Climate Transparency

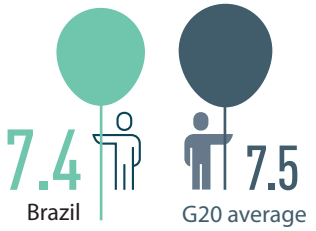
BROWN TO GREEN: 2019
THE G20 TRANSITION TOWARDS A NET-ZERO EMISSIONS ECONOMY

BRAZIL

Brazil's greenhouse gas (GHG) emissions are – per capita – around the G20 average.

The level increased by 8% between 2011 and 2016.

Greenhouse gas (GHG) emissions (incl. land use) per capita[1]
(tCO_2e/capita)



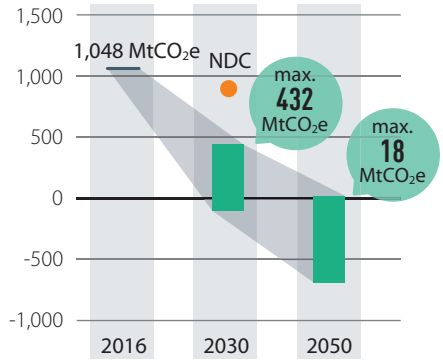
Data for 2016
Source: CAT 2019; PRIMAP 2018; World Bank 2019

Trend (2011-2016) +8% -1%

Brazil is not on track for a 1.5°C world.

Brazil needs to reduce its emissions to below 432 $MtCO_2e$ by 2030 and to below 18 $MtCO_2e$ by 2050 (both excl. land use) to be within its fair-share range compatible with global 1.5°C IPCC scenarios. Brazil's 2025 NDC will limit its emissions to 991 $MtCO_2e$, with an indicative 2030 target of 890 $MtCO_2e$ (both excl. land use), while Brazil's 2030 indicative NDC including land use emissions is 1,208 $MtCO_2e$. All figures are drawn from the Climate Action Tracker.

1.5°C compatible pathway[2]
($MtCO_2e$/year)



Source: CAT 2019

Recent developments[3]

During the latest national energy auction in 2018, approximately 83% of the 2.1 GW contracted went to renewable energy sources. No coal was contracted, despite being allowed to participate in the auction.

The former head of the Brazil Forum on Climate Change and 12 Brazilian states are forming an independent council to commit to the goals of the Paris Agreement.

The Brazilian government cut the budget of the Environment Ministry and deforestation monitoring authorities and reversed some of its LULUCF policies.

Key opportunities for enhancing climate ambition[3]

Deforestation of the Amazon forest increased 73% from 2012 to 2018

→ **Strengthen policies on land use emissions and increase monitoring to reach zero illegal deforestation as soon as possible.**

#1

Brazil's fossil fuel subsidies as share of GDP were well above the G20 average in recent years

→ **Stop subsidising fossil fuels.**

#2

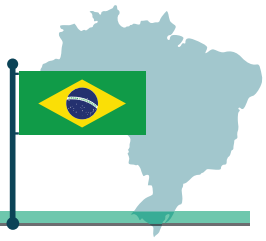
Low market share (0.02%) of electric vehicles and prevalence of cars in transport sector

→ **Strong investment plan to promote modal shifts and electrification of the transport sector.**

#3

This country profile is part of the **Brown to Green 2019** report. The full report and other G20 country profiles can be downloaded at: *http://www.climate-transparency.org/g20-climate-performance/g20report2019*

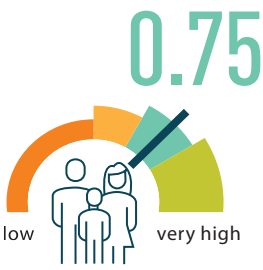
BRAZIL – SOCIO-ECONOMIC CONTEXT



Human Development Index

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

Data for 2017 | Source: UNDP 2018



Gross Domestic Product (GDP) per capita

(PPP US$ const. 2018, international)

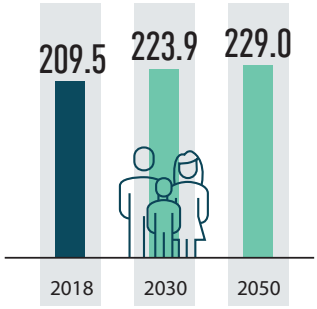
Data for 2018 | Source: World Bank 2019

Population projections

(millions)

The World Bank expects Brazil's population to peak in the 2040s and slightly decrease after that.

Source: World Bank 2019

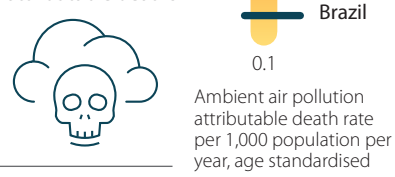


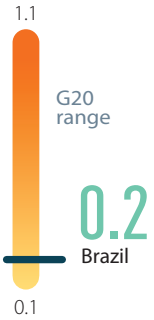
Death through ambient air pollution

(total ambient air pollution attributable deaths)

More than 50,000 people die in Brazil every year as a result of outdoor air pollution, due to stroke, heart disease, lung cancer and chronic respiratory diseases. Compared to the total population, this is at the lower end of the G20 range.

Data for 2016
Source: World Health Organization 2018





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

JUST TRANSITION[3]

In Brazil, energy transition began decades ago with the first oil crisis in the 1970s, which is possibly why 'just transition' is not in the spotlight – renewables are not new in the country. In fact, globally Brazil has one of the highest shares of renewables in total primary energy supply (43%) and in the power sector (80%). However, since the large oil discoveries in the pre-salt layer about a decade ago, the country has been investing heavily in oil exploration and production, and has recently approved important tax breaks for the oil industry until 2040. As a result, oil production is expected to double in the next decade. The Brazilian National Adaptation Plan to Climate Change, published in 2016, recognises the need to achieve a just transition, albeit being quite vague and without offering a clear strategy on how to achieve it. If a just transition has not been an important issue until now, it certainly will be in the future and should be properly addressed by the government and other stakeholders.

Legend for all country profiles

Trends

The trends show developments over the past five years for which data are available.

The thumbs indicate assessment from a climate protection perspective.

Decarbonisation Ratings[4]

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

Policy Ratings[5]

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

For more information see the Annex and Technical Note

MITIGATION BIG PICTURE

BRAZIL

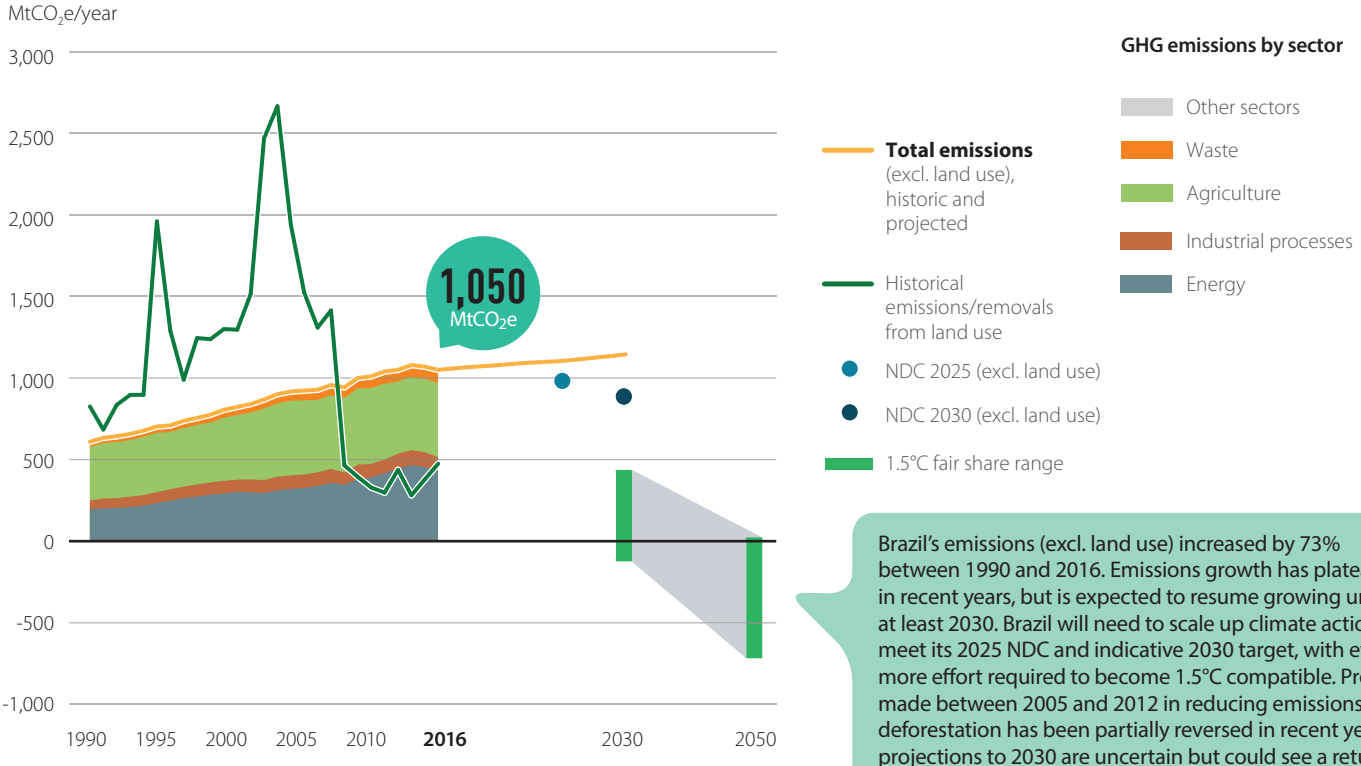
Brazil's GHG emissions have increased by 73% (1990-2016) and the government's climate targets for 2030 (-43%) are not in line with a 1.5°C pathway.

In 2030, global GHG emissions need to be 45% below 2010 levels and reach net zero by 2070.

1.5°C[6]

Source: IPCC SR1.5 2018

Total GHG emissions across sectors[2]



Source: PRIMAP 2018; CAT 2019

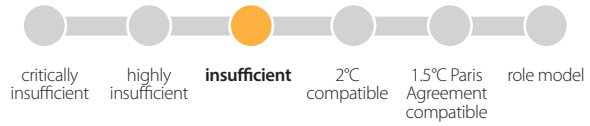
Brazil's emissions (excl. land use) increased by 73% between 1990 and 2016. Emissions growth has plateaued in recent years, but is expected to resume growing until at least 2030. Brazil will need to scale up climate action to meet its 2025 NDC and indicative 2030 target, with even more effort required to become 1.5°C compatible. Progress made between 2005 and 2012 in reducing emissions from deforestation has been partially reversed in recent years; projections to 2030 are uncertain but could see a return to 2012 levels or a substantial increase in emissions.

Nationally-determined contribution (NDC): Mitigation

Targets	37% GHG emissions reduction compared to 2005 by 2025, 43% by 2030 (decarbonisation of the economy by the end of the century)
Actions	Actions specified (sectors: energy, land use and forestry, agriculture, industry, transport)

Source: UNFCCC, NDC of respective country

Climate action tracker (CAT) evaluation of NDC[2]



Source: CAT 2019

Long-term strategy (LTS) to be submitted to the UNFCCC by 2020

Status	No action
2050 target	–
Interim steps	–
Sectoral targets	–

The Brazil Forum for Climate Change submitted a proposal to former president Michel Temer aiming to reach net zero emissions by 2060. It is not yet clear whether President Bolsonaro will follow up on it.

Source: UNFCCC, LTS of respective country

MITIGATION ENERGY

BRAZIL

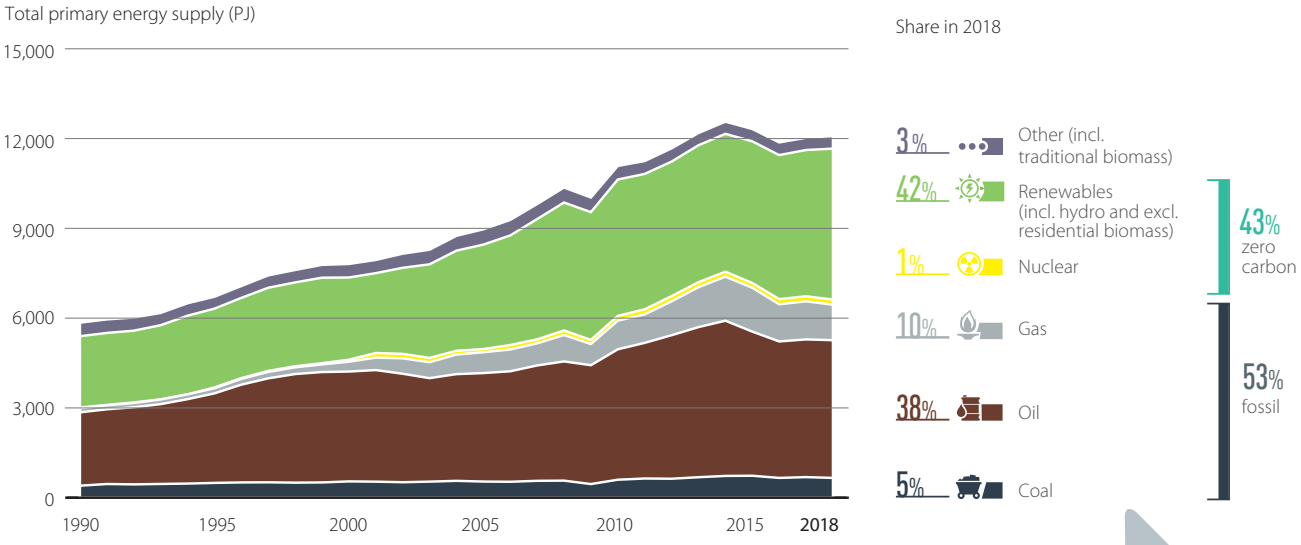
Fossil fuels make up 53% of Brazil's energy mix (including power, heat, transport fuels, etc). Due to the high share of renewables, Brazil's energy mix is much less carbon intensive than the G20 average.

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.

1.5°C[6]

Source: IPCC SR1.5 2018

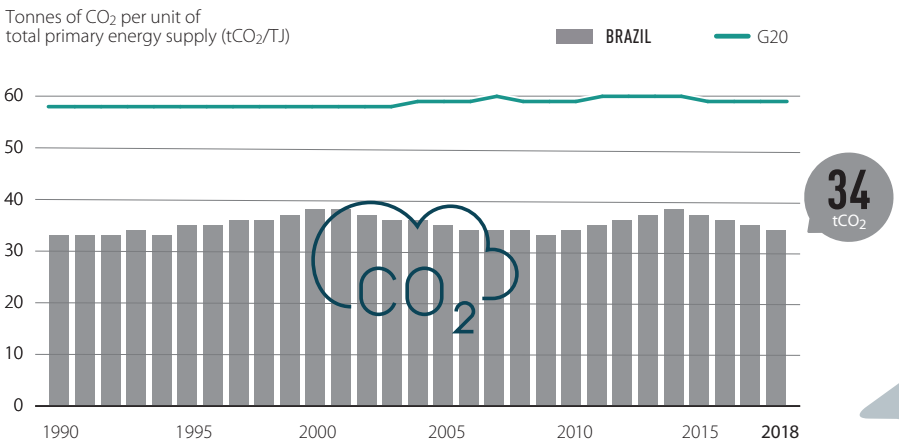
Energy mix[7]



Source: Enerdata 2019

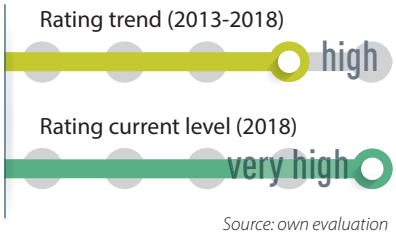
This graph shows the fuel mix for all energy supply, including energy used for electricity generation, heating, cooking, and transport fuels. Fossil fuels (oil, coal and gas) make up 53% of the Brazilian energy mix, which is well below the G20 average. This is due to Brazil's high use of renewable energy.

Carbon intensity of the energy sector



Source: Enerdata 2019

Rating of carbon intensity compared to other G20 countries[4]



Source: own evaluation

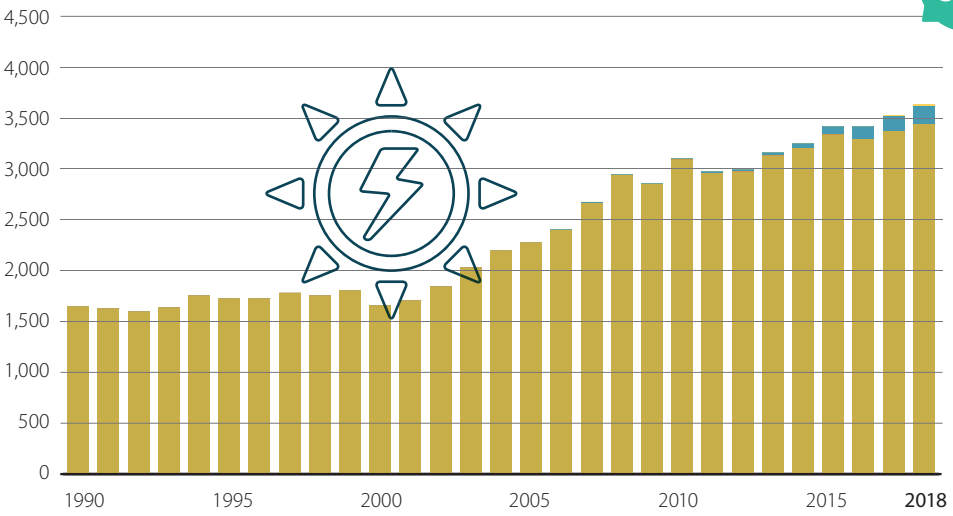
Carbon intensity shows how much CO_2 is emitted per unit of energy supply. Brazil's energy sector has the second lowest carbon intensity in the G20, reflecting the high share of hydropower and biofuels in the energy mix. Since 2014, it has decreased slightly further.

MITIGATION ENERGY

BRAZIL

Solar, wind, geothermal and biomass development[8]

Total primary energy supply (TPES) from solar, wind, geothermal and biomass (PJ)



Source: Enerdata 2019

Share of TPES in 2018

- 0.11% Solar
- 1.44% Wind
- 0.00% Geothermal
- 28.49% Biomass, excl. traditional biomass

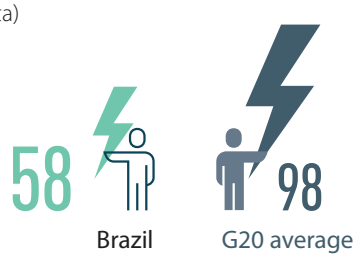
Solar, wind and biomass account for 30% of Brazil's energy supply – the G20 average is only 6%. In the last five years, the share of these sources in total energy supply has increased by around 18%, less than the G20 average (+29%, 2013-2018). Bioenergy (for electricity, and biofuels for transport and heat) makes up the largest share.

Rating of share in TPES compared to other G20 countries[4]

Source: own evaluation

Energy supply per capita

Total primary energy supply per capita (GJ/capita)



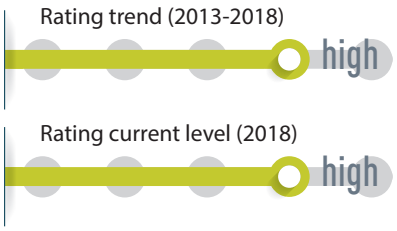
Trend (2013-2018) -7% +1%

Data for 2018 | Source: Enerdata 2019; World Bank 2019

The level of energy supply per capita is closely related to economic development, climatic conditions and the price of energy.

At 58 GJ/capita, energy supply per capita in Brazil is well below the G20 average and has decreased further (-7%, 2013-2018), in contrast to the increasing G20 average (+1%).

Rating of energy supply per capita compared to other G20 countries[4]



Source: own evaluation

MITIGATION ENERGY

BRAZIL

Brazil's economy is slightly less energy intensive (-16%) than the G20 average. Energy supply per capita is well below the G20 average and has decreased further. Energy-related CO_2 emissions peaked in 2014.

Global energy and process-related CO_2 emissions must be cut by 40% below 2010 levels by 2030 and reach net zero by 2060.

1.5°C[6]

Source: IPCC SR1.5 2018

Energy intensity of the economy

(TJ/PPP US$2015 million)

4.06	4.86
Brazil	G20 average

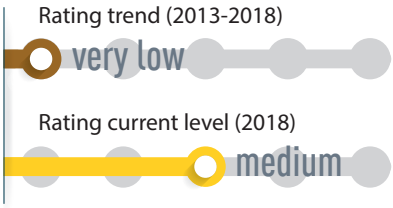
Trend (2013-2018) +3% -12%

Data for 2018 | Source: Enerdata 2019; World Bank 2019

This indicator quantifies how much energy is used for each unit of GDP. This is closely related to the level of industrialisation, efficiency achievements, climatic conditions or geography.

Brazil's energy intensity remains below the G20 average, but increased by 3% from 2013 to 2018, in contrast to the G20's downward trend of 12%.

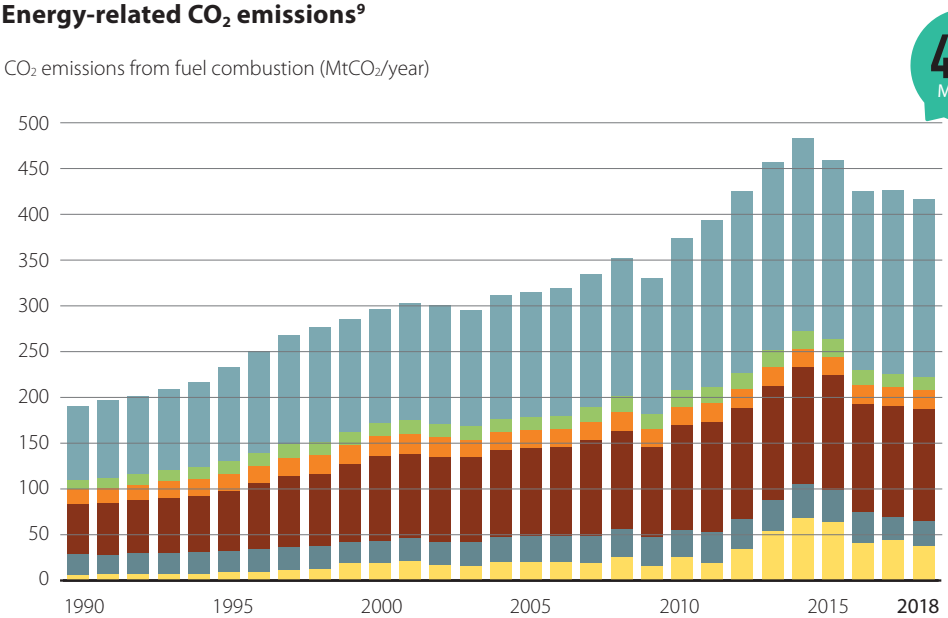
Rating of energy intensity compared to other G20 countries[4]



Source: own evaluation

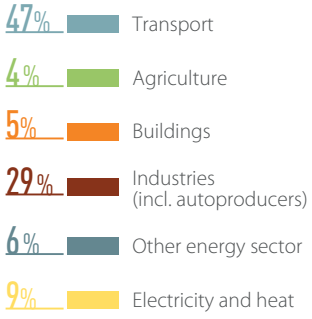
Energy-related CO_2 emissions[9]

CO_2 emissions from fuel combustion ($MtCO_2$/year)



Source: Enerdata 2019

Share of total energy-related CO_2 emissions in 2018



CO_2 emissions from fuel combustion contribute significantly to overall GHG emissions in Brazil. They peaked in 2014 and have decreased since then. At 47%, the transport sector is the largest contributor.

MITIGATION POWER SECTOR

BRAZIL

Brazil produces 82% of electricity from renewable energy sources, most of it hydropower. There are plans to increase the share of wind and solar in the electricity mix.

Share in energy-related CO_2 emissions

9%

Data for 2018 | Source: Enerdata 2019

Coal must be phased out in the EU/OECD no later than 2030, in the rest of the world no later than 2040. Electricity generation needs to be decarbonised before 2050, with renewable energy the most promising option.[5]

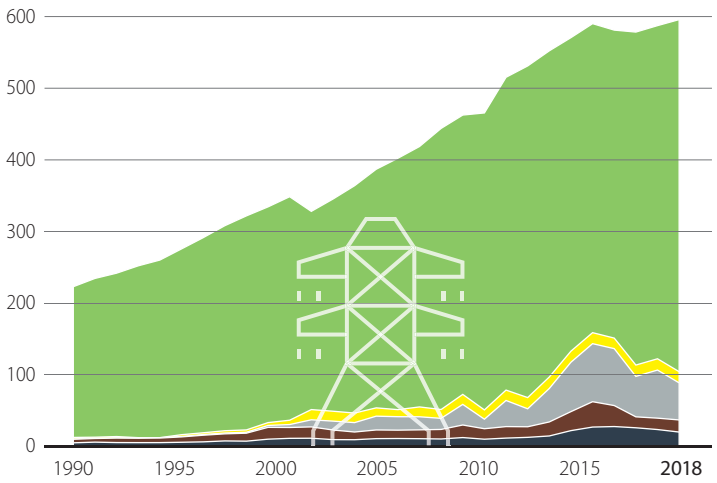
1.5°C[6]

Source: IPCC SR1.5 2018; Climate Analytics 2016; Climate Analytics 2019

STATUS OF DECARBONISATION

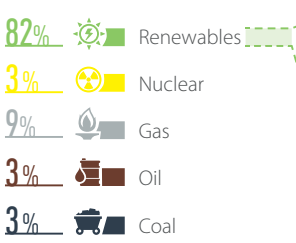
Power mix

Gross power generation (TWh)

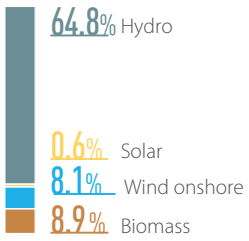


Source: Enerdata 2019

Shares in 2018



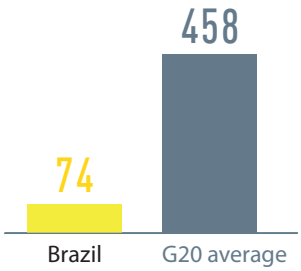
Renewables shares



Brazil generates 82% of its power from renewable sources – the highest level in the G20 – and around 65% from hydropower alone. Fossil fuels (oil, coals and gas) account for only a small share although generation from gas has recently increased.

Emissions intensity of the power sector

(gCO_2/kWh)



Data for 2018 | Source: Brazilian Ministry of Science and Technology 2019

Trend (2013-2018)

-33% Brazil

-11% G20 average

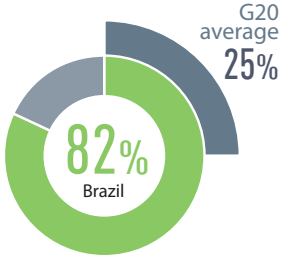
Rating of emissions intensity compared to other G20 countries[4]

Source: own evaluation

For each kilowatt hour of electricity, 74 gCO_2 are emitted in Brazil. This is more than six times lower than the G20 average, reflecting the high share of renewables. Emission intensity has decreased by 33% from 2013-2018, much higher than the G20 rate (-11%).

Share of renewables in power generation

(incl. large hydro)



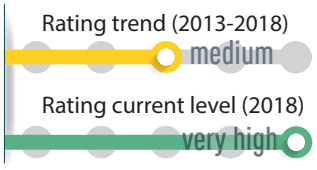
Data for 2018 | Source: Enerdata 2019

Trend (2013-2018)

+10% Brazil

+20% G20 average

Rating of share of renewables compared to other G20 countries[4]



Source: own evaluation

MITIGATION POWER SECTOR

BRAZIL

POLICIES[5]

Renewable energy in the power sector

Brazil already has a high share of hydropower and aims to increase the share of other renewables to 23% by 2030. The latest 10-year Energy Plan 2027 envisages an installed capacity of 8.64 GW of solar and 26.67 GW of wind by 2027, which the government supports through auctions. The government plans to publish a 2050 energy plan by the end of 2019.

Source: own evaluation

Coal phase-out in the power sector

The Brazilian Development Bank, the most important source of finance for energy developments in Brazil, announced in 2016 that it would no longer invest in new coal power plants. In the latest 10-year Energy Plan, the Ministry of Energy limited the expansion of coal-fired power plants in the reference scenario but in two of the Plan's eight sensibility runs, coal-fired installed capacity would increase significantly.

Source: own evaluation

MITIGATION TRANSPORT SECTOR

The transport sector contributes almost half of Brazil's energy related CO_2 emissions and is still dominated by fossil fuels, even though biofuel makes up almost 24% of the energy mix in transport. In order to stay within a 1.5°C limit, passenger and freight transport need to be further decarbonised.

Share in energy-related CO_2 emissions

47% direct

Data for 2018 | Source: Enerdata 2019

The proportion of low-carbon fuels in the transport fuel mix must increase to about 60% by 2050.

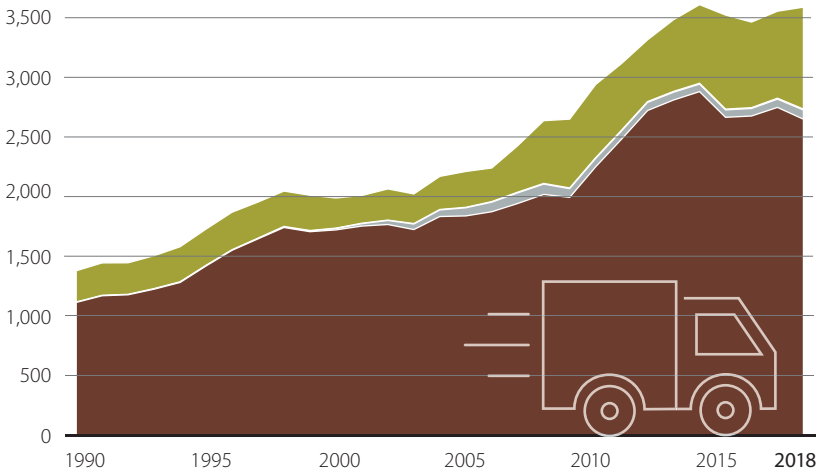
1.5°C[6]

Source: IPCC SR1.5 2018

STATUS OF DECARBONISATION

Transport energy mix

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



Share in 2018

23.8%	Biofuels
0.2%	Electricity
2.2%	Gas
73.8%	Oil
0.0%	Coal

Electricity and biofuels make up 24% of the energy mix in transport – the highest level in the G20.

Source: Enerdata 2019

MITIGATION TRANSPORT SECTOR

BRAZIL

STATUS OF DECARBONISATION (continued)

Transport emissions per capita[10]

(tCO_2/capita, excl. aviation emissions)

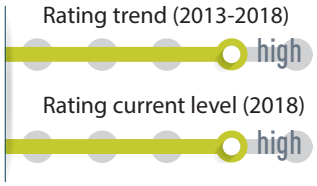
Data for 2018
Source: Enerdata 2019; World Bank 2019

Trend (2013-2018)

-10% Brazil

+5% G20 average

Rating of transport emissions compared to other G20 countries[4]



Source: own evaluation

Aviation emissions per capita[11]

(tCO_2/capita)

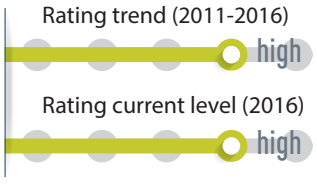
Data for 2016
Source: Enerdata 2019; IEA 2018

Trend (2011-2016)

-6% Brazil

+10% G20 average

Rating of aviation emissions compared to other G20 countries[4]



Source: own evaluation

Motorisation rate

(vehicles per 1,000 inhabitants)

Data for 2014 | Source: Agora 2018

Market share of electric vehicles in new car sales

(%)

Data for 2018 | Source: IEA 2019

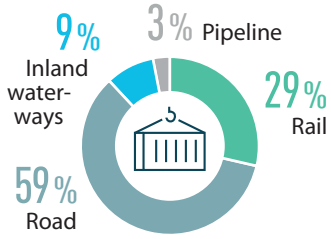
Passenger transport

(modal split in % of passenger km)

Data for 2017 | Source: IBGE 2017

Freight transport

(modal split in % of tonne-km)



Data for 2017 | Source: IBGE 2017

POLICIES[5]

Phase out fossil fuel cars

The latest emission standards for cars in Brazil came into place in 2013. The new 'Rota 2030' regulation, published in 2018, has set a mandatory efficiency improvement target of 11% by 2022 for vehicles and supports EVs through tax incentives. In its NDC, the government set out plans to almost double the use of biofuels, although it has no plans for phasing-out fossil fuel cars.

Source: own evaluation

Phase out fossil fuel heavy-duty vehicles

Emission standards for HDVs in Brazil were updated in 2012. However, a more stringent standard was announced in late 2018 and will come into force in 2023, making Brazil the last major automotive market to adopt one equivalent to Euro VI. However, Brazil has no strategy for reducing absolute emissions from freight transport.

Source: own evaluation

Modal shift in (ground) transport

There is no longer-term strategy for modal shift but the Brazilian Urban Mobility Policy aims to increase use of public transport and non-motorised travel in urban areas. The Plan for Logistics and Transportation aims to increase the share of rail in the freight transport mix, from 25% in 2005 to 35% in 2025.

⚠ A case study in São Paulo highlights a lack of implementation of the Urban Mobility Policy.

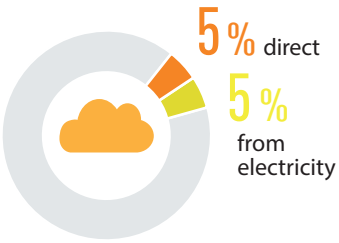
Source: own evaluation

MITIGATION BUILDINGS SECTOR

BRAZIL

Brazil's building emissions – including heating, cooking and electricity use – make up a tenth of energy-related CO_2 emissions. Per capita, building-related emissions are well below the G20 average, but there are no strategies for further reducing building emissions.

Share in energy-related CO_2 emissions



Data for 2018 | Source: Enerdata 2019

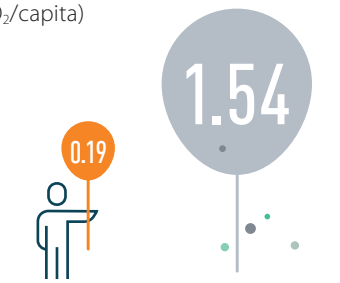
Global emissions from buildings need to be halved by 2030, and be about 80% below 2010 levels by 2050, achieved mostly through increased efficiency, reduced energy demand and electrification in conjunction with complete decarbonisation of the power sector.

1.5°C[6]

Source: IEA ETP B2DS scenario assessed in IPCC SR1.5 2018

STATUS OF DECARBONISATION

Building emissions per capita
(incl. indirect emissions)
(tCO_2/capita)



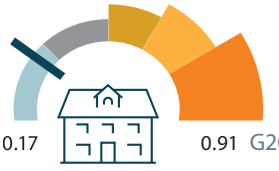
-24.7% +1%

Trend (2013-2018)

Data for 2018 | Source: Enerdata 2019; World Bank 2019

Residential buildings: energy use per m²
(GJ)

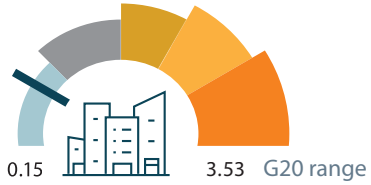
0.33 GJ



Data: year different per country | Source: ACEEE 2018

Commercial and public buildings: energy use per m²
(GJ)

0.66 GJ



Data: year different per country | Source: ACEEE 2018

Rating of building emissions compared to other G20 countries[4]

Source: own evaluation

Building-related emissions per capita are little over a tenth of the G20 average. In contrast to the G20 average, Brazil has managed to reduce the level by 24% (2013-2018).

Building emissions are largely driven by how much energy is used in heating, cooling, lighting, household appliances, etc. In Brazil, energy use per m² is in the lower half of the G20 range for residential buildings and is in the lowest quarter for commercial and public buildings.

POLICIES[5]

Near-zero energy new buildings

Brazil has voluntary building codes as well as rating systems. It also requires the disclosure of energy use for new residential and non-residential buildings. There is, however, no strategy for requiring all new buildings to adhere to near-zero energy standards.

Source: own evaluation

Renovation of existing buildings

There are no policies related to energy retrofitting of existing buildings in Brazil.

Source: own evaluation

MITIGATION INDUSTRY SECTOR

BRAZIL

Industry-related emissions make up more than a third of energy-related CO_2 emissions in Brazil and have remained almost stable over recent years. Policies for reducing industrial emissions are insufficient to bring Brazil on a 1.5°C track.

Share in energy-related CO_2 emissions (not including process emissions)

Data for 2018 | Source: Enerdata 2019

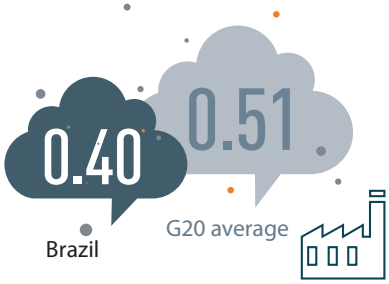
Global industrial CO_2 emissions need to be reduced by 65–90% from 2010 levels by 2050.

1.5°C[6]

Source: IPCC SR1.5 2018

STATUS OF DECARBONISATION

Industry emissions intensity[12]
(tCO_2e/US$2015 GVA)

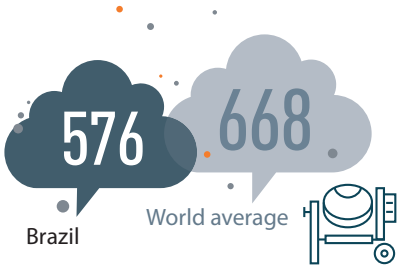


Data for 2016 | Source: Enerdata 2019; PRIMAP 2018; World Bank 2019

+17% -10.2%

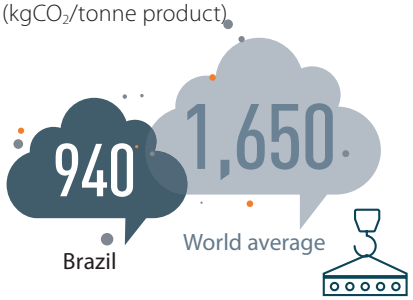
Trend (2011-2016)

Carbon intensity of cement production[13]
($kgCO_2$/tonne product)



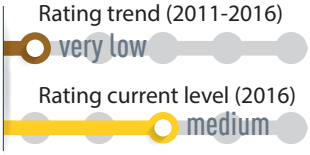
Data for 2015 | Source: CAT 2019

Carbon intensity of steel production[13]
($kgCO_2$/tonne product)



Data for 2015 | Source: CAT 2019

Rating of emissions intensity compared to other G20 countries[4]



Source: own evaluation

When comparing industrial emissions with the gross value added (GVA) from the industry sector, Brazil remains below the G20 average. However, emissions intensity increased by 17% from 2011 to 2016, in contrast to the G20 downward trend (-10%).

Steel production and steelmaking are significant GHG emission sources, and are challenging to decarbonise. Brazil's cement and steel industry are less emission intensive than the world average.

POLICIES[5]

Energy efficiency

According to the International Energy Agency (IEA), less than 10% of Brazil's industrial energy use is covered by mandatory energy efficiency policies (as of 2017). The 2008 National Policy on Energy Efficiency aims to improve energy efficiency in industry, eg through voluntary agreements with manufacturers; however, they include no incentives for participation.

Source: own evaluation

MITIGATION LAND USE

BRAZIL

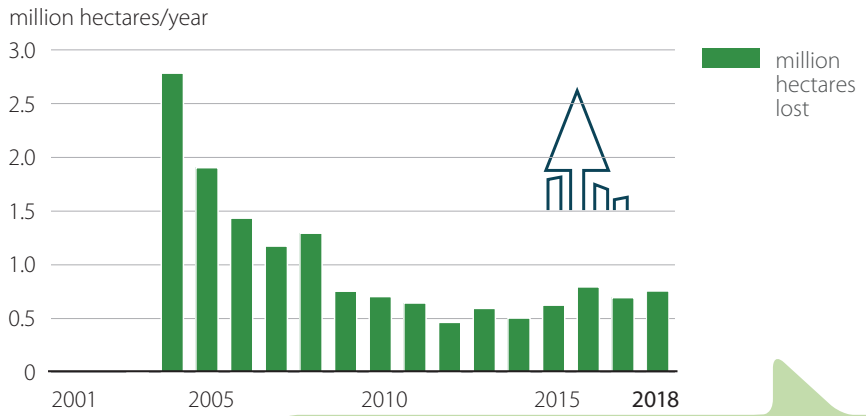
In order to stay within the 1.5°C limit, Brazil needs to make the land use and forest sector a net sink of emissions, eg by halting the deforestation of the Amazonian rainforest, fighting illegal logging, and restoring destroyed forest areas.

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

1.5°C[6]

Source: IPCC SR1.5 2018

Annual Deforestation Rate in the Amazon forest



Note: The deforestation rate only takes into account patches of loss larger than 6.25 hectares.

Source: INPE 2019

POLICIES[5]

(Net) zero deforestation

Brazil aims to restore and reforest 12 million ha of forest, to achieve zero illegal deforestation by 2030 and to compensate for GHG emissions from legal suppression of vegetation by 2030. In 2017, the government launched a revised monitoring system to fight illegal logging.

In 2019, the government replaced top positions at the Environment Ministry and deforestation monitoring authorities, and eased appealing processes against fines for illegal logging.

Source: own evaluation

The annual deforestation rate in the Amazon region fell sharply between 2004 and 2012 – (from 2.88Mha to 0.46Mha) – after the implementation of efficient command and control policies (reinforcing fiscalisation) and economic instruments (cutting public financing to producers who promoted illegal deforestation). From 2012 to 2018, deforestation began to increase again (from 0.46Mha to 0.75Mha), mainly due to insufficient resources and weakened fiscalisation policies. Despite the decision of the new government to remain in the Paris Agreement and support all NDC goals (including reaching zero illegal deforestation by 2030), it has not yet presented any plans or policies to further reduce deforestation rates in the Amazon region.

MITIGATION AGRICULTURE

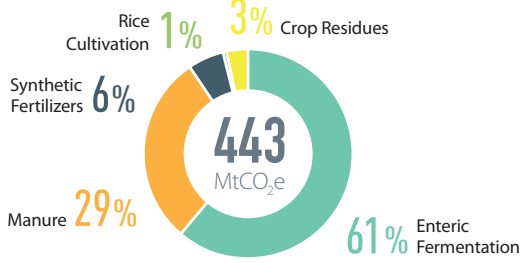
Agriculture accounts for over 40% of Brazil's GHG emissions. Agricultural emissions mainly come from digestive processes in animals, livestock manure, and the use of synthetic fertilizers. A 1.5°C pathway requires dietary shifts, increased organic farming, and less fertilizer use.

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

1.5°C[6]

Source: IPCC SR1.5 2018

GHG emissions from agriculture (not including energy)



In Brazil, the largest sources of GHG emissions in the agricultural sector are digestive processes in animals (enteric fermentation), livestock manure, and the use of synthetic fertilizers. Recovering degraded pasture, diet changes, and more efficient use of fertilizer could help reduce emissions.

Data for 2016 | Source: FAOSTAT 2019

ADAPTATION

BRAZIL

- **Brazil is vulnerable to climate change and adaptation actions are needed.**
- **On average, 146 fatalities and losses amounting to US$1.7 billion occur yearly due to extreme weather events.**
- **With global warming, society and its supporting sectors are increasingly exposed to severe climate events, such as droughts.**
- **With a 3°C warming, Brazil would experience around 125 days per year when temperatures reach more than 35°C.**

ADAPTATION POLICIES

Nationally-determined contribution: Adaptation

Targets	Not mentioned
Actions	Actions specified (sectors: agriculture, biodiversity and ecosystems, cities and urban development, disaster risk management, industry and mining, infrastructure, vulnerable populations, water resources, health, food and nutritional security, coastal zones)

Source: UNFCCC, NDC of respective country

National adaptation strategies

Document name	Publication year	Fields of action (sectors)													M&E process (reporting frequency)
		Agriculture	Biodiversity	Coastal areas & fishing	Education & research	Energy & industry	Finance & insurance	Forestry	Health	Infrastructure	Tourism	Transport	Urbanism	Water	
National Plan on Climate Change	2016	x	x	x		x		x	x	x		x	x	x	Assigned to the Executive Group on Climate Change

Source: Brazilian Ministry of Environment 2016

BRAZIL

ADAPTATION NEEDS

Climate Risk Index for 1998-2017

Impacts of extreme weather events in terms of fatalities and economic losses that occured

Global Climate Risk Index 2019 | All numbers are averages (1998-2017)

Weather-related fatalities	Per 100,000 inhabitants		Annual average losses (PPP US$ mn)	Per unit GDP (%)	
146	0.1	111 rank out of 181 countries	1,711	0.1	126 rank out of 181 countries

Source: Germanwatch 2018

Brazil has already been struck by extreme weather events such as droughts, storms, fires and flash floods. As highlighted by the numbers from the Climate Risk Index, such extreme weather events result in fatalities and economic losses. Climate change is expected to worsen the intensity, frequency and impacts of such events.

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

			1.5°C	2°C	3°C
Water	% of area with increase in water scarcity				
	% of time in drought conditions				
Heat & Health	Heatwave frequency				
	Days above 35°C				
Agriculture	Maize	Reduction in crop duration			
		Hot spell frequency			
		Reduction in rainfall			
	Soybean	Reduction in crop duration			
		Hot spell frequency			
		Reduction in rainfall			

Source: own research

Source: Based on Arnell et al 2019

Overall, with rising temperatures, all sectors are adversely affected. In the water sector, water scarcity and time spent in drought conditions drastically increase. Heat wave frequency increases significantly, together with the number of days above 35°C.

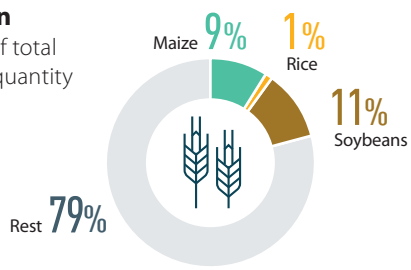
Impact ranking scale

- Very low
- Low
- Medium
- High
- Very high

Blank cells signify that there is no data available

National crop production

(share in % of total production quantity in tonnes)



Data for 2017 | Source: FAOSTAT 2019

Soybeans and maize represent the largest proportions of crop production out of the four crops analysed (maize, rice, soybeans, wheat). Both crops experience drastic reductions in crop duration and are affected by an extreme increase in hot spell frequency. Soybeans are also affected by a drastic reduction in rainfall.

FINANCE

BRAZIL

Brazil's fossil fuel subsidies totalled US$6.8 billion in 2017, mainly for petroleum. The country has no explicit carbon pricing scheme, but requires financial institutions to disclose climate risks.

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

1.5°C[6]

Source: IPCC SR1.5 2018

Nationally-determined contribution: Finance

Conditionality	Further actions beyond the current NDC are conditional
Investment needs	Not specified
Actions	Not mentioned
International market mechanisms	Brazil reserves its position in relation to the possible use of any market mechanisms

Source: UNFCCC, NDC of respective country

Financial policy and regulation supporting a brown to green transition

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.

Category	Instruments	Objective	Under discussion/ implementation	Not identified
Green Financial Principles	N/A	This indicates political will and awareness of climate change impacts, showing where there is a general discussion about the need for aligning prudential and climate change objectives in the national financial architecture.	**X**	

			Mandatory	Voluntary	Under discussion	Not identified
Enhanced supervisory review, risk disclosure and market discipline	Climate risk disclosure requirements	Disclose the climate-related risks to which financial institutions are exposed	**X**			
	Climate-related risk assessment and climate stress-test	Evaluate the resilience of the financial sector to climate shocks				**X**
Enhanced capital and liquidity requirements	Liquidity instruments	Mitigate and prevent market illiquidity and maturity mismatch				**X**
	Lending limits	Limit the concentration of carbon-intensive exposures				**X**
		Incentivise low carbon-intensive exposures				**X**
	Differentiated Reserve Requirements	Limit misaligned incentives and canalise credit to green sectors				**X**

Source: own research

In 2014, the Central Bank of Brazil (BCB) published a mandatory resolution on environmental, social and governance (ESG) standards for financial institutions, strengthening risk management and requiring private banks to implement ESG policies. Between 2008 and 2011, the BCB issued a series of industry-specific green banking regulations to prioritise investment in certain sectors; it was also the world's first banking regulator to request banks to monitor environmental risks as part of the implementation of Basel III's Internal Review for Capital Adequacy. SSP, linked to the Ministry of Finance and responsible for the supervision of insurance, private pension funds and capital markets, called for implementation of the TCFD (Task Force on Climate-related Financial Disclosures) in 2017.

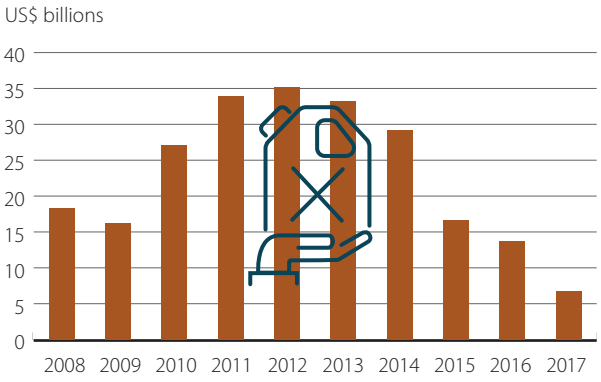
FINANCE

BRAZIL

Fiscal policy levers

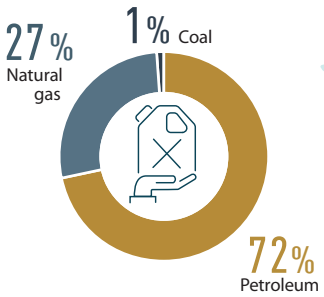
Fiscal policy levers raise public revenues and direct public resources. Critically, they can shift investment decisions and consumer behaviour towards low-carbon, climate-resilient activities by reflecting externalities in prices.

Fossil fuel subsidies



Source: OECD-IEA 2019

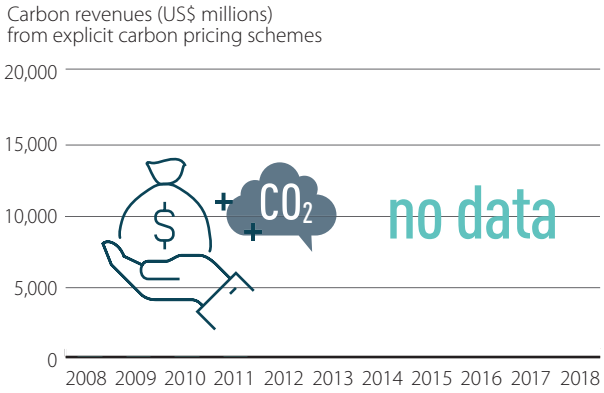
Subsidies by fuel type



Data for 2017 | Source: OECD-IEA 2019

In 2017, Brazil's fossil fuel subsidies totalled US$6.8bn (compared to US$18.4bn in 2008 and the last decade's peak of US$35.2 bn in 2012). 97% of the subsidies quantified were for the consumption of fossil fuels, with the remainder for production. The highest amount of subsidies were for petroleum, at US$4.9bn, followed by natural gas, at US$1.8bn. The largest is the PIS/COFINS Fuel-Tax Reduction, resulting in a US$1.3bn and a US$1.7bn subsidy to petroleum and to natural gas, respectively.

Carbon revenues



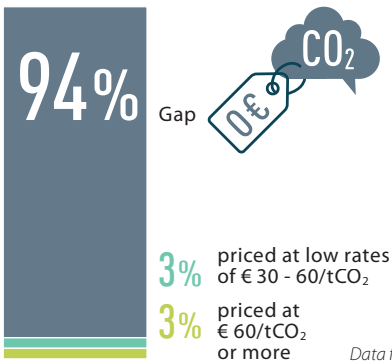
Source: I4CE 2019

No explicit carbon pricing scheme from 2007 to 2018.

Brazil is considering implementing a national carbon tax or emissions trading scheme. The level of pricing for permits or taxation has yet to be determined, alongside the proposed start date and sectors to be covered.

Carbon pricing gap[15]

% of energy-related CO_2 emissions



Data for 2015 | Source: OECD 2018

Only 6% of Brazil's CO_2 emissions are priced at EUR30 or higher (the low-end benchmark), creating a carbon pricing gap of 94%. This gap is much higher than the G20 average of 71%. The price covers not only explicit carbon taxes but also specific taxes on energy use and the price of tradable emission permits.

FINANCE

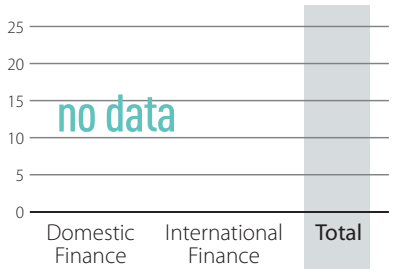
BRAZIL

Public finance

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

Public finance for coal[16]

(million US$)



No finance was identified for coal or coal-fired power production between 2016 and 2017 by the public finance institutions of Brazil.

- Domestic Finance
- International Finance

Data year: 2016-2017 average
Source: Oil Change International 2019

Commitments to restrict public finance to coal and coal-fired power[17]

MDB level	National development agencies and banks	Domestic export credit agencies	Export credit restriction in OECD
–	X	–	

Comment
The Brazilian Development Bank (BNDES) has announced it will no longer support coal plants.

X yes – no not applicable

Source: own research

Provision of international public support[18]

Brazil is not listed in Annex II of the UNFCCC and is therefore not formally obliged to provide climate finance. Despite this, Brazil has provided international public finance for mitigation via the Global Environment Facility (GEF) Trust Fund climate change mitigation focal area. While Brazil may channel international public finance towards climate change via multilateral and other development banks, it has not been included in this report.

Obligation to provide climate finance under UNFCCC

YES NO

United Nations Framework Convention on Climate Change

Bilateral climate finance contributions

Annual average contribution (mn US$, 2015-2016)	Theme of support			
	Mitigation	Adaptation	Cross-cutting	Other
0	0%	0%	0%	0%

Source: Country reporting to UNFCCC

Multilateral climate finance contributions

See Technical Note for multilateral climate funds included and method to attribute amounts to countries

Annual average contribution (mn US$, 2015-2016)	Theme of support			
	Mitigation	Adaptation	Cross-cutting	Other
0	0%	0%	0%	0%

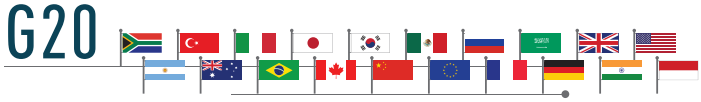
Source: Country reporting to UNFCCC

Core/General Contributions

Annual average contribution (mn US$, 2015-2016)
0

Source: Country reporting to UNFCCC

ENDNOTES



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

2) The 1.5°C fair share ranges for 2030 and 2050 are drawn from the CAT, which compiles a wide range of perspectives on what is considered fair, including considerations such as responsibility, capability, and equality. Countries with 1.5°C fair-share ranges reaching below zero, particularly between 2030 and 2050, are expected to achieve such strong reductions by domestic emissions reductions, supplemented by contributions to global emissions-reduction efforts via, for example, international finance. On a global scale, negative emission technologies are expected to play a role from the 2030s onwards, compensating for remaining positive emissions.

   The CAT's evaluation of NDCs shows the resulting temperature outcomes if all other governments were to put forward emissions reduction commitments with the same relative ambition level.

   The 2030 projections of GHG emissions are from the CAT's June 2019 update and are based on implemented policies, expected economic growth or trends in activity and energy consumption.

   The CAT methodology does not consider GHG emissions from LULUCF due to the large degree of uncertainty inherent in this type of data, and alsoto ensure consistency and comparability across countries.

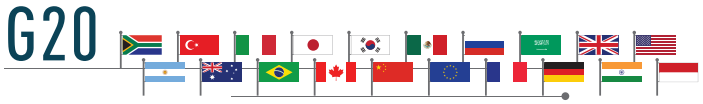
3) See the Brown to Green 2019 Technical Note for the sources used for this assessment.

4) The Decarbonisation Ratings assess the relative performance across the G20. A high scoring reflects a relatively good efforts from a climate protection perspective but is not necessarily 1.5°C compatible. The ratings assess both the 'current level' and 'recent developments' to take account of the different starting points of different G20 countries. The 'recent developments' ratings compare developments over the last five available years (often 2013 to 2018).

5) The selection of policies rated and the assessment of 1.5°C compatibility are informed by the Paris Agreement, the Special Report on 1.5°C of the International Panel on Climate Change (2018), and the Climate Action Tracker (2016): 'The ten most important short-term steps to limit warming to 1.5°C'. The table below displays the criteria used to assess a country's policy performance. See the Brown to Green Report 2019 Technical Note for the sources used for this assessment.

On endnote 5)	low	medium	high	frontrunner
Renewable energy in power sector	No policy 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 target or policy 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 policy 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-based light-duty vehicles by 2035 worldwide
Phase out fossil fuel heavy-duty vehicles	No policy	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)
Retrofitting exis-ting 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
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
(Net) zero deforestation	No policy or incentive 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

ENDNOTES (continued)



6) The 1.5°C benchmarks are based on the Special Report on 1.5°C of the International Panel on Climate Change (2018). See the Brown to Green 2019 Technical Note for the specific sources used for this assessment.
7) Total primary energy supply data displayed in this Country Profile does not include non-energy use values. Solid fuel biomass in residential use has negative environmental and social impacts and is shown in the category 'other'.
8) Large hydropower and solid fuel biomass in residential use are not reflected due to their negative environmental and social impacts.
9) The category 'electricity and heat' covers CO_2 emissions from power generation and from waste heat generated in the power sector. The category 'other energy use' covers energy-related CO_2 emissions from extracting and processing fossil fuels (e.g. drying lignite).
10) This indicator shows transport emissions per capita, not including aviation emissions.
11) This indicator adds up emissions from domestic aviation and emissions from international aviation bunkers in the respective country. Emissions by aircrafts in the higher atmosphere lead to a contribution to climate change greater than emissions from burning fossil fuels. In this Country Profile, however, only a radiative forcing factor of 1 is assumed.
12) This indicator includes only direct energy-related emissions and process emissions (Scope 1) but not indirect emissions from electricity.
13) This indicator includes emissions from electricity (Scope 2) as well as direct energy-related emissions and process emissions (Scope 1).
14) This indicator covers only gross tree-cover loss and does not take tree-cover gain into account. It is thus not possible to deduce from this indicator the climate impact of the forest sector. The definition of 'forest' used for this indicator is also not identical with the definition used for the indicator on page 3.
15) 'Effective carbon rates' are the total price that applies to CO_2 emissions, and are made up of carbon taxes, specific taxes on energy use and the price of tradable emission permits. The carbon pricing gap is based on 2015 energy taxes and is therefore likely to be an underestimate, as taxation has tended to increase in countries over time.
16) The database used to estimate public finance for coal is a bottom-up database, based on information that is accessible through various online sources, and is therefore incomplete. For more information, see to the Brown to Green 2019 Technical Note.
17) See the Brown to Green 2019 Technical Note for the sources used for this assessment.
18) Climate finance contributions are sourced from Biennial Party reporting to the UNFCCC. Refer to the Brown to Green Report 2019 Technical Note for more detail.

For more detail on the sources and methodologies behind the calculation of the indicators displayed, please download the Technical Note at: http://www.climate-transparency.org/g20-climate-performance/g20report2019

CLIMATE TRANSPARENCY

Partners:

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Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

based on a decision of the German Bundestag

Data Partners:

http://www.climate-transparency.org/g20-climate-performance/g20report2019

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