



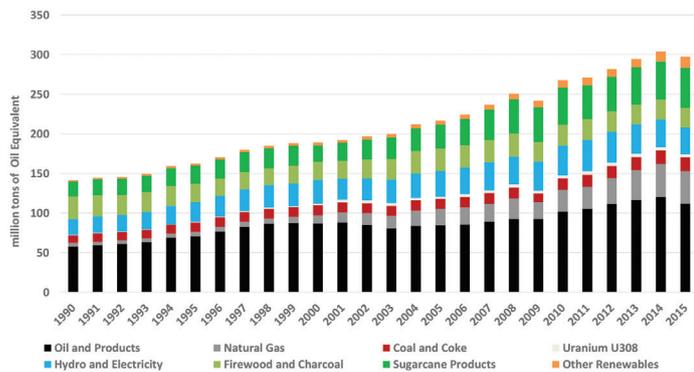
In 2015, 41% of Brazil's domestic energy supply¹ came from renewable sources². However, despite the strong presence of renewable sources in the country's energy matrix, oil and natural gas have been the primary sources with the highest growth rates since 1990³.

In 2015, oil products accounted for 37% of total energy supply, followed by sugarcane (17%), natural gas (14%), hydropower (11%) and firewood and charcoal (8%). Wind, nuclear, coal and solar filled the remaining 13%.

The major final consumers of primary energy⁴ are in industrial uses and road transportation.

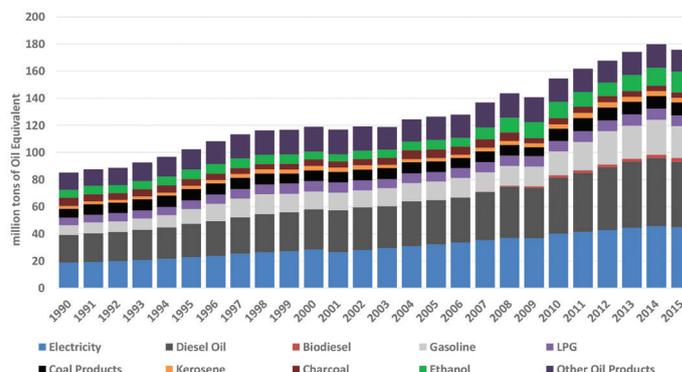
Brazil's freight transport relies heavily on road transportation, which creates a dependency on trucks. On the other hand, the passenger transportation sector has increased its reliance on individual motorized transportation, with a robust growth in cars and motorcycle use. In turn, diesel and gasoline use has the highest growth rate among all fuels that compose the country's energy matrix⁵.

BRAZIL: DOMESTIC ENERGY SUPPLY



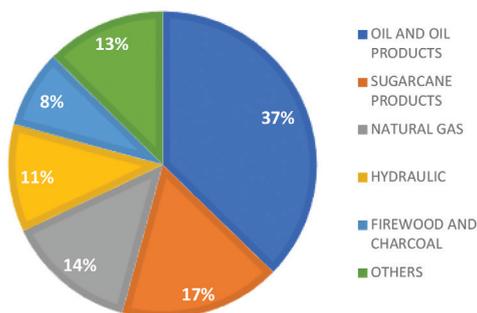
Source: National Energy Balance 2016. EPE/MME.

BRAZIL: FINAL SECONDARY ENERGY CONSUMPTION



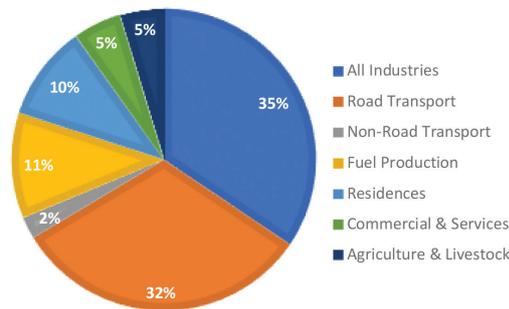
Source: National Energy Balance 2016. EPE/MME.

BRAZIL: DOMESTIC PRIMARY ENERGY SUPPLY, 2015



Source: National Energy Balance 2016. EPE/MME.

BRAZIL: FINAL PRIMARY ENERGY CONSUMPTION BY SECTOR, 2015



Source: National Energy Balance 2016. EPE/MME.

1. 299 million tons of oil equivalent (toe).
2. The worldwide average in 2015 was 14%. Brazilian Energy Balance 2016, EPE/MME.
3. In 1990 this proportion was 61%.
4. In 2015, 246 million tonnes of oil equivalent (toe).
5. In 2015, diesel and gasoline accounted for 41% of all energy and 72% of all petroleum products consumed.

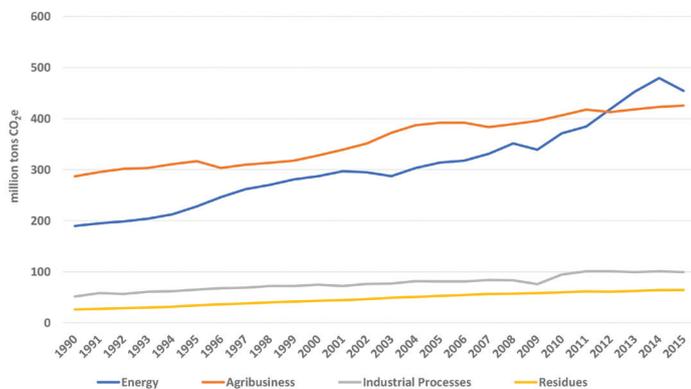
BRAZILIAN CO₂ EMISSION FROM ENERGY

The fastest growing source of CO₂ emissions in Brazil is energy. Since 2012 it has been one of the country's main sources of emissions, only behind land-use & land-use changes (LULUCF).

The largest share of energy-related CO₂ emission comes from passenger transportation (25%), followed by freight transportation (22%), industry (18%) and electricity generation (15%), according to 2105 data. The highest growth rate in the last decade, however, has come from electricity generation.

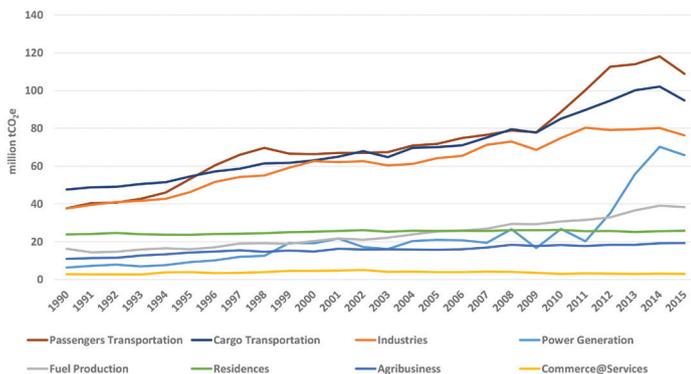
Data from the Independent Systems Operator (ONS)⁶ shows the CO₂e emissions from electricity generation is fast growing since 2011 and reaching around 70 million tons of CO₂ per year in 2014. The worst economic recession the country has seen in more than 30 years, from 2015 to 2017⁷, decreased it

BRAZIL: GHG EMISSIONS W/OUT LULUCF



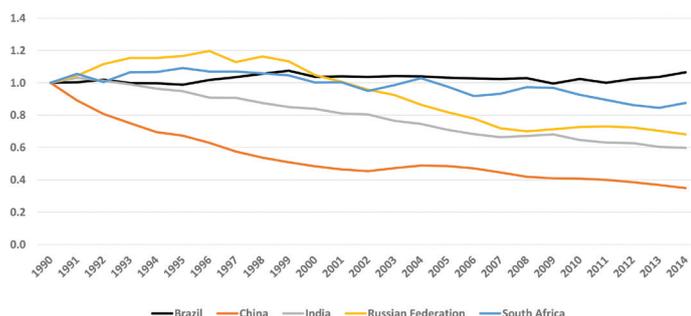
Source: SEEG, Climate Observatory, 2017.

BRAZIL: ENERGY'S GHG EMISSIONS, BY SECTOR



Source: SEEG, Climate Observatory, 2017.

ENERGY USE: TOE PER MILLION US\$ PPP 2011; 1990=1



Source: World Bank, 2017.

to around 60 million tons of CO₂ per year. When it comes to future economic growth, it is possible to predict a proportional increase in CO₂e emission from electricity generation, unless changes in the energy matrix are implemented immediately.

CHALLENGES FOR THE POWER SECTOR

- In Brazil, the energy consumed to produce one unit of GDP has been stable for the past 20 years, whereas this has fallen sharply in the other BRICS countries. Decoupling economic growth from the energy demand needs to be achieved through robust gains in energy efficiency.
- Integration of new renewable and intermittent⁸ sources of energy to the grid. This challenge has technical components (protection, reinforcement and instrumentation) but is mainly regulatory. The operation of the power system uses computing operational models designed at a time when hydropower plants with reservoirs were predominant⁹.
- Build a democratized power sector. To comply with the Paris Agreement, GHG emissions from the power sector should be reduced to zero by 2050. Brazil has sufficient primary energy sources (solar radiation, wind, biomass, etc.) to achieve this, but it is up to the Brazilian society to guarantee compliance throughout future government terms. Today, there is still a lack civil society participation in the major decisions and further monitoring. That could have prevented mistakes such as the Belo Monte hydropower plant and the new coal-fired power plants in Rio Grande do Sul.

ELECTRICITY AND NDC

The NDC proposes to “increase the sustainable use of renewable energy, excluding hydropower, to at least 23% of Brazil's electricity generation by 2030”. Combining all the indications for renewables in this document, 67% of the new electricity supply is still expected to come from new hydropower plants by 2030.

This is in line with the last PDE 2024¹⁰, but it hides a problem: hydropower plants are a long way from been a consensus. Brazilian society sees hydropower plants, particularly in the Amazon, as a source of environmental degradation, banishment of indigenous peoples from their original lands and social conflicts in the municipalities impacted by their construction. This is one aspect of the power sector's contribution to the NDC that should be addressed immediately.

6. <http://www.ons.org.br/home/>

7. The economic recession is still ongoing.

8. Wind and Solar Photovoltaic.

9. The hydroelectric plants built in the last twenty years, and those planned for the next 10 years, are predominantly run-of-the-river hydropower plants (ROR), demanding thermal power plants using coal or natural gas as complement.

10. Decennial Plan for (Expansion of) Energy.

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