average temperature to well below 2°C above pre-industrial levels and pursue efforts to limit to 1.5°C, recognising that this would significantly reduce the risks and impacts of climate change.

EMISSIONS OVERVIEW

Brazil's total **greenhouse gas emissions (excl. LULUCF) have increased by 82.2%** (1990–2019). In the same period, its total methane emissions (excl. LULUCF) have increased by 51%.

GHG emissions across sectors[5]

Total sectoral GHG emissions ($MtCO_2e$/year)

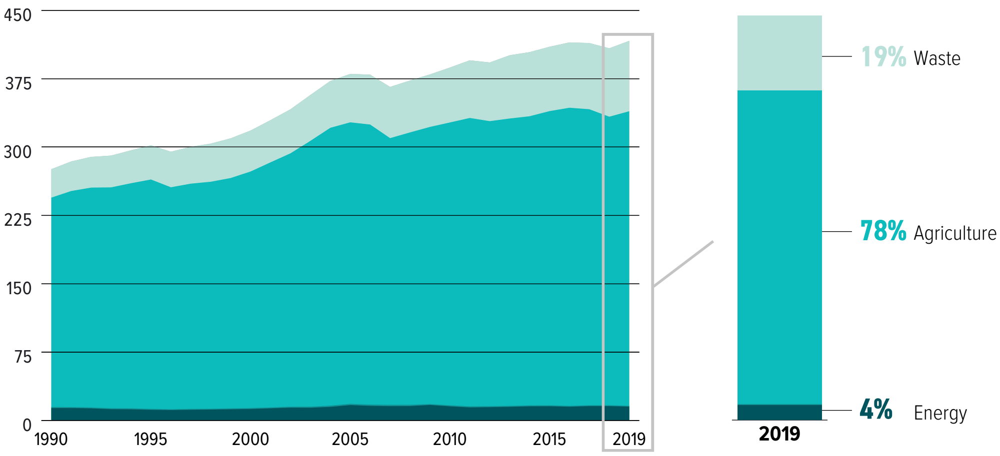


Brazil's GHG emissions (excl. LULUCF) increased by 82.2% between 1990 and 2019 to 1,110 $MtCO_2e$/yr. Increases were largely due to a sustained increase in agriculture and energy-related emissions, but growth in emissions was seen in all sectors over the same timeframe. Estimates of 2020 emissions from Brazil's GHG Inventory show an overall increase from 2019 to 1,678 $MtCO_2e$ (incl. LULUCF), largely due to deforestation. While energy (23%); agriculture (29%); and waste sector emissions (4%) decreased, emissions from LULUCF (38%) and industrial processes (6%) increased.

Gütschow et al., 2021; MCTI, 2022

Methane emissions by sector

Total CH_4 emissions ($MtCO_2e$/year)



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

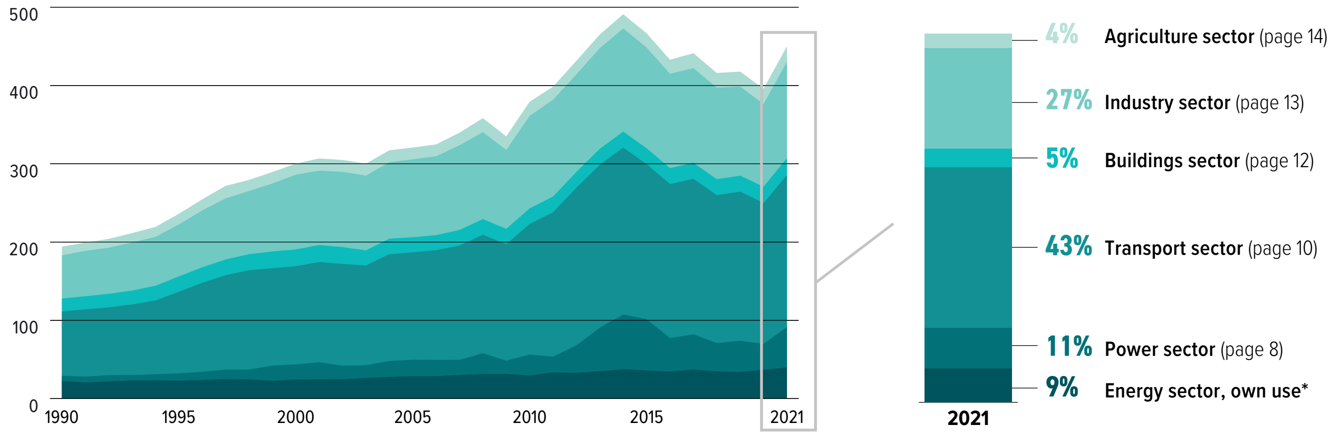
Participating countries pledged to undertake voluntary actions to contribute to a collective reduction of global methane emissions by at least 30% from 2020 levels by 2030. Further scrutiny of plans and implementation will be required.

Methane is a potent, though short-lived, greenhouse gas, accounting for an estimated third of global warming. Brazil's methane emissions (excl. LULUCF) increased by 51% between 1990 and 2019, to 417 MtCO2e/yr. Agriculture has been, and remains, the dominant methane-producing sector in the country. The waste sector has increased slowly but steadily, from 11% in 1990 to 19% in 2019. Energy and industry sector emissions, by contrast, are minimal, and trend downward. The government unveiled its Programa Metano Zero in March 2022, with measures for the waste, industry, and energy sectors; however, no actions were oulined for the important agriculture sector.

Climate and Clean Air Coalition, 2021; Gütschow et al., 2021; Ministério do Meio Ambiente, 2022

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. In Brazil, the emissions have been increasing since 1990 and peaked in 2014. At 43%, the transport sector is the largest contributor, followed by the industry sector, and electricity production with 27.4% and 11.5%, respectively. Emissions fluctuations in the transport sector are due to mitigation measures such as the use of biofuels. In addition, the economic impact of COVID-19 response measures temporarily suppressed emissions from industry and transport sectors.

Enerdata, 2022

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

ENERGY OVERVIEW

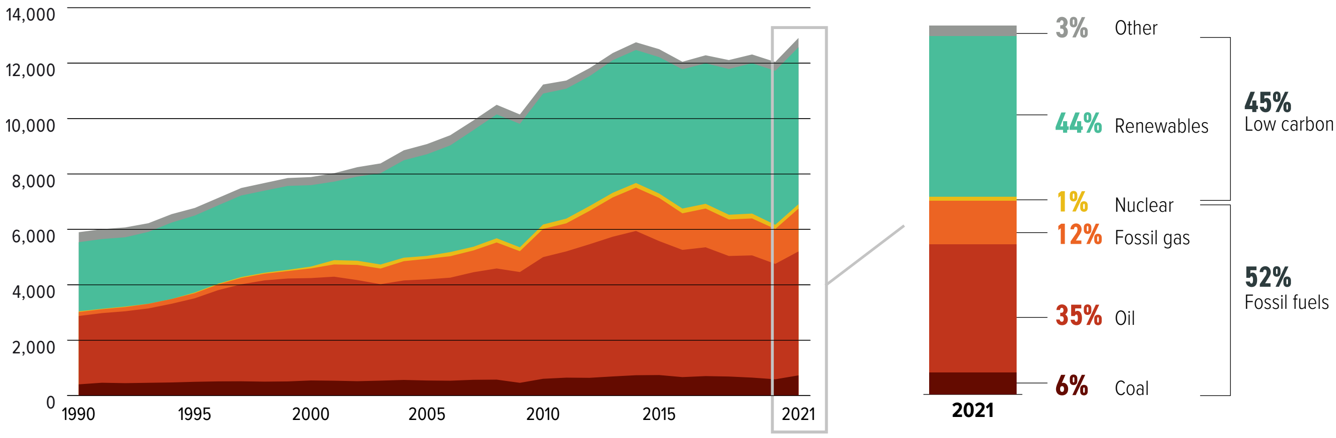
Renewable sources meet 44% of the total primary energy supply. This is significantly higher than the 11% average of G20 Members. Despite the high availability of renewable energy, fossil fuels are still the most widely used source, accounting for 52% of TPES, with oil dominating (35%) other fossil fuels.

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)

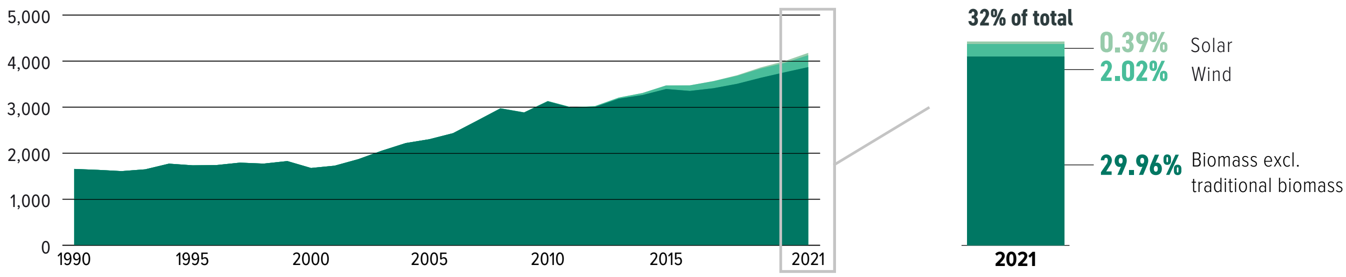


This graph shows the fuel mix for all energy supply, including energy used not only for electricity generation, heating and cooking, but also for transport fuels. Fossil fuels (oil, coal, and gas) make up 52% of Brazil's energy mix, which is lower than the G20 average. Since 2015, energy supply has plateaued, with minor fluctuations brought about by increases in the supply of renewable energy and fossil gas.

Enerdata, 2022

Solar, wind, geothermal and biomass development

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

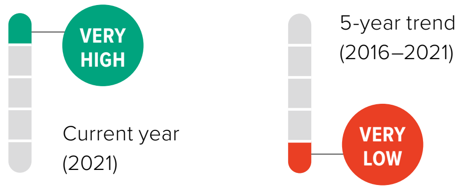


Solar, wind, geothermal and biomass excluding traditional biomass account for 32% of Brazil's energy supply – the G20 average is 7.5%. The share in total energy supply has increased by around 12% in the last 5 years in Brazil (2016–2021). Biomass (for electricity and heat) makes up the largest share.

Enerdata, 2022

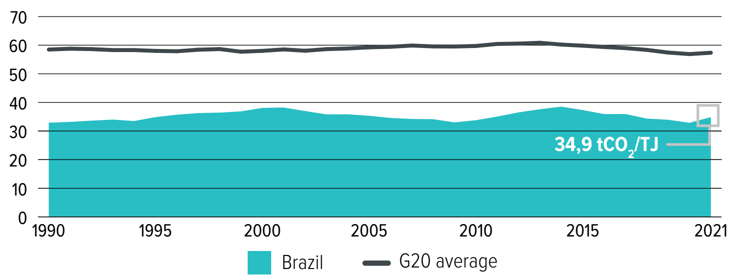
Note: Large hydropower and solid fuel biomass in residential use are not reflected due to their negative environmental and social impacts.

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

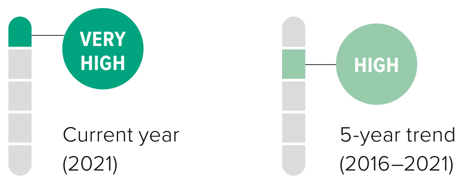


Carbon intensity of the energy sector

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



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

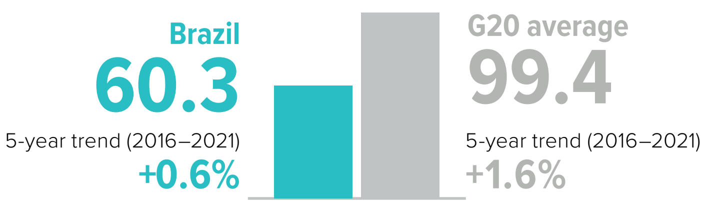


Carbon intensity is a measure of how much CO_2 is emitted per unit of energy supply. The emissions intensity of Brazil's energy sector is 34.87 tCO_2/TJ, well below the G20 average of 57.4 tCO_2/TJ. Brazil's carbon intensity decreased almost 6% between 2016–2021, but then began to rebound. The increase in intensity from 2021 can be attributed to the limited rainfall in the previous years, leading to scarce water resources in the reservoirs of the main hydropower plants and the need to rely more heavily on fossil fuel sources for energy instead.

Enerdata, 2022

Energy supply per capita

TPES per capita (GJ/capita) in 2021

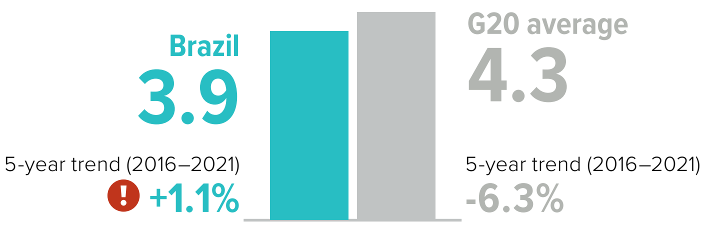


The level of energy supply per capita is closely related to economic development, climatic conditions and the price of energy. Energy supply per capita in Brazil was 60.3 GJ in 2021, or just over 60% of the G20 average. Brazil's energy supply is lower than the G20 average and has been increasing at a slower rate (0.6% from 2016–2021) as compared to the G20.

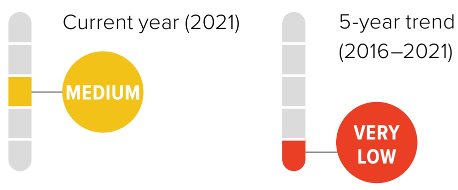
Enerdata, 2022; World Bank, 2022

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. Brazil's economy's energy intensity is lower than the G20 average, but it has been increasing while the G20 average has been decreasing.

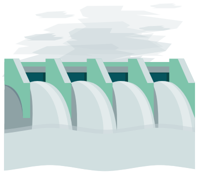
Enerdata, 2022; World Bank, 2021

POWER SECTOR

Emissions from energy used to make electricity and heat

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

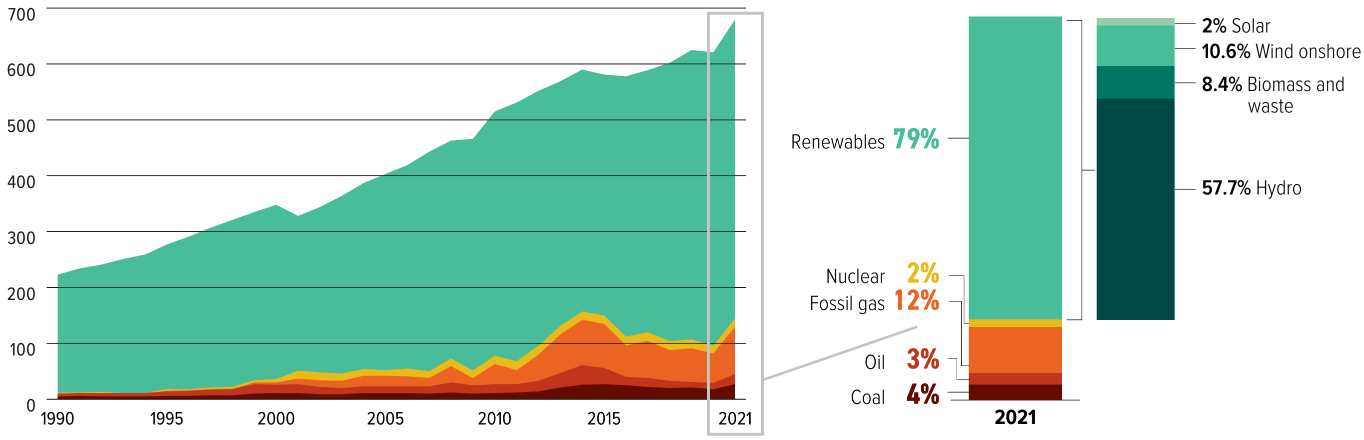


In Brazil, the **main source of power generation is hydropower**, which accounts for 58% of the country's installed capacity, followed by fossil gas at 12%.

Power generation's share of energy-related CO_2 emissions in 2021: **11%** Direct

Electricity generation mix

Gross power generation (TWh)

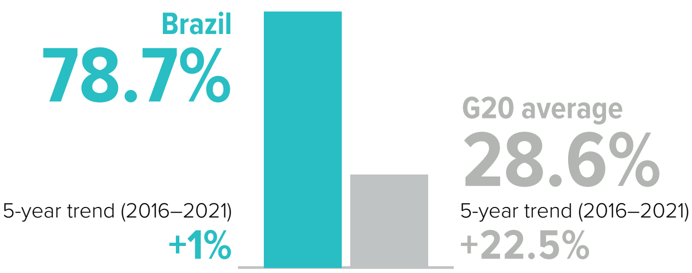


Brazil generated 79% of its electricity from renewables, with hydropower dominating renewable energy. Of the fossil fuels, fossil gas use has been increasing steadily, as has use of coal, albeit from a much lower starting point. Together, fossil fuels generate 19% of Brazil's electricity. Demand for power is expected to increase due to population growth, rising urbanisation, and the expanding economy, and the government plans to meet this demand by investing in more fossil fuel power generation.

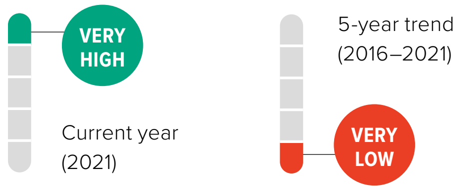
Enerdata, 2022

Share of renewables in power generation

(incl. large hydro) in 2021



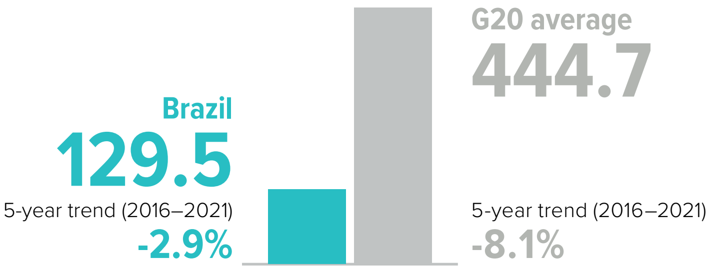
Decarbonisation: a high rating indicates more effort to decarbonise compared to other G20 Members

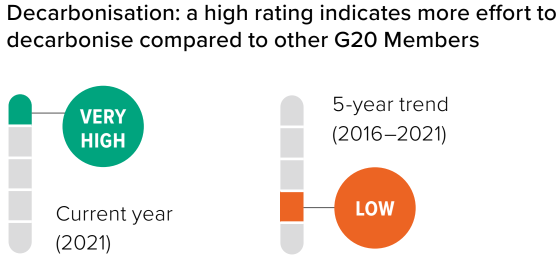


Enerdata, 2022

Emissions intensity of the power sector

(gCO_2/kWh) in 2021



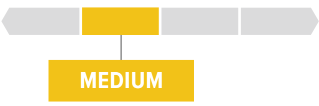


For each kilowatt hour of electricity, 129.5 g of CO_2 are emitted in Brazil in 2021. The emissions intensity trend over the 5 years between 2016–2021 has decreased 2.9%, mainly due to the increase of renewable energy from large hydro, wind and biomass.

Enerdata, 2022

POLICY ASSESSMENT

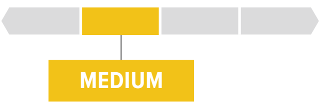
Renewable energy in the power sector



The latest Ten-Year Energy Expansion Plan or Plano Decenal de Expansão de Energia 2031 (PDE 2031) outlines the growth prospects of the power sector. The share of renewable energy is expected to increase 39%, but the use of fossil gas is also expected to increase significantly to 34% by 2031. Solar power is expected to grow by 320% and wind power by 72% from 2021–2031.

Ministério de Minas e Energia & Empresa de Pesquisa Energética, 2022

Coal phase-out in the power sector



According to the PDE 2031, coal use in the power sector will decrease by about 33%, from 9 TWh in 2021 to 6 TWh in 2031. Brazil does not have a coal phase-out plan.

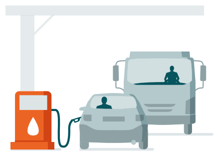
Ministério de Minas e Energia & Empresa de Pesquisa Energética, 2022

TRANSPORT SECTOR

Emissions from energy used to transport goods and people

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

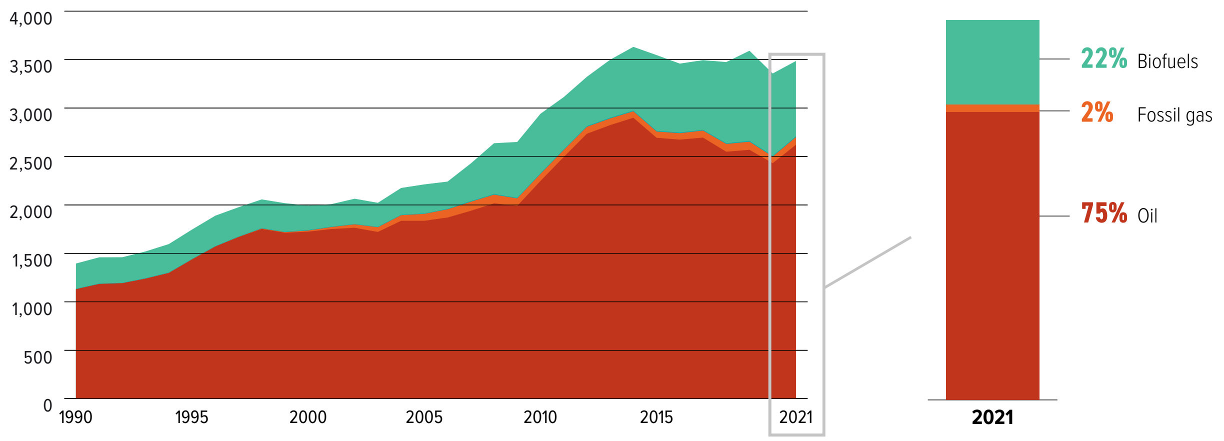


Emissions from transport are still on the rise. 92% of passenger mobility and 59% of freight transport was by road in 2017. Both sectors are still dominated by fossil fuels, and electric vehicles (EVs) make up only 0.46% of car sales; therefore, indirect emissions are negligible.

Transport's share of energy-related CO_2 emissions in 2021: **43.1%** Direct

Transport energy mix

Final energy consumption by source (PJ/year)

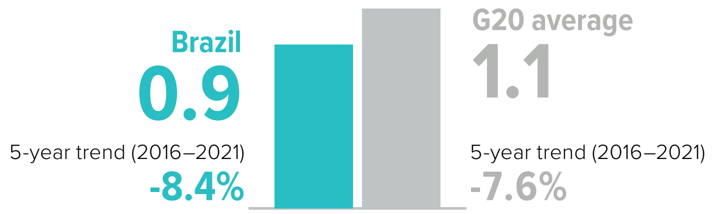


Electricity and biofuels make up 22% of the energy mix in transport.

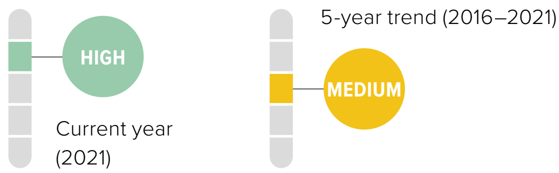
Enerdata, 2022

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

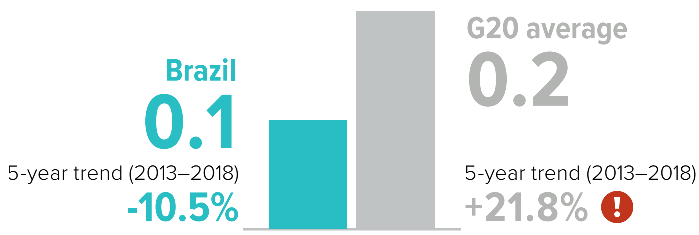


Per capita emissions in 2021 and the 5-year trend have been impacted by COVID-19 pandemic response measures and resulting economic slowdowns. For a discussion of broader trends in the G20 and the rebound of transport emissions in 2022, please see the Highlights Report at www.climate-transparency.org.

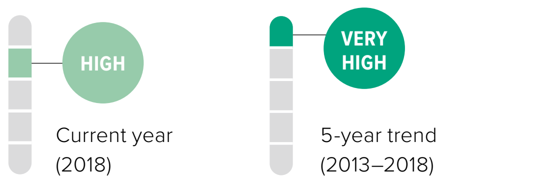
Enerdata, 2022; World Bank, 2022

Aviation emissions per capita[6]

(tCO_2/capita) in 2018

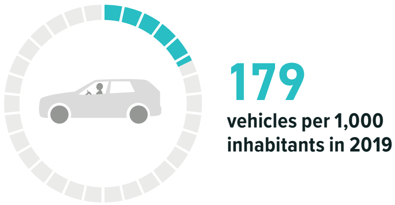


Decarbonisation: a high rating indicates more effort to decarbonise compared to other G20 Members



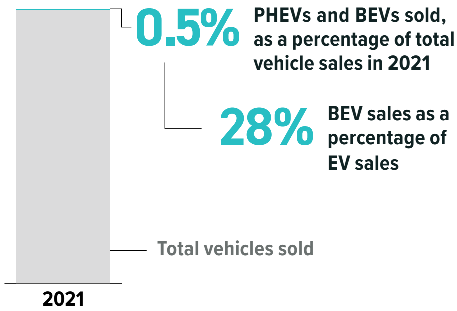
Enerdata, 2022; IEA, 2021; World Bank, 2022

Motorisation rate



Enerdata, 2022

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

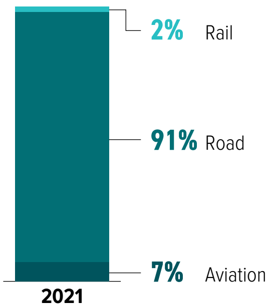


Battery-Electric Vehicles (BEVS) have greater emissions mitigation potential when they are powered by electricity produced by renewables because they have no internal combustion engine (ICE), whereas plug-in hybrids (PHEVs) still produce emissions when using the ICE.

IEA, 2022

Modal split passenger transport*

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

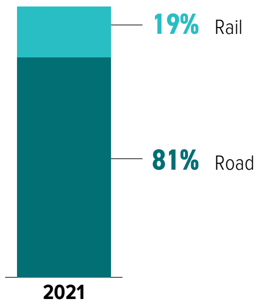


Goes et al., 2020

**These data are not necessarily comparable with data from other G20 Members.*

Modal split freight transport

(modal split in % of tonne-km)

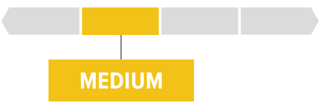


Due to data availability, only road and rail transport are included in the freight transport category. Other freight modes, e.g. waterways, are excluded due to lack of data for all countries.

Enerdata, 2022

POLICY ASSESSMENT

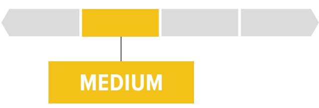
Phase out fossil fuel cars



Emissions from transport account for 43% of total energy-related CO_2 emissions. The main government policy to reduce the use of fossil fuels is RenovaBio, launched in 2016 and updated in 2022. Ethanol, mainly from sugar cane but also from corn, is the preferred biofuel for cars in Brazil. Promotion of incentives for EVs are still limited.

Ministério de Minas e Energia, 2019

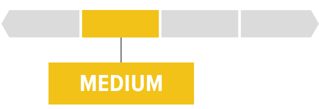
Phase out fossil fuel heavy-duty vehicles



The Rota 2030 emissions performance standards issued by Brazil in 2018 also apply to heavy-duty vehicles (HDVs) and freight transport, with mandatory reduction in fuel consumption of 8.6% compared to 2017 for trucks and vehicles up to 12 passengers. The government does not have any plans or policies to phase out fossil fuel HDVs.

Araujo, 2021

Modal shift in (ground) transport



Brazil has set goals to improve public transport infrastructure in its 2012 National Urban Mobility Policy, which requires cities with more than 20,000 inhabitants to develop an Urban Mobility Plan to support mass and non-motorised transport. Few of the over 3,000 Brazilian cities that fall under this requirement have developed their Urban Mobility Plans. The Plan for Logistics and Transportation (PLNT) aims to increase the share of freight transport on rail and waterways – rail freight to 32% and waterway freight to 32% by 2025.

Ministério da Infraestrutura e Empresa de Planejamento e Logística, 2021

BUILDINGS SECTOR

Emissions from energy used to build, heat and cool buildings

Direct emissions and indirect emissions from the buildings sector in Brazil account for 4.2% and 5% of total energy-related CO_2 emissions, respectively. **Per capita emissions from the buildings sector are 8 times lower the G20 average.**

Buildings sector's share of energy-related CO_2 emissions in 2021: **4.2%** Direct **5%** 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

Brazil
0.2
5-year trend (2016–2021)
-1.4%

G20 average
1.5
5-year trend (2016–2021)
-0.7%

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

VERY HIGH
Current year (2021)

MEDIUM
5-year trend (2016–2021)

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 nearly 8 times lower than the G20 average as of 2021. This reflects the low fossil fuel share of the electricity mix. In contrast to the G20 average, Brazil has decreased the level by 1.4%.

Enerdata, 2022; World Bank, 2022

POLICY ASSESSMENT

Near zero energy new buildings

LOW

There is no national level policy promoting near zero energy in new buildings. Most of the initiatives remain voluntary or with local government regulations.

Renovation of existing buildings

LOW

Brazil has not implemented any comprehensive national policy for the renovation of existing buildings to improve energy use or sustainable buildings standards.

INDUSTRY SECTOR

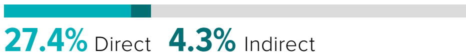
Emissions from energy use in industry

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

Rogelj et al., 2018

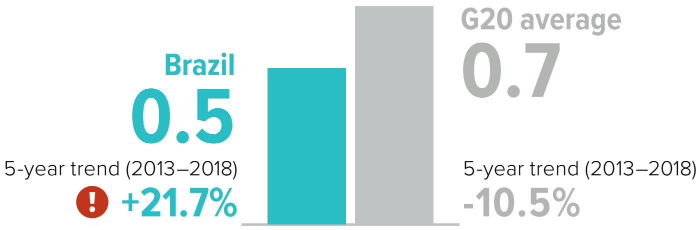
Direct emissions and indirect emissions from industry in Brazil make up 27.4% and 4.3% of energy-related CO_2 emissions, respectively. **Brazil lacks effective policies to increase energy efficiency** of the industry sector nor any effective policies to reduce emissions and to decarbonise the sector.

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

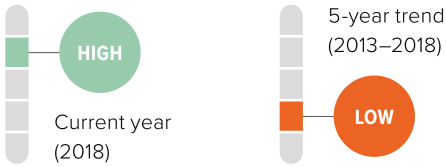


Industry emissions intensity[7]

($kgCO_2e$/USD2015 GVA) in 2018



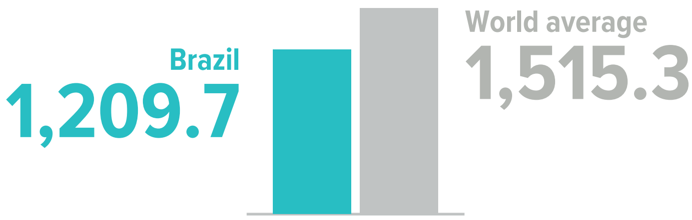
Decarbonisation: a high rating indicates more effort to decarbonise compared to other G20 Members



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

Brazil lacks effective policies to increase energy efficiency of the industry sector, nor any effective policies to reduce emissions and decarbonise the sector. Established by law N° 13,280/2016 Brazil has a National Electricity Conservation Programme (Procel), which promotes the rationalisation of consumption and reduces energy wastage.

Brazil has not updated its energy efficiency policies since its first National Energy Efficiency Plan in 2011, which outlined broad strategies but set few concrete targets for improving the country's energy efficiency. Most of the initiatives remain voluntary.

Agência Senado, 2016; Centro Brasileiro de Informação de Eficiência Energética, 2015

LAND USE SECTOR

Emissions from land use change and forestry

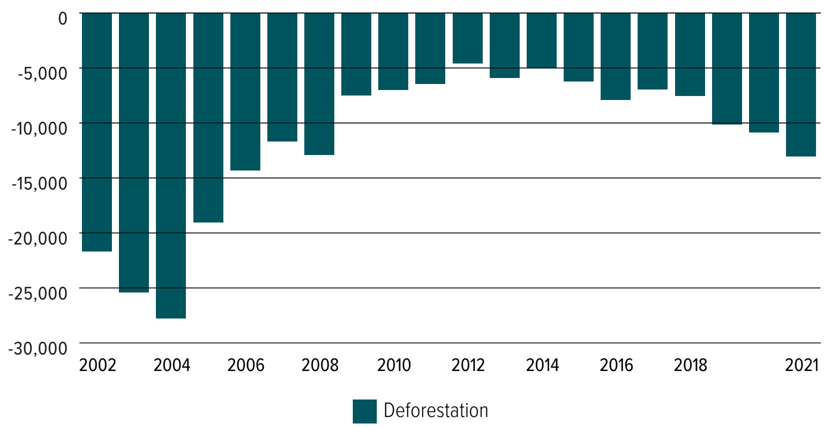
Global deforestation needs to be halted and changed to net CO_2 removals by around 2030.

Rogelj et al., 2018

To stay within the 1.5°C limit, Brazil needs to make the land use and forestry sector a net sink of emissions, e.g. by stopping deforestation, changing land use, and protecting the natural forest. **The policies implemented have proven to be ineffective as deforestation in the Amazon and Cerrado areas has increased significantly in the last few years.**

Annual tree-cover loss

Deforestation in km^2



In the decade between 2012 and 2021, Amazon deforestation has increased 185% — from a loss of 4,571 km^2 in 2012 to 13,038 km^2 in 2021.

Observação da Terra, INPE, 2022

POLICY ASSESSMENT

Target for net zero deforestation

In its most recent NDC update, Brazil pledged to eliminate illegal deforestation by 2028. On the ground, however, deforestation in 2021 (through to the middle of 2022) has reached highs not seen since 2006. Policy and enforcement efforts have not been sufficient, and resources from the climate fund have not been used for their intended purpose.

Government of Brazil, 2022

AGRICULTURE SECTOR

Emissions from agriculture

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).

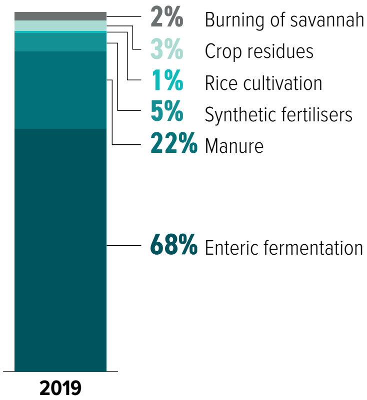
Rogelj et al., 2018

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

Emissions from agriculture

excluding energy emissions, in 2019

526
$MtCO_2e$ in 2019



In Brazil, the largest sources of GHG emissions in the agriculture sector are enteric fermentation at 68%, manure at 22%, and the application of synthetic fertilisers at 5%. Adapting livestock diets, improving manure storage and handling, and making dietary changes in favour of vegetables and fruits could 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 current 2030 targets** and even higher warming **2.7°C with current policies**.

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

AMBITION: 2030 TARGETS

Nationally Determined Contribution: Mitigation

Brazil's latest update in April 2022 increases the 2030 reduction target in terms of a percentage, as the base year was updated. However, it results in absolute emissions higher than the original NDC. No specific sectoral mitigation plans were included. A 2050 target of "climate neutrality" was included.

TARGETS

37% below 2005 levels by 2025

50% below 2005 levels by 2030

ACTIONS

Not mentioned

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 Brazil an overall rating of "insufficient". The "insufficient" rating here indicates that overall, Brazil's climate policies and commitments are not consistent with the Paris Agreement's 1.5°C temperature limit. Brazil has updated its NDC target twice since the Paris COP in 2015. Its most recent (April 2022) update is stronger than its 2020 update (so the CAT's overall rating has improved slightly to "insufficient", but remains weaker than its original NDC submitted in 2016. This updated NDC still allows higher emissions than Brazil's first submission, in contrast to the Paris Agreement's principle of progression of ambition.

This CAT analysis was updated in September 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	Not yet submitted to UNFCCC
Net zero target	"Climate neutrality" by 2050 target in last NDC
Interim steps	None yet published
Sectoral targets	No

FINANCE

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

In 2019, 75% of the USD 6bn Brazil spent on subsidies went to oil, and the remainder largely to fossil gas. Despite voluntary Emissions Trading System (ETS) simulations since 2018, and a federal decree creating a carbon market in Brazil in April 2022, neither pricing nor sectors and start dates have been determined.

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

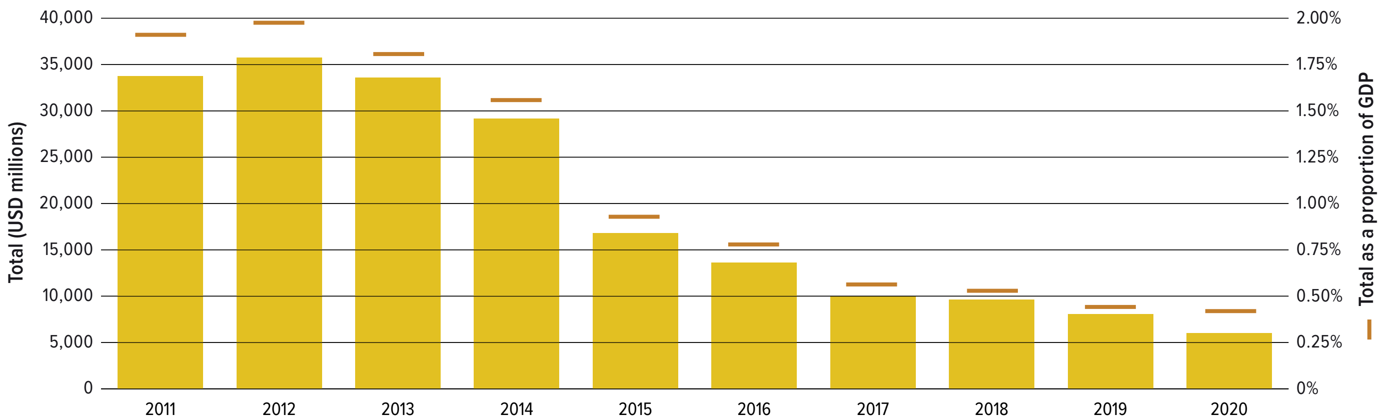
Rogelj et al., 2018

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

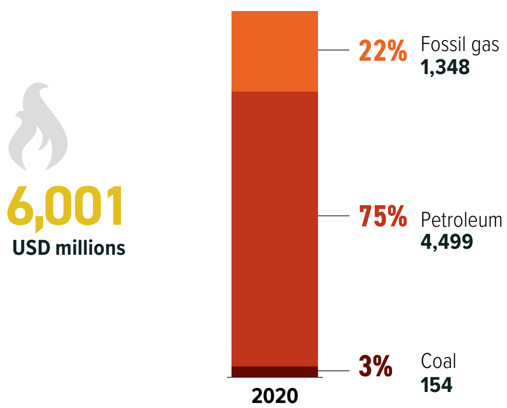
(USD millions)



OECD-IEA Fossil Fuel Support Database, 2022

Fossil fuel subsidies by fuel type

(USD millions) in 2020



Over the past decade (2011–2020), Brazil's subsidies to fossil fuels have decreased considerably. Roughly two thirds of the USD 6bn in subsidies identified in 2020 were for consumption and the rest for production. Of the subsidies, 75% went to petroleum, and the rest mostly to fossil gas.

Two subsidy measures accounted for over half of the total in 2020. The first was a special tax regime that provided exemptions for operators involved in the exploration and development of oil and gas. The second measure supported electricity generation in isolated communities and cities in the north of Brazil, which rely on thermal diesel power plants, by reimbursing the difference between local operating costs and the national average. The use of this measure has been steadily increasing since 2016.

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

Carbon pricing and revenue

To date, no explicit carbon pricing scheme exists in Brazil. Brazil is considering implementing a national ETS through two initiatives, coordinated respectively by the Energy Research Corporation and the Ministry of Mines and Energy, and the Brazilian National Congress. To this end, voluntary ETS simulations have been run since 2018. In April 2022, the Brazilian Government published a decree creating a national GHG emission reductions system to support a future carbon market in the country; however, the level of pricing for permits or taxation has yet to be determined, and neither the start date nor the sectoral coverage has been proposed.

Climate Scorecard, 2020; I4CE, 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.

Brazil has made significant progress in green financial policies and regulation. Brazil was one of the first countries to announce mandatory disclosure of climate-related financial risk for financial institutions, in September 2020. Led by the Banco Central do Brazil (BCB), the second and final phase of this requirement – quantitative aspects including metrics and targets – will come into force in December 2022. It is inspired by the Task Force on Climate-Related Financial Disclosures (TCFD), established in 2015 by the Financial Stability Board, and includes both climate-related transitional and physical risks. In addition, the scope encompasses social and environmental risks as well as climate.

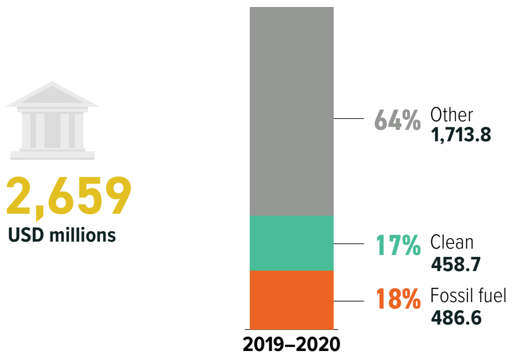
Banco Central do Brasil, 2021; Task Force on Climate-Related Financial Disclosures, 2022

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 and 2020, Brazil provided an average of USD 2.7bn in public finance per year to energy projects; 18% of this amount went to fossil fuels – and entirely to fossil gas power plants near Rio de Janeiro. Notable investments include USD 650m to build transmission lines in the state of Minas Gerais and USD 470m to build pipelines and storage for ethanol in the Sao Paolo region in 2019. USD 217m was also used to re-finance eight wind farms (225 MW) in Bahia, Brazil.

Oil Change International, 2022

Provision of international public support

Brazil 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 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

Bibliography

Agência Senado. (2016). *Lei que Destina Recursos a Programa de eficiência Energética é Sancionada.* https://www12.senado.leg.br

Araujo, C. S. C. (2021). *Freight in Brazil.* https://theicct.org

Banco Central do Brasil. (2021). *New Regulation on Social, Environmental, and Climate-Related Risk Disclosures.* https://www.bcb.gov.br

Centro Brasileiro de Informação de Eficiência Energética. (2015). *Edificações.* http://www.procelinfo.com.br

Climate Action Tracker (CAT). (2020). *Paris Agreement Compatible Sectoral Benchmarks Study.* https://climateactiontracker.org

---. (2021a). *Climate Summit Momentum: Paris Commitments Improved Warming Estimate to 2.4C.* https://climateactiontracker.org

---. (2022a). *Climate Action Tracker Country Assessments*. https://climateactiontracker.org/countries/

---. (2022b). *CAT Climate Target Update Tracker.* https://climateactiontracker.org/climate-target-update-tracker/

---. (2022c). *Despite Glasgow Climate Pact 2030 Climate Target Updates Have Stalled.* https://climateactiontracker.org

Climate Analytics. (2021). *Climate Impact Explorer.* http://climate-impact-explorer.climateanalytics.org/

---. (2022). *1.5°C National Pathways Explorer.* http://1p5ndc-pathways.climateanalytics.org/

Climate and Clean Air Coalition. (2021). *Global Methane Pledge.* https://www.ccacoalition.org/en/resources/global-methane-pledge

Climate Scorecard. (2020). *Brazil Launches New Private and Public Policy Carbon Pricing Initiatives*. https://www.climatescorecard.org

Cuartas, L. A. et al. (2022). *Recent Hydrological Droughts in Brazil and Their Impact on Hydropower Generation.* https://doi.org/10.3390/w14040601

Enerdata. (2022). *Global Energy and CO_2 Data.* https://www.enerdata.net/research

Energy Policy Tracker. (2022). *G20 Countries*. https://www.energypolicytracker.org/region/g20

Food and Agriculture Organization (FAO). (2022). *Emissions Totals: Agriculture.* http://www.fao.org/faostat

Fragoso, R. et al. (2021). *Analise das emissoes brasileiras de Gases de Efeito Estufa e suas implicacaoes para as metas climaticas do Brasil 1990—2020.* https://seeg-br.s3.amazonaws.com

Global Forest Resources Assessment. (2020). *Annual Forest Expansion, Deforestation and Net Change Indicator.* Food and Agriculture Organisation. https://fra-data.fao.org/WO/fra2020/forestAreaChange/

Goes, G. V. et al. (2020). *Transport-Energy-Environment Modelling and Investment Requirements from Brazilian Commitments.* https://doi.org/10.1016/j.renene.2020.05.032

Government of Brazil. (2022). *Brazil NDC update.* https://www4.unfccc.int

Gütschow, J. et al. (2021). *The PRIMAP-hist National Historical Emissions Time Series (1850-2018), V.2.2.* Zenodo Open Access Repository. https://doi.org/10.5281/zenodo.4479172

Institute for Climate Economics (I4CE). (2022). *Global Carbon Accounts 2021.* https://www.i4ce.org/

Institute for Health Metrics and Evaluation (IHME). (2020). *Global Burden of Disease Study 2020*. http://ghdx.healthdata.org/gbd-results-tool

Intergovernmental Panel on Climate Change (IPCC). (2022). *Sixth Assessment Report, WGII Summary for Policymakers. Headline Statements.* https://www.ipcc.ch/report/ar6/wg3/resources/spm-headline-statements/

International Energy Agency (IEA). (2021). *Aviation.* https://www.iea.org/reports/aviation

---. (2022). *Global Electric Vehicle Outlook 2022.* https://www.iea.org/reports/global-ev-outlook-2022

Ministério da Estado da Ciência, Tecnologia e Inovações (MCTI). (2022). *Estimativas Anuais De Emissões De Gases De Efeito Estufa No Brasil. 6ª Edição*. https://www.gov.br

Ministério da Infraestrutura (MinFra) & Empresa de Planejamento e Logística (EPL). (2021). *National Logistics Plan (NLP 2035).* https://ontl.epl.gov.br

Ministério de Minas e Energia (MME). (2019). *RenovaBio.* https://www.gov.br/mme

Ministério de Minas e Energia & Empresa de Pesquisa Energética (MME/EPE). (2022). *Plano Decenal de Expansão de Energia 2031.* https://www.epe.gov.br

Ministério do Meio Ambiente (MMA). (2022). *Programa Nacional Metano Zero.* https://www.gov.br/mma

Observação da Terra, INPE. (2022). *Monitoramento do Desmatamento da Floresta Amazônica Brasileira por Satélite (PRODES).* http://www.obt.inpe.br/OBT/assuntos/programas/amazonia/prodes

Oil Change International. (2022). *Shift the Subsidies Database.* http://priceofoil.org/shift-the-subsidies

OECD-IEA. (2022). *Fossil Fuel Support Database.* http://www.oecd.org/fossil-fuels/data

Rogelj, J. et al. (2018). "Mitigation Pathways Compatible with 1.5°C in the Context of Sustainable Development", in Masson-Delmotte, V. et al. (eds) *Global Warming of 1.5°C. An IPCC Special Report on the Impacts of Global Warming of 1.5°C.* IPCC. https://www.ipcc.ch/

Romanello, M. et al. (2022). *The 2022 Report of The Lancet Countdown on Health and Climate Change.* https://www.thelancet.com/countdown-health-climate

Silva Junior, C. H. L. et al. (2021). *The Brazilian Amazon Deforestation Rate in 2020 is the Greatest of the Decade.* https://doi.org/10.1038/s41559-020-01368-x

Task Force on Climate-Related Financial Disclosures. (2022). *TCFD Supporters.* https://www.fsb-tcfd.org/supporters/

United Nations. (2018). *World Urbanisation Prospects.* UN Department of Economic and Social Affairs, Population Division. https://population.un.org/wup

United Nations Development Programme (UNDP). (2020). *Human Development Index Database.* http://hdr.undp.org/en/data#

United Nations Framework Convention on Climate Change (UNFCCC). (2021). *Decision 1/CMA.3, Glasgow Climate Pact*. http://www. https://unfccc.int/documents/460950

The World Bank. (2021). *GDP Per Capita (constant 2015 US$).* https://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD

---. (2022). *Population, Total.* https://data.worldbank.org/indicator/SP.POP.TOTL

World Steel Association. (2021). *Steel Data and Statistics.* https://www.worldsteel.org/

Partners

Data Partners

Funders

Supported by:

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

based on a decision of the German Bundestag

Climate Transparency

This country profile is part of the Climate Transparency Report 2022.
Find the Highlights Report and other G20 Member profiles at
www.climate-transparency.org

For more information on the country profile for Brazil, please contact:

CentroClima/COPPE/UFRJ
William Wills, wwills@lima.coppe.ufrj.br