Benefits of climate action for Brazil

Brazil is the largest economy of Latin America and the home of the Amazon forests. Brazil's actions on climate will influence the future of the planet. This document provides a factbase to understand Brazil's economy and sources of emissions, and explains the numerous benefits climate action can bring for Brazil.

General facts and stats about Brazil's economy and demographic

- The population of Brazil in 2018 was ~209 million and it is expected to peak around 233 million in 2047. The Southeast region of Brazil is the most populated, with the metropolitan region of Sao Paulo and Rio de Janeiro having 12 million and 6.5 million inhabitants.
- Brazil is the largest economy of Latin America with a GDP of 1.869 trillion in 2018. From 1996 to 2014, the country experienced a rapid economic growth, driven by higher commodity prices and abundant capital inflows. In this period, the annual GDP growth rate averaged 3.1%. Between 2003 and 2014, Brazil also experienced a period of social progress with declining inequality and poverty levels (more than 29 million people).
- Since 2014, a combination of lower commodity prices and domestic policies have plunged Brazil deep into recession. The situation worsened in 2015-16, when its economy contracted by almost 7% and inflation remained close to 10%. Since 2017, Brazil has experienced a slow recovery, with 1.1% of GDP growth in 2017 and 2018. In 2019, Brazil's economy expanded 0.4% after shrinking 0.2% in the first quarter of the year. Forecasts about the future of Brazil remain uncertain, with many analysts expecting low growth levels.
- Brazil's agriculture and livestock sector represented ~24% of the total national GDP in 2017 - the highest proportion in 13 years. In 2018, Brazil's agricultural GDP fell by 0.5% driven mainly by a decline of 3.4% in crop production while livestock production increased by 3.2%. For the year 2019, a 0.4% growth is expected for the total agricultural GDP.
- In 2019, Brazil took over the US as the main beef exporter. Products derived from meat accounted for 22% of the total revenue (R$ 646 billion) of the country's food industry. Forecasts show that by 2028, Brazil will account for 23% of the world's total beef exports.
- Brazil is one of the main commodities exporters globally. Its main exports are: soybeans (US$25.9 billion), iron ore (US$20.1 billion), crude petroleum (US$17.4 billion), and raw sugar (US$11.4 billion).
- Brazil is the second largest soy producer globally, with more than half of all its croplands dedicated to soybean cultivation.
- The country is also a large producer of oil and gas. In 2018, the country hit a record year for crude oil exports, selling 1.12 million barrels per day, representing a 13.3% increase from 2017.
- Brazil is the second largest biofuel producer in the world after the US, accounting for 23% of the world's total biofuel production, mainly ethanol from sugarcane.

Sources of emissions in Brazil

- Brazil's is the sixthest largest greenhouse gas (GHG) emitter, with most emissions coming from the agriculture, land-use and forestry sectors (AFOLU) - 46% of the total GHG emissions in 2017.
- Agricultural activity is the main source of Brazilian GHG emissions, almost 1.5 billion tonnes of carbon dioxide (CO_2) in 2017, or 71% of the country's total emissions. If it were a country, Brazilian agribusiness would be the eighth largest emitter in the world, ahead of Japan.
- Brazil's power sector is one of the least carbon-intensive in the world, and more than 98% of Brazil's population has access to electricity. Brazil is the second largest producer of hydropower globally, which accounts for 80% of its domestic electricity. But prolonged droughts have constrained its expansion, pushing the country towards other energy sources.
- In 2017, the transport sector accounted for most of the energy sector emissions (48%), followed by energy consumption in industry (15%) and electricity generation (14%). Electricity generation had the largest emission increase (7%), driven by rises in fossil fuel thermoelectric generation (9%) and declines in hydropower generation.

- Brazil holds the largest renewable energy market in Latin America[1] and almost ~ 45% of its primary energy demand is met by renewable energy. The country's wind power production has been growing significantly, from 1.9 to 14.4GW, between 2012-18. Future forecasts show that hydro, renewables and nuclear will represent half of the brazilian energy mix in 2040. Onshore wind, which is the third largest source of electricity, is expected to reach 22.6 GW of installed capacity by 2022.
- Lower deforestation, which dropped by 12% in 2017, has contributed to the 2,3% decline in the total national GHG emissions in 2017 relative to 2016. In the Amazon region, deforestation decreased by 71 million tonnes of CO_2 from 2016-17, reducing emissions by 5.5% in 2017. But increasing deforestation and the ongoing fires in the Amazon will likely drive emissions up again.

Deforestation drivers and wildfires

- In the past two years, deforestation in Brazil has been increasing. In 2018, the area deforested was 7.8 million km², with total deforestation increasing 13.7% from 2017 and 72% from historic lows[2]. Brazil recorded the world's highest loss of tropical primary rainforest of any country in 2018, reaching 1.3 million hectares, largely due to deforestation in the Amazon. Between Aug 2018-19[3], deforestation in the Amazon has risen by 15% (5,054 km²)
- The major drivers of deforestation in Brazil are agricultural expansion and land speculation. Creation of new pastures alone is the main reason for tree cover loss in all forest types.
- Between 2000 and 2014, croplands in Brazil rose from 26 to 46.5 million hectares - an area bigger than Sweden. This expansion is linked to the cattle industry and land speculation, with 80% of new cropland coming from the conversion of pastures instead of direct conversion of native vegetation[4].
- Amazon conversion to pastureland remains high despite declines between 2006 and 2017[5]. The Cerrado savannah has also seen rapid deforestation because of agricultural expansion (soy plantations and pastureland). Deforestation in the Cerrado was 2.5 times higher than in the Amazon, mainly due to weaker legislation in the region.
- In 2019, there has been a surge in wildfires in the Amazon by 60% when compared to the last 3 years. This rise is linked to increases in deforestation rather than with droughts, with 33% of the 45,256 fires outbreaks recorded until August 2019 occurring on private properties that cover 18% of the region.
- The extent of the environmental impacts of agriculture in Brazil goes beyond deforestation and far outweigh the agrobusiness revenues. For example, for each R$ 1 million revenue of the cattle production in Brazil, there is R$ 22 million loss of foreign capital in the form of GHG emissions, air and water pollutants, waste, and water use.

Projected climate impacts across Brazil and Latin America

Climate change scenarios for Brazil show that:

- It is very likely that climate change will trigger a process of "savannization" of the Occidental Amazon basin. This, in turn, will cause a major change in hydrology. As of now, the expansion of agriculture and livestock occurred in regions that will suffer with less rain and, therefore, will lose production.
- This pattern will affect a vast area from the southwestern part of the Amazon along an arc all the way down to the Southeast.
- Climate models show that it is likely that a desertification process will accelerate in the Northeast.

With 1.5 degrees Celsius of global warming:

- Under a low emissions scenario[6], Latin America could see about 5.8 million internal climate migrants by 2050.

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[1] In 2018, it had 135.6 GW of cumulative installed capacity.

[2] This was in 2012, when deforested area was a total of 4571 km². http://www.obt.inpe.br/OBT/assuntos/programas/amazonia/prodes

[3] Data is from the Sistema de Alerta de Desmatamento (SAD), do Instituto do Homem e Meio Ambiente da Amazônia (Imazon), which monitors part of the region. Thus, numbers must not reflect the entire rate of deforestation in the Amazon.

[4] In Brazil, deforestation happens as a two-step process where forests are cut to create pasture, and over time, these lands are converted to croplands, especially soy. These lands are usually sold at high prices.

[5] There has been a rapid increase in 2016.

[6] RCP2.6 - where temperatures rise 1.3-1.9 degrees Celsius by the end of the century

- Rising temperatures, drought, and unstable weather patterns have serious implications for global food production. Every degree of global temperature rise reduces global yields of wheat by 6.0%, rice by 3.2%, maize by 7.4%, and soybean by 3.1%.

With more than 1.5 degrees Celsius of global warming:

- Globally, agricultural yields fall rapidly between one and three degrees Celsius of warming. Once local temperatures reach three degrees Celsius above pre-industrial levels, all crops are negatively affected, wherever they are in the world - including in temperate regions. Fish species go locally extinct, with serious impacts on fisheries.
- Under a high emissions scenario[7], Latin America could see about 10.5 million climate migrants by 2050.

Benefits of limiting temperatures to 1.5 degrees Celsius of global warming:

- About 3.3 million cases of dengue fever annually in Latin America and the Caribbean could be avoided compared with a no-policy scenario with warming of 3.7 degrees Celsius (an additional 0.5 million per year, compared with two degrees Celsius).

Benefits of climate action for Brazil and new areas of raising ambition

Climate financing

- Clean energy investment is expected to grow. Investment in clean energy already rose to US$12 billion in 2017, wind was US$4 billion and solar was US$2 billion. Overall, wind power was responsible for 56% of US$57 billion clean energy investment between 2010 and 2017, whereas solar accounted for 6%. Wind energy investments are expected to continue growing to US$24.5 billion by 2020.
- The Brazilian green bond market is growing rapidly, with the majority of finance coming from corporate entities (73%). Energy projects have received the largest proportion (42%) of financing. Beyond the green bond market in Brazil, bonds are financing climate projects that are not labelled as green, but have climate benefits. The size of this market is at least US$2.9 billion. The potential for the national green bond market could exceed US$6.5bn.
- The publicly funded Brazilian Development Bank (BNDES) is the largest provider of credit to the Brazilian renewable energy sector. BNDES offers subsidised loans for up to 80% of capital costs for solar and 70% of wind power. BNDES was the largest investor in renewable energy, with $27 billion loaned between 2008 and 2017. Financing from BNDES comes with a requirement of 65% for renewable projects to be supplied by local content.
- The Green Climate Fund has already approved 3 projects in Brazil, with a total amount of funding approved of US$556.5 million. All funding is for mitigation projects in the forestry and energy sectors.
- Brazil's Superintendência de Seguros Privados (private insurance) recommended implementation of the task force on climate-related financial disclosures in 2017 to overcome challenges in raising green finance. The Brazilian central bank has now introduced new requirements for monitoring environmental risk and enhanced due diligence for financial institutions' lending practices.
- In 2017, the Brazil's Green Finance Initiative was established. It brings together high level representatives from Brazil's pension funds, public and private banks, insurance companies, local market institutions and key industrial sectors to develop and promote policy and market mechanisms to catalyse green investments in Brazil.

Economy and energy security

- Clean energy sector could drive further economic growth, as private investment in wind energy is increasing in the Northeast. The country has also been holding competitive auctions to procure clean energy and contracted 24.8GW of solar and wind projects between 2009 and 2017.
- Brazil has generated 1.9 million green jobs in the renewables sector - the second-highest globally. Brazil has the world's highest workforce in biofuels (795,000), followed by large hydropower (184,000), solar (42,400) and wind (33,700).

[7] RCP8.5 - where temperatures rise 4.0-6.1 degrees Celsius by the end of the century, and moderate development

- Brazil spent US$16.25 billion on fossil fuel subsidies in 2016, placing the country's fossil fuel subsidies as a share of GDP above the G20 average.
- The oil and gas sector is dominated by state-owned Petrobras, which owns 96% of proven oil reserves and 72% of gas reserves. Brazilian government could avoid blowing its carbon budget by investing in renewables instead. The challenge is to find alternatives for the 70% of goods that are transported in Brazil by diesel powered trucks.

Agriculture

- Minimising the impacts of climate change can optimise planting and harvesting timelines, farming methods, and farmland availability in Brazil.
- Improved technology in the agricultural sector has the potential to offset the challenges presented by climate change.
- Brazillian farmers are applying new methods to combat climate change. They are using different types of legume crops that contain bacteria that convert nitrogen from the air, helping to fertilise soil. Crops planted in the legume residue benefit from the nitrogen, allowing farmers to minimise the use of chemical fertilisers.
- Farmers are also integrating cropping-livestock methods in order to use land more efficiently, reducing by 89% the GHG emissions from urine and dung.
- Agricultural area encompasses only 30% of the Brazilian territory, and current and future productivity gains could help double production without the need for more land.
- In Brazil, 79% of plant-based protein is grown to feed animals. Thus, there is potential to shift much of the agricultural productivity from the feed industry to cultivation of ingredients that could be used in a variety of plant-based protein products, which have lower environmental impact than animal production.
- In Brazil, preserving the natural vegetation can help with the sustainable development of the country. The country has 270 million hectares of native vegetation on rural properties - between unprotected areas and the Legal Reserve - that yields R$6 trillion a year in ecosystem services like pollination, pest control, water security, among others.

Enhance the rule of law in the Amazon

- The price for carbon, specially in REDD+-like projects in the Amazon, can reach US$3 per tonne. If applied widely throughout the region it could help discourage about 75% of cattle ranching in the forest region. If this was increased to US$50 per tonne of carbon, deforestation could drop by 95%.
- The Brazilian state of Mato Grosso issued one of the world's largest subnational programs to help mitigate the impacts of climate change. In 2015 the Produce, Preserve and Include Program was launched, which aims to recover "2.5 million hectares of degraded land, to reduce deforestation in the Amazon by 90% and in the Cerrado by 95% and to extend the area under sustainable forest management from 2.8 million to 6 million hectares by 2030."
- Allowing indigenous communities rights over forestlands in the Amazon could lower deforestation rates by 2.5 times. This could bring benefits (like the local and global benefits combined) of a net total in Brazil ranging between US$4,636/ha and US$10,402/ha.
- Indigenous forest land-tenure security has the potential to avoid 31.76 Mt CO2 per year in Brazil. This is about the same as 6.7 million cars taken off the roads for one year.
- Pará, an Amazonian state, has developed the Pará 2030, a set of strategies that aim to reduce emissions and promote restoration.
- Using a blockchain (technology used to support bitcoin), Brazil is looking to reduce fraud in the country's land titling system. The platform could help reduce fraud and corruption associated with the old system and improve control in the region.

Human health

- In Brazil, heat-related deaths among the eldery population (65+) are expected to increase to ~72 deaths per 100,000 by 2080. A rapid reduction in emissions could reduce the number of deaths by about 59 per 100,000.
- In Brazil, 336,000 deaths are caused by air pollution. Outdoor and household air pollution is predominantly caused by the burning of solid fuels (biomass or charcoal) for cooking. Nearly 300 child deaths in Brazil are caused by acute lower respiratory infections due to household air pollution. Switching to cleaner fuels could help to lower the number of adults and children vulnerable to air pollution-related illnesses and help limit temperature rise.

- Smoke arising from the increase in wildfires in the Amazon Region in 2019 can trigger a series of respiratory problems among those who live in the region, increasing public health expenditure and economic losses due to the absence of employees. The states of Acre and Rondonia have already recorded emergency public health emergencies because of air pollution, with people breathing much more particulate matter than is recommended by the World Health Organization.
- By implementing 14 short lived climate pollutant reduction measures, about 9,800 premature deaths caused by outdoor air pollution could be avoided in Brazil by 2030.
- The mosquito-borne Zika virus was found in Brazil in 2015. Due to rising temperatures and changes in rainfall patterns, with the virus rapidly spreading in the Northeast region of Brazil. The epidemic is controlled, but can re-emerge as temperatures keep rising. Reducing emissions and, consequently, temperatures, can minimise this risk.

Food security

- Brazil's dietary guidelines (2014) is unlike any other in the world as it takes a novel approach to nutrition by making natural and minimally processed foods the building blocks of a healthy diet. But, overweight and obesity rates have risen dramatically, with 20.8% (26 million people) of the adult population, are obese. This has mainly been driven by the consumption of ultra-processed foods. Brazil has a high consumption of meat - nearly 26kg and 38kg of beef and chicken per year, which can also be associated with high obesity rates and other diet-related diseases.
- Increasing consumption of 'functional foods'[8] could reduce obesity rates and increase income for smallholder farmers, as they are 'low volume, high value' products that work well with smallholder cropping systems.
- Demand for plant-based and healthy products has been rising. In a 2018 survey, almost 30% (60 million people) of Brazilians were already eating less meat due to health concerns. Another study has shown that 48% of Brazilians had eaten less meat in 2014. This changes in eating habits present an opportunity for food companies to diversify its products, offering more-plant based options. This is also an opportunity to reduce the environmental impacts of agriculture production in the country.
- The younger generation is driving the shift to healthier foods, with a number of plant-based companies either created or managed by them, like NoMoo, VidaVeg (plant-based cheese) or HeyHo (snacks).

International relations

- Brazil's support of climate action makes the country a world leader on climate change. Its NDC promises an absolute reduction in emissions - the only one amongst large developing countries.
- Starting with the Earth Summit in 1992, Brazil played a global leadership role in the issues of environment and sustainable development. The country has pushed for fair recognition of developing countries in the international climate regime, and secured an international financing mechanism for the global South.
- Brazil's decision to withdraw from hosting the 2019 UN global summit on climate change damaged the reputation of Brazil as a leader. It shows the country quits being an influential player in mitigating the effects of global warming. At the same time, the current administration political agenda is dismantling environmental legislation and cutting down budgets for actions to combat climate change.
- Unlike the US, Brazil has a lot to lose financially from weakening its commitment to the Paris Agreement. Brazil needs more investment to advance its low-carbon energy sector. Foregoing the Paris Accord could adversely impact Brazil's economy. European clients might stop buying beef and crops from a country that removes itself from the climate challenge.

Cities infrastructure

- While 86% of Brazil's population is living in urban areas, it has limited policy instruments to improve the resilience of its infrastructure and reduce GHG emissions.
- Brazil plans to slash GHG emissions from road transport in cities by 19.5 Mt CO_2e by 2020. The country allocated US$22billion for urban mobility investments from 2014 to 2021, and passed a federal mobility law requiring cities to develop mobility plans.

[8] Include foods that have direct health benefits like reducing cholesterol, improving liver function, reducing hypertension.

- Increasing energy efficiency by 50% in urban buildings could have saved 25TWh of electricity between 2015 and 2022.
- As storms are becoming more severe, there has been an increase in floods which adversely impact the transport infrastructure and electricity grid in cities. 463 cities are under risk from rising sea levels, affecting almost 26% of Brazil's population.
- A growing of cities join the international networks to develop resilience plans, including Cities Climate Protection, the C40 Cities and the Rockefeller 100 Resilient Cities. Sao Paulo's climate policy was a pioneer in setting goals for GHG emission reduction, followed other cities such as Belo Horizonte, Feira Santana, Porto Alegre and Rio de Janeiro.

Emissions

- Brazil committed to reducing GHG emissions by 36% below 2005 levels by 2025 and 43% by 2030. To reach this target, the country plans to increase the share of renewable energy to 45%, end illegal deforestation in the Amazon, and restore 12 million hectares of forests by 2030.
- A McKinsey study in 2009, pointed out that Brazil could potentially slash its GHG emissions by 70% by 2030 implementing a series of measures across its sectors. Yet, Brazil's current sectoral policies are incompatible with the Paris Agreement. With the existing level of implementation, GHG emissions are expected to rise to 1,095 $MtCO_2e$ by 2030, leaving out those from deforestation.
- Leaving the Paris Agreement and the political support for deforestation will likely increase emissions from land use and forestry. Brazil needs to strengthen implementation in the forestry sector. Brazil took drastic measures to reduce deforestation in the Amazon, but under the current government deforestation has surged, which will impact its emissions and forest commitments.
- There is increasing potential to reduce emissions from cities. For example, the city of Sao Paulo, emits about 20 million tCO_2e alone - if it were a Brazilian state, it would be the eighth largest emitter. For cities, the greatest potential for reduction is in the transport sector as cars emit three times more pollution than buses. Incentives for new forms of mobility in Brazilian cities can reduce emissions and generate other positive effects, such as improved breathing air quality in large urban centers.
- The waste sector, which emitted 91 million tonnes of CO_2 equivalent in 2017 has also potential to reduce emissions. At city level, only 20% of Brazilian cities collect and treat more than 50% of their domestic wastewater. Thus measures to expand access to sanitation and reduce emissions need to be put in place to decarbonise this sector.

This briefing was compiled by researchers in Europe and the US. For more information or questions, please contact info@mission2020.global, or visit mission2020.global.

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