Environmental Samba! The Greenwashing of Brazil’s Global Climate Change Commitments

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# **Abstract**

Brazil is considered a country with a clean energy matrix seeking to fulfill its international commitment(s) addressing global climate change. However, Brazilian offshore fossil-fuel development, as well as large-scale hydropower planned in the Amazonian interior, casts doubt on the fulfillment of those commitments. This research presents a preliminary investigation of Brazilian energy policies, based on a two-pronged theoretical approach, to demonstrate how the concepts of the “energy curse” and “environmental justice” negate Brazil’s capacity to perform its climate change commitment(s). In doing so, this research effort seeks to answer the following questions: Where are fiscal benefits from Brazil’s offshore energy development being directed? Given that Brazil has a natural potential to develop a highly diversified energetic matrix, why are national energy policies primarily focused on developing new offshore fossil-fuel resources and hydropower projects in the Amazonian interior? Preliminary analysis suggests that while Brazil has the economic potential to foster the large-scale development of renewable energy, fiscal resources derived from offshore fossil fuel development are not being utilized to achieve that objective. Further proposed hydropower projects suggest further deforestation of the Amazon and in doing so; raise serious environmental justice concerns for Brazil’s indigenous populations. The juxtaposition of the Brazilian energy curse resulting from offshore fossil-fuel development generates an apparent absence of environmental justice for indigenous peoples of the Amazon in the development of hydropower. Therefore, it is likely that Brazil is engaging in state-sponsored greenwashing of its international climate change commitments.

# Literature Review

Energy is the backbone of economic growth and development of countries. The global primary energy resource is fossil fuels such as oil, coal, and natural gas (Cavaliero & Da Silva, 2005). The high global dependence on non-renewable resources caused the accumulation of carbon dioxide into the atmosphere leading to aggravation of climate change. Therefore, it is necessary to invest in clean energy such as biofuel, solar, wind, geothermal, hydropower, and biomass.

Overall, countries around the world are heavily dependent on fossil fuels, and renewable sources represent just 12.9% of their energy matrix (Kumar, Kumar, Kaushik, Sharma, & Mishra, 2010). Unlike other countries, Brazil is classified as a ‘green nation,' because 46% of its energy matrix is based on renewable and 54% on non-renewable energy (Chart 1) (MME, 2015). The higher renewable share is due to the country’s hydroelectric energy, which accounts for 77% of the total electricity generation and 14% of the total energy sources (Chart 1). However, although Brazil has natural characteristics to develop wind and solar sources (Winrock International, 2002), those comprise only 0.3% of the national electricity supply.

Chart 1. Source of electricity generation in Brazil, 2015 (left) and total energy sources in Brazil, 2015 (right)

Source: MME 2015

\*Others covers wash water from the ashes of wood burning and wind power

The Atlas of Brazilian Wind Power Potential (CEPEL, 2001) shows an impressive capacity to generate wind energy in the Northeast (144.3 TW hour/year), parts of the South (41.1 TW hour/year) and Southeast (54.9 TW hour/year) of the country. The current wind energy installed in Brazil represents less than 1% of its total electrical capacity (Martins & Pereira, 2011). Therefore, it is possible and recommended to expand wind generation, to diversify the matrix and increase energy supply (Lucena, Szklo, Schaeffer, & Dutra, 2010).

Regarding solar energy, Brazil has a potential for water heating and electricity generation. The National Energy Plan 2030 shows that Solar metric Atlas of Brazil registered radiation levels between 8 and 22 MJ/m2 per day, with the lowest variations occurring from May through July, from 8 to 18 MJ/m2 per day (Pereira, Camacho, Freitas, & Silva, 2012). India, in 2016, was the 5th country in the world in solar PV capacity (REN21, 2016). Rajasthan, one of India's most solar-developed states, present a radiation of 3.6 – 25.2 MJ/m2 per day (Kumar et al., 2010), which is closer to the Brazilian solar radiation. Therefore, if Brazil has similar solar insolation as India, it has the potential to develop solar energy.

In Brazil, electricity generation by photovoltaic systems are used only by households in some rural areas and by small commercial and public services (Pereira et al., 2012). The most widespread application of solar energy is heating water. Brazil has no large scale solar energy production, and there is not enough public awareness of the advantages of this technology to boost the industry (Martins & Pereira, 2011).

Public policies to diversify the electrical matrix have never been a priority because of the low cost of hydraulic-based energy (Cavalieiro & Da Silva, 2005; Martins & Pereira, 2011). Researchers also point out that one of the biggest barriers developing and disseminating wind and solar energy is their high cost relative to conventional sources (Cavaliero & Da Silva, 2005). These researchers consider the prices of the year 2000, which were too high. However, since 2010, advances in technology have made renewables more affordable and more attractive.

The energy demand in Brazil increased rapidly since 1975 (Geller, Schaeffer, Szklo, & Tolmasquim, 2004) because of industrialization and urbanization (Tolmasquim et al., 1998), and it continues raising. Brazilian government intends to attend the electrical demand by: improving energy efficiency; building more hydropower wit emphasizes on projects in Amazon; increasing the share of other renewable sources for electricity generation such as wind farms, small hydroelectric plants, biomass, and biofuels (Brasil, 2008).

In fact, energy supply in Brazil is dominated by two forms of energy: petroleum and hydroelectricity (Geller et al., 2004). Cao (2003) claims that often countries, such as Brazil, are placed in a dilemma between economic growth and environment / social objectives. Ross (2012) argues that there is a ‘curse’ in many developing countries when they decide to explore their natural resources because instead of those contribute to the country economic development, they increase negative caracteristics, such as corruption or authoritarian government.

Over the past 25 years, Brazil has attempted to reduce its foreign dependency on energy supplies stimulating the domestic sources (Geller et al., 2004). In the 1970s, Brazil started the offshore oil extraction in deeo water. According to the U.S. Energy Information Administration (EIA) 2014, regarding proven oil reserves in the world, Brazil is in the 15th position. Regarding production, Brazil is the 9th, responsible for 3% of the mundial oil production.

In 2006, a promising oil deposit was discovered – the Pre-salt field. Brazil used to extract oil from the post-salt layer, and the new reserve is under the current layer. Researches made by Petrobras (the Brazilian oil company) estimate that the new field contains from 50 billion to 123 billion barrels of oil (MME, 2015). Therefore, in the global scenario, Brazil could jump from the 15th position in the world proved reserves, to 9th or 6th in the ranking. Further, the country could increase, by 2020, the daily oil production from 2.9 million barrel of oil/day to 5 million barrel of oil/day (MME, 2015), positioning Brazil among the top five largest oil producers in the world.

Although Pre-salt is seen as a ‘pot of gold,' exploring the new field means to overcome several challenges regarding extraction in ultra-deep water. The depth can exceed 7,000 meters (PETROBRAS, n.d.), which represents an enormous amount of financial resources and several environmental risks. From 2009 to 2013 Brazil developed a Long Duration Test in one of the platform exploration – Tupi, with an investment of $28 billion. Until 2020, Brazilian Government aims to invest more $146.4 (MME, 2015).

In 2001, Brazil experienced a power shortage because of inadequate investments in power generation, transmission, and coupled with drought conditions that reduced hydropower output (Geller et al., 2004). To overcome the problem, Brazil planned to build more hydroletric in the country. However, the remaining hydropower potential (estimated at 170 GW) are located in the north region, in Amazon (Lucena et al., 2009), which is far from the main consuming center in the southeast region (about 2,000 miles distance).

Despite the high transmission costs of the hydroelectrics and the environmental constrains derivatives of the location, Brazil proposed to build 23 new hydroelectric in Amazon, which 7 are forecasted in untouched areas. Although hydropower is a clean energy, those projects will generate deforestation, flood, negative influence on biodiversity, the devastation of several indigenous territories, and loss of subsistence of many river populations.

Since 1998, when Brazil signed the Kyoto Protocol, the country is committed to taking actions to decrease carbon emission and avoid global warming. Assessing the plan that establishes the next ten years strategies for energy development in the country, the Ten-Years Energy Plan *(Plano Decenal de Energia PDE),* Brazilian government indicates that will invest $311 billion, until 2024 in the energy sector. About $225 billion (72.3%) are destinated to oil and gas, $12.4 billion (3.9%) to wind and solar power, and about 7% to biofuel. Therefore, although Brazilian government declares itself engaged in climate commitments, its policies shows that the country is investing more than 72% in fossil fuel and less than 4% to diversify its renewable energy sources. Further, the new hydropowers in Amazon will not only contribute to increasing deforestation and carbon emission but also promote environmental injustice.

The academic literature does not assess Brazilian’s energy policies and its commitments with climate change. The present article aims to investigate those topics to answer the following research questions: Where are fiscal benefits from Brazil’s offshore energy development being directed? Given that Brazil has a natural potential to develop a highly diversified energetic matrix, why are national energy policies primarily focused on developing new offshore fossil-fuel resources and hydropower projects in the Amazonian interior?

# Hypothesis

Brazil is comprised of 5 Regions, which involves 26 states and one Federal District. Each region has its particularities and needs. However, the energy policies are developed and implemented at the national level. The States, regarding energy policies, only follows the directions given by the Federal Government when required. Therefore, the present research has as population focus the country of Brazil at the national level.

The research presents a preliminary investigation of Brazilian energy policies, based on two-pronged theoretical approach, to demonstrate how the concepts of the “energy curse” and “environmental justice” negate Brazil’s capacity to realize its climate change commitment(s).

Preliminary analysis suggests that Brazil has economic potential to foster the large-scale diversification of renewable energy resources. However, the policy focus is offshore drilling, and the fiscal resources derived from its development are not being utilized to achieve a sustainable goal. Proposed hydropower projects suggest further deforestation of the Amazon, and in doing so, raise serious environmental injustice concerns for Brazil’s indigenous peoples. Further, recently corruption scandals suggest that Brazil is engaging in state-sponsored greenwashing of its international climate change commitments. Therefore, the present research seeks to test three hypotheses:

* H1. Energy curse is present in oil extraction.
* H2. New hydroelectric in Amazon region impacts environmental justice.
* H3. Engagement in state-sponsored greenwashing.

The hypothesis test will use a mix methods approach (quantitative and qualitative methods) to identify whether they are true or false. The following sections detail the research design, variables, data collection and analysis concerning each hypothesis.

# Testing H1. Energy curse is present in oil extraction.

Collier (2010) argues that the exploration of natural resources is a unique opportunity to boost economic growth. Ross (2012) states that countries with relevant oil wealth can have better chances of funding government, and provide an institutional capacity to alleviate poverty and invest in development. Therefore, if oil revenues are well used, the country should have faster economic growth and greater improvements in social welfare (Ross, 2012).

However, oil wealth has an irony. The greater the country needs for additional income, more likely the wealth from the natural resource will be misused (Collier, 2008). Ross (2012), define it as an ‘oil curse.' Ross (2012) researched 50 years of data for 170 countries in all regions in the world to evaluate how oil affects democracy and peace. He found that because of the volatility of oil prices, countries with oil do not have economic growth different from others that have no oil (Ross, 2012). In addition, he claims that oil can lead the government to one or more of the following characteristics: make them weaker, more corrupt, or less effective.

Ross (2012) contends that many influential studies show that oil wealth can be an economic curse, since the more oil the country extracts, slower is its economic growth. Oil revenues, when spent wisely, can contribute to sustainable improvements in social welfare, or be a waste and support corruption (Ross, 2012).

This first hypothesis aims to check whether the statement ‘Energy curse is present in oil extraction’ is true or false. To perform the test we used quantitative and qualitative methods. The qualitative approach aims to identify where oil revenues from the offshore drilling have been directed. Brazilian laws and regulations served as support to assess resources destination.

The main use of oil in Brazil is for transportation purpose. Therefore, the pre-salt exploration aims to bring some direct benefits for the population. The quantitative method to test energy curse hypothesis used a longitudinal analysis of the variables ‘population benefit’ and ‘oil results.'

## The pre-salt field

The pre-salt field, discovered in 2006, is also called the ‘black gold’ of the country. According to Mello et al. (2011), in the post-salt layer, the lighter oil part is consumed by bacteria, which decrease the quantity of gasoline and diesel extracted. However, in the pre-salt layer, a high-temperature exceeding 80oC because of the great depth, allied with a large reservoir of rocks, creates a condition that sterilizes the oil and preserves its qualities, enabling extraction of lighter oil, which is more valuable (Mello, et al. 2011). Therefore, considering the national and international perspectives, the Brazilian government understood that investment in the pre-salt would bring wealthy and economic growth to the country.

The pre-salt field is located around 800 Km of extension by 200 Km width, on the Brazilian East coast, between the states of Santa Catarina and Espirito Santo (Figure 1), totaling an area of 149 million Km2 (PETROBRAS, n.d.). The exploration of the field must overcome several challenges. The first challenge is the extraction in ultradepp water. Water depths can exceed 2,000 meters. The post-salt layer varies from 1,000 meters to 2,000 meters. The salt layer is 2,000 to 5,000 meters thick, and the pre-salt layer varies from 500 to 1,500 meters (Figure 1) (PETROBRAS, n.d.). Therefore, the total depth can exceed 7,000 meters. The second challenge is related to oil temperature. According to Carminatti et al. (2008), when the oil leaves the rocks, it is extremely hot. The thermal shock because of its contact with the cold seawater can create precipitation in the flexible extraction lines.

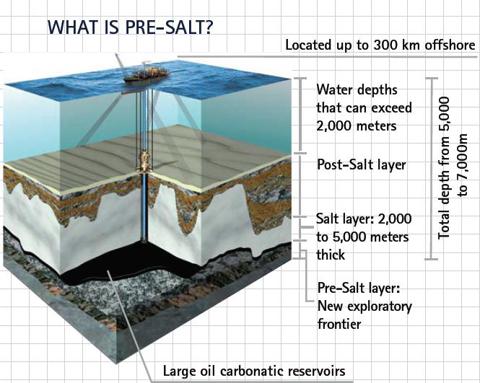
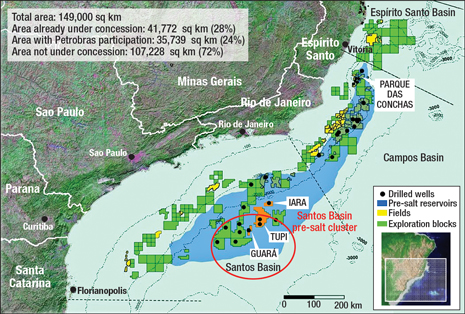


Figure 1. Location of the pre-salt reservoirs (left) and location of pre-salt layer (right)

Source: Retrieved from <http://static.cdn-seekingalpha.com/uploads/2013/3/12/1356991-136309597885032-Jeff-Williams.jpg> (pre-salt layer) and http://sites.duke.edu/history136a\_01\_s2012\_rdd12/technical-background/ (pre-salt reservoirs)

The third challenge is related to the distance between the coast and the deposits. In average, the current off-shore are situated around 100 Km from the coast. The pre-salt deposits are located from 150 to 300 km from the coast, which implies that the platform is often subject to severe oceanic conditions (Lima, 2009). Further, long distances involve difficulties in the transportation of people, equipment, and supplies for producing deep-water wells.

The fourth challenge is regarding the CO2 presented inside the deposits. The carbon dioxide is mixed with oil and natural gas, which come up during the exploration. In the pos-salt offshore the average concentration of CO2 was around 5%. In the pre-salt field, it is around 8% to 12% (Lima, 2009). According to Lima (2009), it is estimated that just considering two extraction areas (Tupi and Iara) there are 3.1 GtCO2 inside the deposits. To avoid the carbon dioxide emission into the atmosphere, there are discussions and studies to storage carbon or to use it into the wells in an alternate injection of water and CO2. Although the technology is known, it has not been utilized on a commercial scale (Lima, 2009).

Evaluations by Greenpeace Brazil (2009) claim that the unknowns related to the CO2 inside the deposits bring concerns. Ricardo Baitelo, Ph.D. in energy planning in the Polytechnic School of Sao Paulo (USP) and Campaign Coordinator renewable energy Greenpeace Brazil, affirms that the alternate injection technology is an experiment, and it is not available (Greenpeace Brazil, 2009). The studies assessed by the present paper could not ensure whether Petrobras deployed the technology on an industrial scale, or it is just an investigation.

According to Petrobras (2011), until 2010 the average time to build an offshore well in the pre-salt cluster was about 310 days. Therefore, the oil results from the pre-salt field started to enter in the Brazilian production in 2010 and have constantly increased (Chart 2). On average, from 2001 to 2010 the production was about 1,845 bpd. After the pre-salt, the average from 2011 to 2016 was 2,207 bpd, which represents an increment in the average of 16%.

Chart 2. Average oil production in Brazil from 2001-2016

Source: Petrobras Activity Report (2001-2015)

## Qualitative analysis

A strong argument used by the Brazilian government to invest in the pre-salt field is that the wealthy from the exploration would contribute to strenght the economy, reducing inequalities and increasing income (Lobao, 2009). Therefore, royalties from the pre-salt would work toward environmental justice.

To evaluate whether financial benefits from oil field was used for social purpose or to subsidize the development of other sources of renewable energy in the country, the analysis identified the destination for the royalties. It was used as a base, the Annual Activities Reports from Petrobras and also into the Brazilian legislation regarding the topic.

Each year, the oil company, Petrobras, invest some of its financial resources in social activities. They consist of punctual projects where they transfer money to associations and subsidize cultural and sports activities. There are also some environmental educational projects for kids, but there is no specification regarding subsidizing new renewable technologies.

Brazilian government receives from the fossil fuel extraction royalties, which correspond to 10% of the oil and gas production (Federal Brazilian Law 9478 of 1997). The royalities are shared between the Federal Government, State and municipal level in which there is the extraction. States and municipalities are free to use the resources according to their needs. The Federal Government, before 2013, used the funds to compose the Fund of Municipal Participation (FPM – Fundo de Participacao Municipal), which is a resource sent to all cities in Brazil, in order to share the Federal revenue with the local government.

In 2013 a new Federal Law (number 12858 of 2013) was approved to establish the share of the pre-salt’s royalties. In that, it was determined that all funds received by the Federal Government as royalties would be destined to a Social Fund (Fundo Social – FS). The money would be directed 75% for primary education and 25% for the public health in the local government. However, the money has never been received for the cities because it was used for the Education and Health Ministry. In 2016, the State of Rio de Janeiro questioned in court the new share proposal of pre-salt royalties, since the state used to have a bigger percentage before the new law. Because of that, the financial resources are blocked until the judicial process is concluded.

The Social Fund was created through the Federal Law 12351 of the 2010 year. It establishes that the financial resource of this fund is linked to the President, and aims to subsidize programs and projects related to education, culture, sport, public health, science and technology, natural environment, and mitigation actions for climate change adaptations (Federal Law 12351 of 2010). Although the Fund exists, no action according to its purpose has never being funded.

In conclusion, there is no evidence that profits from oil extraction were used to subsidize other renewable energies or technical studies that could promote climate change adaptations. Further, although Petrobras sponsors culture and sports activites, as well as some small associations, those actions are an example of social responsibility made by the Company, but they do not serve to promote environmental justice.

## Quantitative analysis

In the quantitative analysis, there are two variables: population benefit and oil results. The ‘population benefit’ is measured by the average gasoline pump price/year, which is regulated by the Brazilian government. The ‘oil results’ is measured by the number of barrels of oil produced per year. Both variables were compared using their percentage change in relation to the previous year. The data considered values from 2002 to 2015, which encompasses information before and after pre-salt. Petrobras (Brazilian oil company) and National Oil Agency (ANP – Agencia Nacional do Petroleo) served as a source for th database.

Ross (2012) argues that in an economy without the ‘energy curse,' oil boosts the size of government revenues, which typically increases government benefit. Therefore, there is no need to increase revenue through taxes, and governments can, in fact, decrease them (Ross, 2012). Because Brazilian government regulates gasoline prices, oil results directly affect ups and downs in the pump price in the country. Therefore, if H1 is not true, it is expected that the relationship between both variables is negative, following the ‘supply and demand law.' If the National Company is producing more oil, the average gasoline price of the country will decrease. However, if there is a positive relationship between the variables (oil production and average gasoline prices increase at the same time), it is an indication that H1 can be true.

The data (Chart 3) shows that from 2002 to 2010 there was a negative relationship between gasoline pump price and average oil production. The results follows the supply and demand law. However, Chart 3 shows an intriguing result after 2011. The relationship between the variables became positive. The changed in the relationship between the variables occurred in the year that the pre-salt oil entered into the national production. Therefore, the ‘energy curse’ is likely.

Chart 3. Relationship between percentage increase/decrease from the previous year between gasoline pump price and average barrels of oil produced 2002-2015

Source: Petrobras Activity Report (2002-2015) and National Oil Agency (ANP)

# H2. New hydroelectrics in Amazon region impacts environmental justice

Environmental justice covers many other different concepts of justice simultaneously (Schlosberg, 2009). Therefore, it aims to address equity including social and ecological dimension, avoiding destruction of nature, culture and promoting democratic participation in planning development (Schlosberg, 2009). According to Schlosberg (2009), it also includes indigenous population since they are calling for environmental and social justice and equity.

A qualitative approach was used to test H2, considering the assessment of secondary data available, regarding the plans for future electricity generation in Brazil and its consequences. Several countries have set targets for the growth of renewable energy sources to reduce their carbon emissions and increase the security of energy supply. Although Brazil has already a clean electric matrix because of hydropower, the country is resistant to diversify and expand other sources of renewable energy, despite its abundand potential for wind, solar and biomass.

The economic and social development of Brazil demands more and more electricity. The main solution adopted by Brazilian Government is to build more hydropower. The Ten-Years Energy Plan *(Plano Decenal de Energia PDE)* argues that only 30% of the Brazilian hydropower capacity have been explored (*Plano Nacional de Energia, 2040),* and the remaining potential is on Amazon region. The Brazilian Government has a proposal to deploy 23 hydropower there, which 7 are planned in untouched areas inside the forest. There are several technical, social and environmental limitations surround the project. Grzybowski (2015) argues that:

“In the internal political debate, if it is not possible to implement the project of making the Amazon a great supplier of “sustainable” electric power, the argument cried out as a threat is that we will be forced to build more and more thermoelectrical plants. In practice, however, the construction rhythm of thermoelectrical plants in the country shows that the full steam development promoter’s priority strategy is this, regardless of more or less hydroelectric power station” (Grzybowski, 2015, pp. 74-75)

The Brazilian government has stated hydroelectricity in Amazon as an alternative to avoid the installation of more thermoelectrics (which has increased in the last ten years in the country). However, the plan constitutes a paradox. Although hydropower can generate clean energy, in the Amazon region they, in fact, will also produce: deforestation on the power plant and transmission lines area; interruption of the fluvial system, changes in water quality; change in the ecosystem; proliferation of vectors and diseases; displacement of local population and land owners; threats to the right of native population their identity and culture (Schaeffer, Szklo, Lucena, Soria, & Chavez-Rodriguez, 2013). Furhter, Brazilian energy matrix needs diversification, but not giving room for expansion of thermoelectric (coal, oil and natural gas) or nuclear power. The solution lies in other renewable sources and energy efficiency measures. Grzybowski (2015) argues that:

“What is incredible is that having twice the sunlight of Germany we are so reticent in using this gift of nature and strategically moving forward regarding solar energy. The same attention is given to the wind that makes our palm trees flutter throughout the over eight thousand kilometers of coast, but... these do not generate much electric power” (Grzybowski, 2015, pp. 75)

Environmental impacts are one of the consequences of hydropower in Amazon region. Another is environmental injustice, which occurs when the environmental justice is negated. Benn (1993) claims that environmental justice calls equity. Lazarus (1994) states that the concept aims to avoid injustice in the distribution of environmental costs and benefits. Therefore, when an implementation of new hydropower in Amazon region affects the indigenous population, environmental injustice is promoted. Schaeffer et al. (2013) argue that 25% of the Amazon hydropowers would affect the indigenous population, as stated in Figure 2.

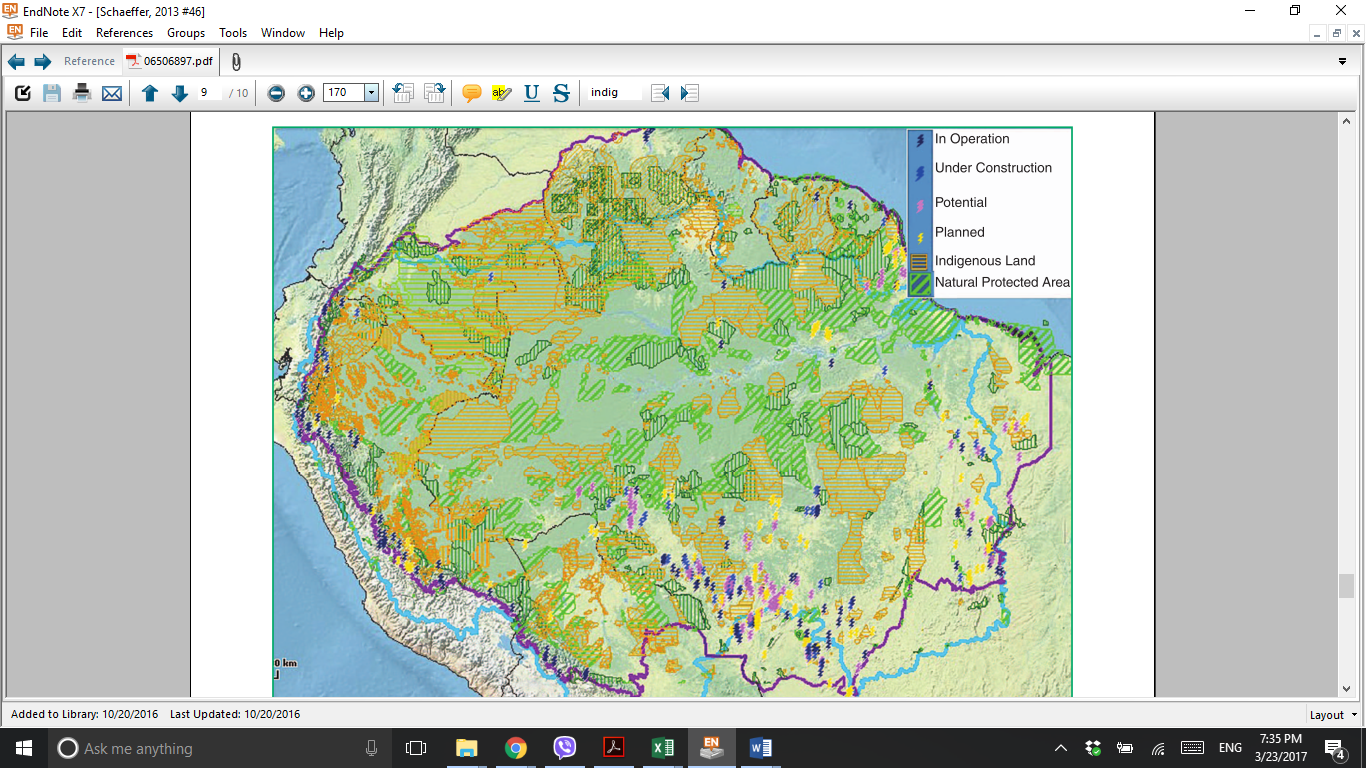


Figure 2. Hydropower plants in the Amazon region by stage versus natural protected area and indigenous land

Source: Schaeffer et al. (2013)

Since Brazil has other alternative methods that can generate electricity, there is no justification to invest in hydropowers in Amazon. Financial, environmental and social costs of the hydtroeletric planned are not enough to validate its benefits. Therefore, their implantation in Amazon region are classified as an environmental injustice.

# H3. Engagement in state-sponsored greenwashing.

Because H1 and H2 are true, it is likely that Brazil is engaged in greenwashing. Bowen (2014), states that greenwashing is a combination of a positive environmental communication with poor environmental performance. Therefore, sustainable solutions are just stated for the maketing purpose, without any environmental improvement or impact (Bowen, 2014). One of the explanations of why Brazil is not investing in clean energy is that in fact, the country is engaged in greenwashing. To test H3, an observational study assessed the Brazilian climate agreements signed and its target commitments to decrease carbon emission.

## Climate change commitments and greenhouse gases emission in Brazil

Conforming IPCC-AR5 (2009) report, by 2100, it is necessary that the average total global emission of GHG is 11 GtCO2eq to stabilize global warming in 2ºC, which is 66% likely (IPCC, 2009). According to estimates from Emission Database for Global Atmospheric Research (EDGAR) in 2012, the total global emission of GHG was around 52 billion of carbon equivalent (GtCO2eq). In the same year, the contribution of Brazil was 1.49 GtCO2eq, which represents 2.86% of the total global emission.

To show the Brazilian commitment reducing carbon emissions, the country voluntary signed and ratified the Kyoto Protocol in 1998 and 2002. In 2008, Brazil elaborated the Climate Change National Plan, which was presented at the UNFCCC Conference of the Parties in Copenhagen in 2009. In that opportunity, Brazil also assumed a voluntary goal of decreasing the projected emission of the country for 2020 by 36.1% to 38.9%, which would avoid 0.0974 to 1.051 GtCO2 (UNFCC, 2010).

In 2015, Brazil signed the Paris agreement, in which the country pledge its commitment to reducing by 2030 its emission by 37% of 2005 levels. Evaluating the CO2eq emissions of Brazil, from 1990-2015, the average was 2.27 GtCO2eq, with a maximum value of 3.82 GtCO2eq in 2004, and a minimum of 1.53 GtCO2eq in 1991 (SEEG, 2015). The year 2005, which is the reference level, represents the third highest emission in 27 years (Chart 4). Before 2010, deforestation was the largest Brazilian emitter, accounting for more than 50% of the CO2eq released (Chart 4, Chart 5).

Chart 4. Total and deforestation greenhouse gases emission in Brazil 1990-2015

Source System Study Greenhouse Gas Emissions Estimates (SEEG) retrieved from <http://plataforma.seeg.eco.br/total_emission>

Chart 5. Greenhouse gases emission in Brazil, in GtCO2eq per sector, and % representativeness

Source: System Study Greenhouse Gas Emissions Estimates (SEEG) retrieved from http://plataforma.seeg.eco.br/total\_emission

Declarations of engagement in replacing fossil fuels by ethanol and biofuels; building a clean electrical matrix; and voluntary sign commitments in climate agreements make Brazil a “green country.” However, a closer assessment of the agreements and the energy policy in place leads to to another conclusion.

Deforestation was the largest GHG emission in the country. Policies deployed to avoid illegal deforestation made de carbon emission from the sector decrease from 2.32 CO2eq in 2005 to 0.88 CO2eq in 2015. According to the Paris Agreement signed by Brazil, the country by 2030 should have emissions of 1.41 CO2eq (37% of the 2005’s level). Therefore, in 2015, Brazil already accomplished 61% of its reduction goals.

The emission reduction shows the sustainable image of Brazil to the rest of the countries. However, in 2008, when Brazil made its first voluntary commitment, it had already accomplished 43% of the climate agreement goal. Therefore, just keep controlling deforestation would lead Brazil to conclude its target. However, an evaluation of other two GHG sectorss (energy and agriculture/livestock) in Brazil shows that other sectors emission are increasing (Chart 6).

Considering the growth in population, which impacts in more energy and food supply, Brazilian government needs policies that can reduce carbon emission and at the same time attend the necessities of its citizens. The energy sector in Brazil has raised its carbon emission (Chart 6). The data shows that in 2015 the sector had an increase of 145% in comparison to 2005 (Chart 6). There are two main reasons for that. First, Brazil has incremented oil production and consumption. Second, Brazil has adopted investments in fossil fuel power plants (coal, oil, and natural gas) as an alternative source of electricity generation. From 2002 to 2015, the power generation from non-renewables rose from 2,753MW to 44,067MW (SEEG, 2015). Further, the forecast of the Brazilian CO2eq emission in the sector tends to increase in the following decades.

Problems regarding GHG emission and pre-salt are not restricted to burning fossil fuel. The high CO2 concentration inside the deposits and the risks of the project also bring serious concerns. Although there are studies and speeches suggesting storage carbon and also injection of the CO2 into the wells, it is unknown whether or not the technology have been applied in the fields, how much carbon dioxide have been used and how much remain.

Chart 6. Energy and agriculture/livestock greenhouse gases emission in Brazil 1990-2015, in GtCO2eq

Source System Study Greenhouse Gas Emissions Estimates (SEEG) retrieved from http://plataforma.seeg.eco.br/total\_emission

NRDC (2015) claims that Brazil commited to zero illegal deforestation by 2030 in the Amazon region. Interestingly, the new hydropower to be implemented in Amazon will impact, among other things, in deforestation (legal and illegal).

In Brazil, energy policies budget distribution for the next 10 years indicates that 72.3% of the financial resources are directed to fossil fuels, 3.9% to wind and solar power, and about 7% to biofuel (PDE 2024). A country committed to clean energy and climate change would make investments to decrease oil consumption and increase renewable energy. Brazilian policies are doing exactly the opposite.

Clearly, Brazilian current and planned energy policy are not going towards decrease carbon emission or fulfill social justice. Financial resources resulted from the investments in oil and hydroelectricity are not being redirected to subsidize other clean energies or promote environmental justice. Instead, they are financing more dirty energy and corruption, which has been disclosure for the media since 2014. The called, ‘operation car wash,' is a federal policy investigation of money laundry, which has already arrested CEOs and politicians, and continuing investigating corruption in Petrobras and other constructions agreements in Brazil.

Therefore, evaluating the commitments of Brazil and its energy policies, the conclusion is although it seems that the Country is engaged with climate change, the policies and investments show a paradox. Brazil has not only not been invested enough to develop renewable energy but also present in serious risks to become one of the most emitters of greenhouse gasses. In fact, Brazil is engaging in state-sponsored greenwashing of its international climate change commitments.

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