

RIO DE JANEIRO STATE APPENDIX

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Secretaria de
Estado do
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GOVERNO DO ESTADO
RIO DE JANEIRO
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EXECUTIVE SUMMARY

The State of Rio de Janeiro (ERJ) is particularly vulnerable to natural disasters associated with extreme events as a result of historical and constant changes in physical space and biophysical issues such as mountainous relief, river and stream mischaracterization, and the deforestation of the original Atlantic Forest cover, as well as the disorderly occupation of its coastal zone. In addition, its location in a transitional area between atmospheric systems favors the occurrence of heavy rain events, causing flooding and landslides, which cause societal disruption and socioeconomic damage. This situation combined with global warming places the state of Rio de Janeiro in a position of high vulnerability to climate change impacts. According to the State's Adaptation Final Report, many sectors can suffer with these effects, like sea level rise and water crisis in the Paraíba do Sul basin. The state presents the third biggest population in the country with 96.71% of its population living in urban areas, which means that the effects of climate change could potentially affect a great number of people and the state economy.

On the other side, besides Rio de Janeiro established since 2010, principles, goals, guidelines and instruments to prevent and mitigate the effects and adapt the State to climate change through its State's Climate Change Policy, the emissions increased 40% from 2005 GEE Inventory, according to III Rio de Janeiro's Greenhouse Gases Emissions Inventory (2015).

The Rio de Janeiro State's Climate Change Plan of the State was published in 2012, and hasn't been reviewed since, and so it needs urgent reevaluation, including broad engagement and articulation with other government sectors to meet proposed goals. Parallel to this effort, SEAS are also leading the climate change adaptation agenda, and in 2018 the first phase of the Adaptation Plan was finalized, which consisted of a great effort to analyze state vulnerabilities.

The state goals for the climate change agenda are:

- 1. Raise ambition to set long term goals to mitigate GHG emissions following Brazil's NDC*
- 2. Update the climate change planning, including the revision of the State Climate Change Plan, which includes an assessment of the fulfillment of the mitigation targets proposed in 2012, a review of the proposed new and / or adaptation of ongoing goals, and a sectoral and municipal engagement;*
- 3. Reactivate the main governance instrument, the Climate Change Rio Forum;*
- 4. The elaboration of the 4th State Inventory of Greenhouse Gases 2020 base year;*

STATE CHARACTERIZATION

The State of Rio de Janeiro is part of the Southeast region of Brazil, bordering the States of São Paulo, Minas Gerais and Espírito Santo. It has the third biggest population in the country, with a population estimated on 17,264,943 people for 2019, and it's the second most densely populated State (365.23 inhab/km²). The State has 96.71% of its population living in the cities, well above average for Latin America (80%), which is considered high. The state capital, the city of Rio de Janeiro that along with its metropolitan region is considered the 4th megacity in size in Latin America. According to Brazil's Human Development Atlas, Rio's Gini Coefficient is 0.59, which means that the social inequality in the State is still big, even considering the Brazil index (0.515).

Rio de Janeiro's State has an area of 43,750.423 km², and the State territory is composed entirely of the Atlantic Forest biome. It contains a considerable number of protected areas, divided into: 19 federal protected areas; 39 State protected areas, being 23 of them strict protection and 16 for sustainable use; 80 municipal protected areas; and 89 Private Reserve of Natural Site Heritage (in Portuguese the known as its initials "RPPN").

Rio de Janeiro's GDP was around R\$ 640.186,00 million for the year 2016, representing 10,2% of national economy. According to IBGE, the economy of Rio de Janeiro is based on the service sector, which represents 68.74% of the State's GDP (R\$ 440 million). The main activities for this sector are in the public and commercial area. The III Rio's GHG Emissions Inventory shows that these 2 areas combined represent over 28% of the State's energy consumption, becoming 54.1% along with the residential area sector. This means that the services sector is the biggest responsible for the energy consumption on Rio de Janeiro, which, in turn, is also the main GHG emissions source. In 2014, the energy consumption in Rio de Janeiro was 54,860 GWh (0,85 MWh/inhabitant) and the residential sector was responsible for 25.4% of it.

In 2015, the installed capacity of the generating park of public service power stations in the State of Rio de Janeiro was around 7.343 MW while the self-generation capacity approached 926MW, totaling 8.269 MW or 5.87% of the country's installed capacity (III Rio de Janeiro's Greenhouse Gases Emissions Inventory, 2017). Most part of this generation is based on thermoelectric plants, which represent 67.7% of the State's energy generation, and nuclear plants, representing 25.3%. The electricity production has major environmental impacts. Specifically, in the case of thermoelectric plants, in addition to emitting GHG, they contribute to local and regional pollution due to emissions from the use of fossil fuels (III Rio de Janeiro's Greenhouse Gases Emissions Inventory, 2017).

The agricultural sector is the weakest one on the State's economy, representing only 0.48% of its GDP (R\$ 3,076 million), and it's also the sector with the lowest GHG emissions. However, according to the III Rio de Janeiro's Greenhouse Gases Emissions Inventory, the main ground cover class is field/pasture, with a total of 52.19% of the State's area in 2015. The Atlantic Forest covers a total of merely 18.7% of the State, according to the NGO SOS Mata Atlântica, 2019. Even so, according to them, recently the Rio de Janeiro' State has reached zero deforestation, which means a big improvement for both State's climate and forestry related policies.

Rio de Janeiro's State is highly vulnerable to climate change impacts. According to the State's Adaptation Final Report, many sectors can suffer with these effects, like sea level rise and water crisis in the Paraíba do Sul basin, which, in turn, can cause new conflicts like the one that happened between Rio de Janeiro and São Paulo from 2013 to 2015. Besides that, the climate change can: potentially increase vector diseases and physiologic disease's transmissions; overload the drains system, causing floods; possibly increase the landslides; cause damages on

the roads and instability on the bridge decks; cause some species extinction and harm the agricultural productivity; and cause many damages by the sea level rise, since most of Rio de Janeiro's population live on the coastal zone. A table at the end of this appendix shows some possible impacts caused by climate change on the State.

EMISSION PROFILE IN RIO DE JANEIRO

According to III Rio de Janeiro's Greenhouse Gases Emissions Inventory (2015), the emissions reached a total of 92,689.74 GgCO₂e, and the main emission drivers were the Energy and the Industrial Processes activities. The Agriculture, Forest and Land Use- AFOLU emissions were the lowest in the State, with the land use emissions reaching negative amounts (carbon removal).

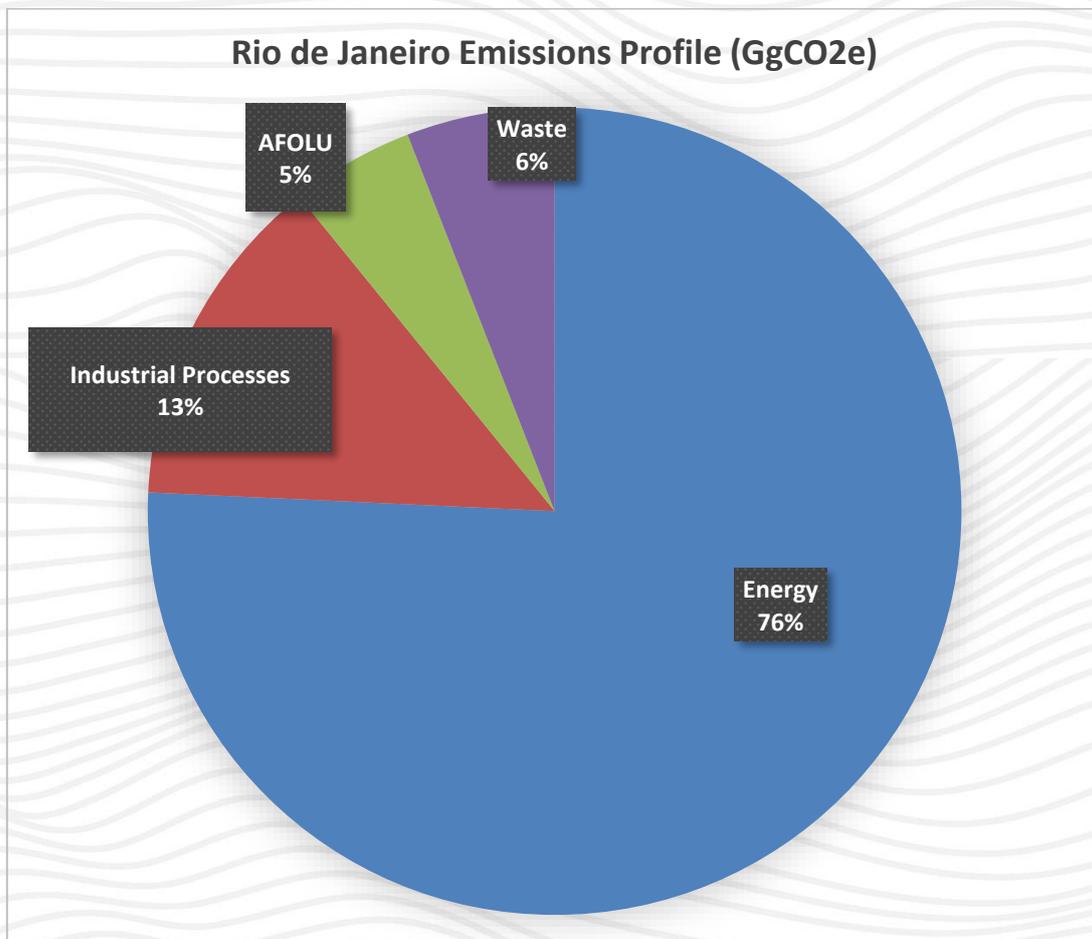


Figure 1 – Gross CO₂e Emissions in Rio de Janeiro, according to III Rio de Janeiro's Greenhouse Gases Emissions Inventory (2015).

The energy sector was responsible for about 75% of the States' GHG emissions in 2015. The main driver for the energy's emissions, responsible for 58,5% and 41,080 GgCO₂, was the final consumption uses. In turn, the sector that generated the most energy's GHG emissions was the transport sector, which accounted for 38.1% of these emissions, being the biggest villain in the transport sector road transport modal (Table 2).

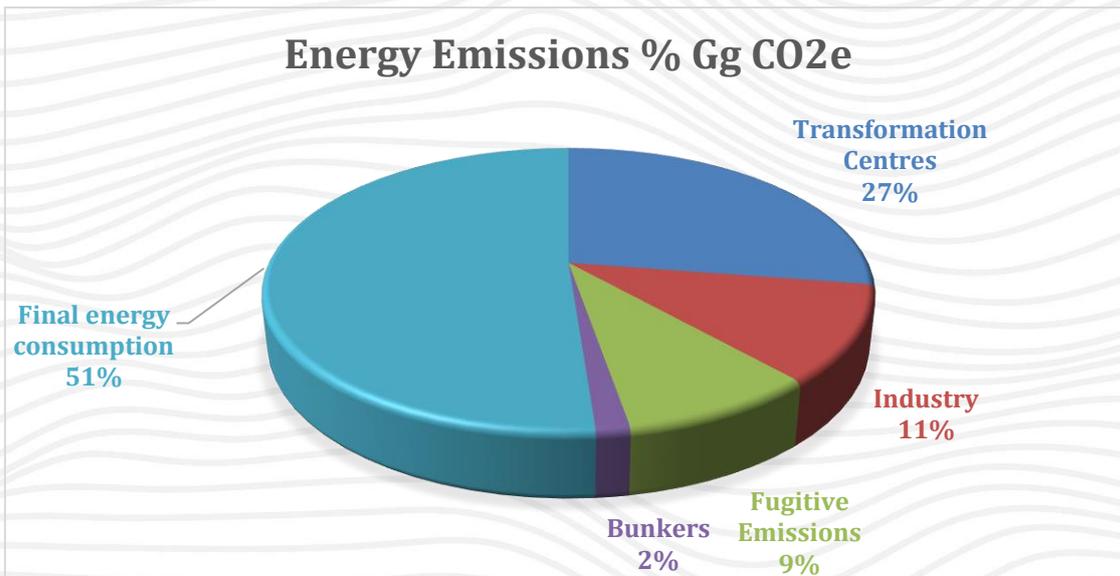


Figure 2 – Energy emission, according to III Rio de Janeiro’s Greenhouse Gases Emissions Inventory (2015).

Table 1 – Energy emission by sector, according to III Rio de Janeiro’s Greenhouse Gases Emissions Inventory (2015)

Sector	Emissions	
	Gg CO2e	%
Transformation Centres	22.024	31,40%
Final energy consumption	41.080	58,50%
<i>Energetic sector</i>	10.743	26,20%
<i>Residential</i>	3.377	8,20%
<i>Commercial</i>	1.655	4,00%
<i>Public</i>	695	1,70%
<i>Agricultural</i>	132	0,30%
<i>Transports</i>	15.648	38,10%
<i>Road</i>	11.692	74,70%
<i>Railway</i>	286	1,80%
<i>Airway</i>	2.586	16,50%
<i>Waterway</i>	1.083	6,90%
Industry	8.830	12,60%
Fugitive Emissions	7.099	10,10%
Bunkers	1.221	1,70%
ENERGY TOTAL	70.203	100%

The most emitting region of the State is the North Fluminense Region, responsible for 48.4% of these emissions, mainly due to the large thermoelectric natural gas production, and fugitive emissions related to oil and gas exploration and production activities. Then comes the Metropolitan Region, which accounts for 34% of the state's emissions, mostly because of its large population and consequent high final energy demand, and some of it due to industrial concentration and transformation centers. After that, there is the Middle Paraíba’s Valley Region, with 10.4% of the state's emissions due to its transformation centers and, to a lesser extent, final energy consumption by industries and the transportation sector.

CURRENT STATE'S CLIMATE CHANGE POLICY

Since 2010, Rio de Janeiro has a State's Climate Change Policy, which establishes principles, goals, guidelines and instruments to prevent and mitigate the effects and adapt the State to climate change. This policy's goals are:

- I - stimulate changes in society's behavior, in order to modify production and consumption patterns, aiming at reducing GHG emissions and increasing their removal by carbon sinks;
- II - promote the participation of the use of renewable energy sources in the State;
- III - promote changes and technological substitutions that reduce resource and resource use and emissions per unit of production, as well as the implementation of measures that reduce greenhouse gas emissions and increase anthropogenic carbon sink removals in the State territory;
- IV - identify the needs and measures required in order to adapt it to the adverse effects of climate change in the municipalities of the State of Rio de Janeiro;
- V - foster the competitiveness of goods and services that contribute to reducing greenhouse gas emissions.
- VI - preserve, conserve and recover environmental resources, considering the protection of biodiversity as a necessary element to avoid or mitigate the effects of climate change;
- VII - consolidate and expand legally protected areas and encourage reforestation and the restoration of vegetation cover in degraded areas.

To accomplish that, the policy relies on some instruments, such as the State's GHG Emissions Inventories, the Rio Climate Change Forum and, mainly, the State's Climate Change Plan. This plan presents mitigation and adaptation targets for the State to be reached by 2030, most of them based on 2005 emissions. For the adaptation, 2 targets are presented, focusing on water and vegetation (Table 3). The mitigation targets are divided into 3 sectors: energy; waste and sewage; and transports, plus a general target based on the State's GDP. For each sector, the plan provides a small context, which includes its 2005 emissions, followed by the mitigation targets and some action lines to get to these targets. The table 4 below presents the targets for the sectors.

Table 3 – Adaptation targets of the Rio de Janeiro State's Climate Change Plan

Sector	Goals	Targets	Target Year
Water resources	Growth of flood control and watershed recovery	Increase from 40 to 400 linear kilometers of projects and construction works on river banks.	2030
AFOLU	Expansion of the Rio Rural Program from 400,000 ha to 1,700,000ha	Establish 266,000ha with conservationist actions and sustainable management of agricultural activities.	-
		Implementation of 1,100 ha of agroforestry systems	
		Regeneration or restoration of 800ha of native forests 60,000ha of economic afforestation implemented through forestry projects	
		Implementation of 700ha rotational intensive grazing	

Table 4 – Mitigation targets of the Rio de Janeiro State’s Climate Change Plan

Activity	Targets	Base Year	Target Year
Sewage	Reduction of GHG emissions per capita by 65% over the base year (leaving the level of 31 kg CO2e / inhab / year in 2005 and not exceeding 11 kg CO2e / inhab / year in 2030)	2005	2030
Solid Waste	Reduction of GHG emissions per capita by 65% over the base year (leaving the level of 241 kg CO2e / inhab / year in 2005 and not exceeding 84 kg CO2e / inhab / year in 2030)	2005	2030
	Increase from 2% to 15% of household waste recycling	2010	2030
	Encouraging Continuous Growth of Waste Energy Generation	-	-
Transports	Reduction of GHG emissions per capita by 30% over the base year: expansion of the subway and railway, and of the municipal and intercity ferry services and bus systems; increase of the biofuels use.	2010	2030
Energy	Reduction by 30% of the public sector energy consumption's emissions (leaving the level of 1,17 MtCO2e in 2005 to 0,82 MtCO2e in 2030)	2005	2030
	Construction of 1000 MW in cogeneration units in the state	2010	-
	Expansion of renewable energy supply from 234 MW in 2010 to 1000 MW by 2030	2010	2030
	40% increase in total clean or low carbon energy generated in RJ	2010	2030
General	Carbon intensity of the RJ economy in the target year should be lower than the base year level	2005	2030

CLIMATE CHANGE AGENDA PLANNING:

The Rio de Janeiro State’s Climate Change Plan of the State was published in 2012, and hasn’t been reviewed since. It’s important that the plan could be monitored and get its targets reviewed every 5 years, so that the State can know better what changed, what has been done and what can still be done. Moreover, data from the latest inventory indicated that total state emissions increased by 40.2% between 2005 and 2015. This indicates that the current State Plan needs urgent reevaluation, including broad mobilization and articulation with other government sectors to meet proposed goals.

Parallel to this effort, SEAS are also leading the climate change adaptation agenda, and started a vulnerability study by the end of 2017. This was a pioneer initiative in the country, as few states had such a plan. In this sense, in 2018, the first phase of the Adaptation Plan was finalized, which consisted of a great effort to analyze state vulnerabilities, bringing results on impacts on human health, urban drainage, landslides, highways, coastal zone and the agenda. green. Climate adaptation is a totally cross-cutting agenda and for us to move forward, the involvement of other sectors and entities (private sector and civil society) is essential. Our planning foresees the elaboration of the 2nd phase of the Adaptation Plan through the refinement of some vulnerability analyzes, articulation with other sectors and with the municipalities and establishment of goals and sectoral proposals for adaptation.

The state goals for the climate change agenda are:

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- *Update the climate change planning, including the revision of the State Climate Change Plan, which includes an assessment of the fulfillment of the mitigation targets proposed in 2012, a review of the proposed new and / or adaptation of ongoing goals, and a sectoral and municipal engagement;*
- *Reactivate the main governance instrument, the Climate Change Rio Forum;*
- *The elaboration of the 4th State Inventory of Greenhouse Gases 2020 base year;*

REFERENCES:

IBGE data base. Disponible in: <<https://cidades.ibge.gov.br/brasil/rj/panorama>>. Access: 23rd 2019

SOS Mata Atlântica. Dados mais recentes sobre a situação da Mata Atlântica e desmatamento. Disponible in: <<https://www.sosma.org.br/projeto/atlas-da-mata-atlantica/dados-mais-recientes/>>. Access in: out 25th 2019.

Centro Clima/COPPE, 2015. Inventário de Emissões de Gases de Efeito Estufa (GEE) do Estado do Rio de Janeiro Ano Base 2015. Rio de Janeiro, 2017. 48 p

Atlas do Desenvolvimento Humano no Brasil. Available in: <<http://www.atlasbrasil.org.br/2013/pt/>>. Access in: out. 25th 2019