



Odette School
of Business
University of Windsor

FINAL DRAFT: SUSTAINABILITY PRACTICES IN BRAZIL

Prepared by: Afnan Alhussainawi & Savanna Campbell

Supervising Instructor: Dr. Francine Schlosser

Date: January 20th, 2022

Table of Contents

Abstract.....	3
Introduction.....	3
Sustainability Practices in Brazil.....	3
Corporate Governance: Sustainability.....	3
Green Economy.....	4
Green Buildings.....	4
Eco-packaging.....	5
Transportation.....	5
Deforestation.....	5
The Effects of Land Use and Land-use Change on Emissions.....	5
Green Bond Issuance.....	6
Green Energy.....	6
Hydropower.....	7
Biomass.....	7
Wind power.....	7
Similarities/Differences to Canada.....	8
Corporate Governance.....	8
Green Economy and Green Energy.....	8
Recommendations.....	10
Implications for Canada’s Ongoing and Future Relationship with Brazil.....	11
Conclusion.....	12
References.....	13
Appendix.....	17

Abstract

The following report examines the Federal Republic of Brazil's current environmental circumstance, along with its sustainable practices. In this study, we used a variety of resources including online websites, articles, and previous research studies. After completing our research, the results proved that although Brazil has faced substantial loss in environmental health and has neglected implementing crucial sustainable practices, the country's current government plans to ameliorate and execute their sustainable initiatives to further prevent environmental loss. Despite progress in the green energy sector, Brazil still has significant room for improvement in terms of establishing a robust green economy. Government support will be crucial in ensuring its sustainability. The country's green energy sector, which includes thriving segments such as wind and biomass power, holds great potential for future growth.

Introduction

Brazil, discovered in the 1500s and gaining its independence in 1822, is the largest country in South America and the fifth largest country in the world in terms of both land area and population (Census, 2022). It is known for its diverse culture, vibrant cities, and stunning natural landscapes. The country's economy is one of the largest and most developed in the region and it is known as a major producer of agricultural and mining products, as well as a leader in the manufacture of aircraft, automobiles, and consumer goods.

Historically, Brazil has faced significant environmental challenges, including deforestation, loss of biodiversity, and land degradation (Andreoni, 2022). The country has large areas of rainforest, including the Amazon rainforest, which are vulnerable to illegal logging and land clearance for agriculture and mining. The government has implemented policies and programs to address these issues, but enforcement and implementation have been inconsistent, and progress has been slow in some areas. Climate change also poses a threat to Brazil's ecosystems and communities, particularly those dependent on natural resources.

When former president Jair Bolsonaro was elected in 2019, Brazil experienced weakening environmental regulations and increasing deforestation. He has also been criticized for dismantling the country's Ministry of the Environment and reducing the budget for environmental protection agencies (Freedman, 2022). He has also been criticized for rolling back protections for indigenous communities and allowing illegal mining and logging in protected areas. In recent news, Brazil's newly elected President, Luiz Lula De Silva, an advocate for environmental protection, has chosen to return many of the environmental regulations and commitments that Bolsonaro chose to eradicate. Lula plans to respond to urgent social demands in Brazil, with the largest concern being the environment—including international climate commitments. (Freedman, 2022).

Sustainability Practices in Brazil

Corporate Governance: Sustainability

Company sustainability standards and frameworks play an important role in ensuring the quality of sustainability disclosures. A recognized framework or standard for reporting is essential to provide more detailed and transparent information in the disclosures and use independent assurance to provide assurance on the information disclosed (Arnold & Bueno, 2021). In Brazil, environmental legislation is quite extensive and includes laws, decrees and regulations focusing

on specific topics in areas such as sustainable corporate laws. However, these laws are often neglected and not followed through due to the lack of superintendence in the government to identify unsustainable practices (Arnold & Bueno, 2021).

One of the most prominent forms of corporate governance in sustainability in Brazil was created by the The Brazilian National Environmental Policy, called the environmental licensing. The Environmental Licencing is an administrative instrument by which the competent environmental body of administration authorizes and establishes the conditions, restrictions and the measures for the environmental control that must be obeyed by the entrepreneur, physical or legal person, to locate, install, expand and operate undertaking or activities that may cause environmental degradation. Any construction, installation, expansion, operation of establishments and activities that utilize environmental resources that are effective or potentially polluting, or capable of causing environmental degradation, must have previous licensing by the competent public agency (Ag, 2017).

There are many different frameworks and standards that companies in Brazil can use to report on their sustainability performance, including those developed by organizations such as the Global Reporting Initiative (GRI), the Sustainability Accounting Standards Board (SASB), and the Carbon Disclosure Project (CDP). Each of these frameworks has its own set of guidelines and indicators that companies can use to measure and report on their sustainability performance. Furthermore, according to the National Monetary Council and the Brazilian Central bank, it is required that Brazilian companies disclose specific information annually in an ESG (Environmental, Social, and Governance) report, which is a standard report used worldwide by over 29 countries (ICLG, 2022).

One key finding is that while many companies in Brazil are making sustainability disclosures, the quality of these disclosures is often lacking (Arnold & Bueno, 2021). Many companies are not providing enough detail in their sustainability disclosures, and that there is often a lack of transparency and consistency in the information that is provided.

Green Economy

Green Buildings

A green economy is defined by the United Nations as ensuring sustainable development for the measurement of economic progress and the appraisal of projects and policies when it comes to climate change, ozone depletion, deforestation, and resource loss in the developing world. According to the Brazilian Constitution, a healthy environment is a citizen's right (Trajber and Mochizuki, 2015). Brazil has a developing economy and they have some green business practices in place. Firstly, they have Legislation in place to encourage the use of green buildings (Mukonza et al, 2021). In many Brazilian towns, they provide land discounts for projects that recycle water, reduce waste generation or use renewable energy. Due to this, many green building product suppliers are opening in the country since 2016 (Mukonza et al, 2021) (See Appendix A). Sustainable cities require sustainable buildings. Green buildings must be energy-saving, emission reducing or land-saving; they must also create a comfortable working/living environment for human activities. In Brazil, they have the Green Building Council (GBC Brazil). Brazilian green buildings concentrate in São Paulo and the region surrounding it (Sant'Anna, 2018). Brazil has put in place several loans and grants for small-large businesses to boost innovation and foster partnerships between private sector and academia.

Eco-packaging

Another example of green business in Brazil is the activities of Natura which is one of the biggest eco-packaging companies in the country. It gauges the impact of all its activities on the environment (Mukonza et al, 2021). Although these efforts are a big step, there is still a lot that needs to be done in order to sustain a green economy, including regulations from the Brazilian government. Some regulations prioritized by Brazil include the country playing an important role in environmental commitments at an international level (Mukonza et al, 2021).

Transportation

In the transport sector, the Brazilian government is challenged with financing and developing new and faster capital-intensive infrastructure to develop the transport offer and avoid or reduce congestion (De Gouvello, 2010). This is also important for developing low-carbon scenarios. These plans are particularly important in densely populated urban municipalities such as São Paulo and Rio de Janeiro since urban transport accounts for about half of the overall sector emissions (De Gouvello, 2010). In Brazil, cars, trucks and buses together account for 87% of emissions. Mass transport systems like the metro can be powered by hydroelectricity or other renewable energy sources and are expected to generate virtually no direct emissions. Feasible emissions mitigation options for regional transport are expected to be implemented in Brazil by 2030 (De Gouvello, 2010).

Deforestation

Due to the large share of renewable energy sources, Brazil is not a major producer of fossil-fuel emissions. Two notable mega-hydropower plants include the Itaipú and Tucuruí hydropower plants. The world's largest hydropower plant is found in the Paraná River Basin in Brazil. The hydropower company, Itaipú, runs this plant. They have launched a series of initiatives towards sustainable development projects to address climate change and water issues (Trajber and Mochizuki, 2015). Nevertheless, Brazil is one of the major net producers of greenhouse gasses due to the deforestation rate in the Amazon (Trajber and Mochizuki, 2015). Recently in Brazil, there has been a rush of deforestation, land grabbing, and burning. It assumed that there is a surge in these activities because of the recognition that there could be changes in the laws regarding environmental crime (Pereira, 2022). According to F. Maisonnave from Time Magazine (2022), Brazil's president Luiz Inácio Lula de Silva announced that they will be "cracking down" on illegal deforestation, even if it means disappointing some of the large agribusiness interests. Preventing deforestation is key to fighting climate change.

The Effects of Land Use and Land-use Change on Emissions

According to the Brazil Low Carbon Case Study by the World Bank (2010), there are three main ways in which land and land-use change contribute to carbon emissions. These reasons include: i. the conversion of forest land to other land uses such as agriculture, grassland, settlements, etc, ii. Agricultural production, and iii. Livestock activities.

i. Adding onto what was said earlier, deforestation accounts for 40% of Brazil's gross carbon emissions. Between 1970 and 2007, the Amazon lost about 18% of its original forest (De Gouvello, 2010). There are now more rigorous conservation policies for the rainforest, it is not as easy for livestock or agricultural expansion into the Amazon.

ii. Agricultural production has also largely contributed to the carbon emissions in Brazil, caused mainly by the changes in soil stocks, fertilizers and the burning of residues. Variation in

soil carbon stock corresponds to the overall loss of organic matter in the soil during land use (De Gouvello, 2010).

iii. Livestock activities emit methane in Brazil from the digestive processes of ruminants. According to the Brazil Low Carbon Case Study by the World Bank (2010), direct emissions from livestock accounted for 18% of gross national emissions. Beef-cattle farming is predominantly responsible for this total.

With the election of President Lula De Silva, plans to emit carbon emissions by reducing deforestation, agriculture production, and livestock activities are in discussion. However, although many environmentalists support President Lula's re-election and his plans to re-implement environmental regulations, most of the leaders and workers within the agriculture business are against his re-election. During former President Bolsonaro, deforestation increased by 60%, and over 11,500 square kilometers of deforestation in the Amazon between August 2021 and July 2022 for agriculture farming (Shnaider, 2022). The presidency of Bolsonaro allowed for illegal and undocumented destruction and the use of forest land for agricultural activities, which is described as a miracle for the financial state of farmers (Shnaider, 2022).

Now, farmers are concerned about their agriculture businesses, as President Lula plans to protect the Amazon rainforest with deforestation regulations and reforestation practices (Araujo, 2022). The concern stems from farmers' reliance on constant deforestation to grow successful crops. Farming practices in the Amazon prove to be a failure as the soil of the rainforest is not preferred, and deforested sections can only be used for a maximum of three harvest seasons (Mongabay, 2012). The nutrients and acidity of the soil are primarily trapped in the trees. Therefore, when farmers burn or cut down trees to make farming land, the nutrients seep into the soil before becoming obsolete after a few harvest seasons (Mongabay, 2012). Most farmers rely on constant deforestation to continue to produce healthy crops. With President Lula's return of the environmental regulatory groups, agribusiness companies face the risk of failure.

Green Bond Issuance

Green bonds have emerged in Brazil as a means to financially support green initiatives in the country. Green bonds allow investors to earn a return and fund projects that support sustainability (Boyle, 2022). Green bonds in Brazil were first issued by a food company called BRF S/A in 2015. Since then, Brazil has issued green bonds worth more than \$5 billion USD and the number is expected to grow (de Deus et al, 2022). The green bond market in Brazil does have a few obstacles that are holding back its growth. These obstacles include the fact that there are additional costs of placing green bonds and there is a lack of incentives for the underwriter. Brazilian green policies are also not fully coordinated amongst ministries (de Deus et al, 2022).

Green Energy

In Brazil, about 70% of its electricity is generated from renewable energy sources such as hydropower, biomass and wind power (Mukonza et al, 2021). The Alternative Energy Sources Incentive Program (PROFINA) was designed in 2002 to stimulate the electricity generation from three green energy sources: wind, biomass and hydropower. This program was designed 20 years ago because of the energy crisis in Brazil at the time, they needed to search for alternatives in order to stabilize the energy matrix and diminish the dependence on precipitation (Wachsmann, 2003).

PROFINA was divided into two phases with the goal of working towards renewable energy development in the short term and the long term. (Dutra and Szklo, 2008). PROFINA would support the use of Brazilian made equipment, create jobs and promote the diversification of the Brazilian energy matrix. Profina supports the hydropower, biomass and wind power development of 1100 MW respectively.

Hydropower

In Brazil, the use of hydroelectric power for energy generation is 70%, whereas the rest of the world averages around 16%. The production of hydropower comes from the gravitational force of falling or flowing water. Brazil has over 600 hydroelectric plants, they are one of the leading countries in this sector alongside Canada, Norway, Sweden and Venezuela (Sperling, 2012). Not only does the existence of these plants produce green energy, but they also generate jobs and enhance the quality of water. Hydroelectricity avoids the environmental constraints related to coal mining. A downside to hydropower in Brazil is due to the fact that the reservoirs and dams can become breeding grounds for disease vectors. Especially so in Brazil because of mosquitos (which carry malaria) and snails (which carry schistosomiasis). The flooding of these areas could also disrupt the flora and fauna of the local biodiversity (Sperling, 2012).

Biomass

Brazil is a major exporter of the biomass bioethanol. They predominantly trade their biomass exports to Europe, the USA and Japan. Together, the USA and Brazil represent over 85% of the global bioethanol market. Brazil is highly important in this market due to their vast production of plantation crops such as sugarcane (Welfle, 2017). Brazil even has growth potential in this market as it has a vast area of savannas that could be used instead of risking deforestation. Biomass energy comes from either grown materials, residual materials or waste. In Brazil, their main sources in these categories would be managed forests, straw, eucalyptus, soya and sugarcane. According to a forecast done by A. Welfle in 2017, The availability of biomass resources in Brazil is sufficient enough to allow the generation of bioenergy that exceeds the Brazilian energy demand by 2030 (see Appendix B).

Wind power

Brazil has an area of about 169,6 million km² and the area is sparsely populated (Wachsmann, 2003). Wind power in Brazil is considered to be their “untapped renewable energy source”. Brazil has an estimated wind power potential of 143.5 GW, mostly concentrated on the coastlines of the Northeast and Southeast of Brazil (Mukonza et al, 2021). There are seven main wind parks in Brazil (See Appendix C). The Brazilian model of government market intervention in favour of wind energy is based on a price regulation for generated electricity. Brazil does not allow free adjustment of the amount of wind power to be installed. The obligation to purchase the energy from small renewable sources has not yet been realized in Brazil (Wachsmann, 2003). In Brazil, this plan does not promote the long-term establishment of a wind industry, but they have created an incentive for the importation of wind turbines. Brazil has geographical potential to promote more wind energy production. There are high wind average velocities with a low variation of wind directions, but it is hard for operators of small renewable energy projects to become established in a privatized Brazilian market (Wachsmann, 2003). Wind power would contribute to the supply of eclectic energy and it could be used to solve the problem of hydropower water usage in various regions of Brazil.

Similarities/Differences to Canada

Corporate Governance

In terms of corporate sustainability disclosure, it may be surprising that Canada does not have any official documents that companies are required to produce to examine their environmental practices. In Canada, under current Canadian securities legislation, there are no specific requirements mandating the disclosure of the “environmental, social and governance” practices of public companies, “but the idea is gaining recognition in some Canadian precincts including in one of Trudeau government's latest budget,” (Globberman, 2022).

Despite the growing momentum of the ESG movement worldwide including in the United States, Canada remains one of the only western countries that does not require public companies to disclose their ESG (environmental, social and governance) practices (Hub, 2022). And in Brazil, ESG’s did become a requirement for public companies to create using the International Integrated Reporting Council (IIRC) format of reporting, a global sustainability report framework (Arnold & Bueno, 2021).

Green Economy and Green Energy

A green economy is defined by the United Nations as ensuring sustainable development for the measurement of economic progress and the appraisal of projects and policies when it comes to climate change, ozone depletion, deforestation, and resource loss in the developing world. According to the Brazilian Constitution, a healthy environment is a citizen's right (Trajber and Mochizuki, 2015). Below, *Exhibit A* suggests the differences between Brazil and Canada’s current circumstances in various green economy and energy practices .

Exhibit A- Differences of Initiatives between Brazil and Canada

	Brazil	Canada
Green Buildings	<ul style="list-style-type: none"> - Energy saving - Emission reducing - Comfortable for humans (Trajber and Mochizuki, 2015)	<ul style="list-style-type: none"> - Climate-resilient - Transforming space and water heating - Decarbonize existing housing (Government of Canada , n.d.)
Eco-packaging	<ul style="list-style-type: none"> - Still challenging to replace all plastic packaging (Mukonza et al, 2021)	<ul style="list-style-type: none"> - Slowly banning single use plastics - Still challenging to replace all plastic packaging (Government of Canada , n.d.)
Transportation	<ul style="list-style-type: none"> - Cars, trucks, buses produce a large 	<ul style="list-style-type: none"> - Working with provinces and

	<p>amount of emissions</p> <ul style="list-style-type: none"> - Need for the development of energy efficient transport in more densely populated areas - Using other energy sources to power transportation <p>(De Gouvello, 2010)</p>	<p>territories to support low-carbon transportation systems</p> <ul style="list-style-type: none"> - Regulation piloted aircraft - Replacing VIA Rail corridor fleet with Tier 4 compliant locomotives (for fuel efficiency) - Reduce congestion - Protect the environment - Budget 2017: funds to develop greenhouse gas regulations/electric vehicle infrastructure etc. <p>(Government of Canada, n.d.)</p>
Deforestation	<ul style="list-style-type: none"> - High deforestation rate in the Amazon - Laws coming in place to prevent it <p>(Trajber and Mochizuki, 2015)</p>	<ul style="list-style-type: none"> - Deforestation rate among the world's lowest at 0.02% - Sustainable forest management <p>(Government of Canada, n.d.)</p>
Green bonds	<ul style="list-style-type: none"> - Lack of incentives for investors, scared of the risk - Not fully coordinated with the ministries <p>(de Deus et al, 2022)</p>	<ul style="list-style-type: none"> - Green bond framework for a variety of sectors - Green bond incentives <p>(Government of Canada, n.d.)</p>
Green Energy	<ul style="list-style-type: none"> - Hydropower is the leading renewable energy source - Wind power and biomass power potential <p>(Mukonza et al, 2021)</p>	<ul style="list-style-type: none"> - Hydropower is the leading renewable energy source - Wind is the second most important renewable energy source in Canada - Solar energy initiatives are growing <p>(Government of Canada, n.d.)</p>

In terms of green energy and green initiatives, Canada is ahead of Brazil. We can assume that this is due to the fact that Brazil is still a developing country. They have the largest economy in South America, but the country remains with a low GDP per capita, low living standards and other issues that need to be worked on at the same time as their sustainability practices (Canas, 2021). Brazil has a lot of potential in their green energy segments and they have achieved great success harnessing hydropower. Their next big steps would be in the transportation and deforestation sectors.

Recommendations for Brazil and Canada

Corporate Governance

Good corporate governance and social responsibility work together to maintain a healthy balance within corporations. This further promotes the development of control mechanisms, elevates shareholder value, and enhances satisfaction among shareholders, stakeholders, and the public (Farnham, 2022). Brazil is one of twenty-six countries with mandatory ESG (Environmental, Social, and Corporate Governance) reports for all registered organizations. Therefore, to combat the issue of negligence and dishonesty, President Lula should focus on recreating the environmental ministry that Jair Bolsonaro previously dismantled. The environmental ministry's role is to create and implement environmental legislation, regulations, standards, policies, guidelines, and programs and to monitor and inspect those implementations to ensure all organizations meet standards. In doing so, a sense of purpose will be provided to all organizational leaders, as their claims will be followed through and no longer submitted for a law that has never been followed up with.

Green Economy and Green Energy

There are several strategies that President Lula or any leader seeking to attract support for their climate change and environmental protection plans can adopt. When Canada proposed the zero emissions plan, many fuel and gas companies in the province of Alberta voiced their discontentment and resistance to the emissions reduction plan (Thomas, 2022). Albertans were mainly concerned because the province has a strong economy that is heavily dependent on the oil and gas sector, and many residents and businesses in the province were concerned about the potential economic impact of emissions reduction policies. Furthermore, Canada believed that the uproar in discontentment was a result of a lack of understanding regarding the impact of emissions of climate change. So, to engage Alberta and address these concerns, the government of Canada made a number of efforts, including:

1. **Negotiations with the Alberta government:** Negotiations were held between the federal government and the Alberta government to reach a mutually acceptable agreement on emissions reduction targets and policies (Sheel, 2022). The Prime Minister also met with key stakeholders, including industry and business leaders, to build support for emissions reduction policies and address their concerns. These negotiations resulted in the development of support programs and measures to help the oil and gas sector transition to a low-carbon economy and reduce its emissions (Sheel, 2022).
2. **Public education and awareness campaigns:** The federal government launched public education and awareness campaigns to build public understanding of the importance of emissions reduction and the role of the oil and gas sector in achieving these goals (Government of Canada, 2022).

Overall, the Canadian government's approach to engaging Alberta involved a combination of negotiations, support programs, public education and awareness, and engagement with stakeholders. The goal was to find a balance between reducing emissions and supporting the province's economy. Therefore, President Lula can gain the support and trust of farmers and agribusiness leaders by engaging with the organization and their workers to listen to their concerns and voice his concerns with the goal of reaching a mutual agreement between the two parties.

Implications for Canada's Ongoing and Future Relationship with Brazil

Canada and Brazil have had a long withstanding relationship for decades. Both nations fought side by side during WWII during the Italian campaign. Canada has an embassy in Brasilia and consulates in São Paulo and Rio. There are also several trade offices throughout both countries (Government of Canada, n.d.) Brazil is currently one of the largest trading partners with Canada. Canada imports precious stones and metals (23.5%), machinery (7.7%) and iron and steel (4.7%) among other commodities (Rueters, 2018).

Furthermore, Canada and Brazil are currently simultaneously signed with many sustainability agreements, most notably, the Paris Agreement, and the United Nations Framework Convention on Climate Change, implying that both countries not only have goals but must present their progress in terms of environmental sustainability and the actions they are taking against climate change. There is also a growing trade and investment flow which would further bind Canada and Brazil, strengthening the possibility of a free trade agreement.

Additionally, Canada and Brazil both have a talent flow that consists of highly skilled and educated individuals in a range of industries. In Canada, the government actively encourages immigration and has implemented various programs to attract skilled workers and entrepreneurs. Some of these programs include the Federal Skilled Worker Program, Express Entry, and the Start-Up Visa Program. Additionally, Canadian universities are renowned for producing a large pool of highly educated individuals, many of whom contribute to the country's talent flow (Government of Canada, 2023). Every year in the past few years, there have been thousands of Brazilian post-secondary students seeking an education in Canadian universities (EduCanada, 2023). In Brazil, the government has implemented programs to attract and retain highly skilled professionals, including the Science Without Borders program. This program provides funding and scholarships to Brazilian students to study abroad and bring back their knowledge to help boost the country's economy and workforce (Gov.br, n.d.). Additionally, Brazil has a thriving technology sector, which attracts highly skilled professionals from around the world. Both Canada and Brazil have active talent flows, with workers moving between the two countries and other international destinations. The flow of talent is driven by a variety of factors, including job opportunities, education, and quality of life. Both countries have policies and initiatives in place to attract and retain highly skilled workers and continue to develop their talent pools (Government of Canada, 2023). Hence, we may continue to see a large talent and information flow between the two countries.

Regardless of the vast differences between the sustainability practices in Canada and Brazil, and the regulations or activities within each nation, it is unlikely that it will negatively affect the relationship. Hence, we will not be seeing a hindering relationship between Brazil and

Canada, rather we will be seeing greater strength between the countries, especially with the rapid expansion of the Brazilian economy, which has continued to be the most prominent focus of development for Brazil for the past few years.

Conclusion

In conclusion, Brazil boasts significant potential in the realm of green economics and energy, particularly in the biomass and wind power industries. Despite being a developing economy, it lags behind Canada in terms of sustainability and eco-friendly initiatives. Both nations share comparable values and uphold democratic principles. Brazil has a rich history, including overcoming environmental challenges, and boasts diverse and remarkable biomes and ecosystems. There is still much work to be done in preserving and protecting Brazil's rainforests and savannas, but the country is making positive strides towards sustainability and green initiatives.

References

- Andreoni, Manuela. "What Lula's Victory in Brazil Means for Climate." *The New York Times*, The New York Times, 31 Oct. 2022, <https://www.nytimes.com/2022/10/31/climate/brazil-election-lula-bolsonaro-climate.html>.
- Arnold, J. and M. Bueno (2021), "How effective are different social policies in Brazil? A simulation experiment", OECD Economics Department Working Papers, No. 1662, OECD Publishing, Paris, <https://doi.org/10.1787/47087376-en>.
- Bureau, US Census. "Brazil Independence Day (1822): September 7, 2022." *Census.gov*, 17 Aug. 2022, <https://www.census.gov/newsroom/stories/brazil-independence-day.html>
- Canada, N. R. (2022, December 12). *Government of Canada*. Natural Resources Canada. Retrieved from <https://natural-resources.canada.ca/energy-efficiency/transportation-alternative-fuels/electric-and-alternative-fuel-infrastructure/zero-emission-vehicle-awareness-initiative/22209>
- Canas, I. (2021, April 22). Why does Brazil underperform its potential? Why does Brazil underperform its potential? · The Time Party. Retrieved from <https://timeparty.uk/blogs/brazil/#:~:text=Why%20Brazil%20is%20not%20a,mortality%20rate%2C%20and%20other%20issues>.
- CBC/Radio Canada. (2022, November 23). *Alberta wants to challenge federal emissions cap in Court | CBC news*. CBCnews. Retrieved from <https://www.cbc.ca/news/canada/calgary/alberta-federal-government-oil-gas-emissions-constitution-1.6661484>

- “Costs of Mandatory ESG Disclosure Likely Would Outweigh Benefits : Op-Ed.” Fraser Institute, 18 Oct. 2022, <https://www.fraserinstitute.org/article/costs-of-mandatory-esg-disclosure-likely-would-outweigh-benefits>.
- de Deus, J. L., Crocco, M., & Silva, F. F. (2022). The Green Transition in emerging economies: Green bond issuance in Brazil and China. *Climate Policy*, 22(9-10), 1252–1265. <https://doi.org/10.1080/14693062.2022.2116381>
- de Gouvello, C. (1970, January 1). Brazil low-carbon country case study. Handle Proxy. Retrieved from <http://hdl.handle.net/10986/19286>
- Dutra, R. M., & Szklo, A. S. (2008). Incentive policies for promoting wind power production in Brazil: Scenarios for the Alternative Energy Sources Incentive Program (PROINFA) under the new Brazilian Electric Power Sector Regulation. *Renewable Energy*, 33(1), 65–76. <https://doi.org/10.1016/j.renene.2007.01.013>
- Freedman, Andrew. “Lula's Defeat of Bolsonaro Was a Climate Turning Point with Global Repercussions.” *Axios*, 31 Oct. 2022, <https://www.axios.com/2022/10/31/brazil-lula-bolsonaro-climate-election>.
- Globerman, Steven. “Costs of Mandatory ESG Disclosure Would Likely Outweigh Benefits .” *The Hub*, 30 Aug. 2022, <https://thehub.ca/2022-08-31/steven-globerman-costs-of-mandatory-esg-disclosure-would-likely-outweigh-benefits/>.
- Government of Canada. (n.d.). Government of Canada. Retrieved from <https://www.canada.ca/en.html>
- Group, Global Legal. “Environmental, Social, & Governance Laws and Regulations Report 2023 Brazil.” *International Comparative Legal Guides International Business Reports*, Global Legal Group, <https://iclg.com/practice-areas/environmental-social-and-governance-law/brazil>.

“Introduction to the Environmental Licensing (Brazil).” Introduction to the Environmental Licensing (Brazil) | Association of Corporate Counsel (ACC), <https://www.acc.com/resource-library/introduction-environmental-licensing-brazil>.

Kenny, T. (2022, October 21). What is a green bond? The Balance. Retrieved from <https://www.thebalancemoney.com/what-are-green-bonds-417154#:~:text=Green%20bonds%20provide%20a%20way,too%20costly%20for%20retail%20investors>.

Maisonave, F. (2022, December 29). Brazil's Lula taps Amazon activist for environment minister. Time. Retrieved from <https://time.com/6243776/brazil-lula-amazon-environment-minister/>

Mukonza, C., Hinson, R., Adeola, O., Adisa, I., & Mogaji, E. (2022). Green Marketing in Emerging Markets: Strategic and operational perspectives. SPRINGER NATURE.

Pereira, C. C. (2022, October 27). Vote against Amazon deforestation in Brazil | science. Vote against Amazon deforestation in Brazil. Retrieved from <https://www.science.org/doi/10.1126/science.adf2475>

Prime minister Justin Trudeau meets with Alberta premier Danielle Smith. Prime Minister of Canada. (n.d.). Retrieved from <https://pm.gc.ca/en/news/readouts/2023/02/07/prime-minister-justin-trudeau-meets-alberta-premier-danielle-smith>

Sant’Anna, D. O., Dos Santos, P. H., Vianna, N. S., & Romero, M. A. (2018). Indoor Environmental Quality Perception and users’ satisfaction of conventional and green buildings in Brazil. *Sustainable Cities and Society*, 43, 95–110. <https://doi.org/10.1016/j.scs.2018.08.027>

Sperling, E. (2012). Hydropower in Brazil: Overview of positive and negative environmental aspects. *Energy Procedia*, 18, 110–118. <https://doi.org/10.1016/j.egypro.2012.05.023>

Thomas, S. (2022, March 29). *Albertan energy watchers respond to aggressive federal climate plan*. Calgary. Retrieved from <https://calgary.ctvnews.ca/albertan-energy-watchers-respond-to-aggressive-federal-climate-plan-1.5839899>

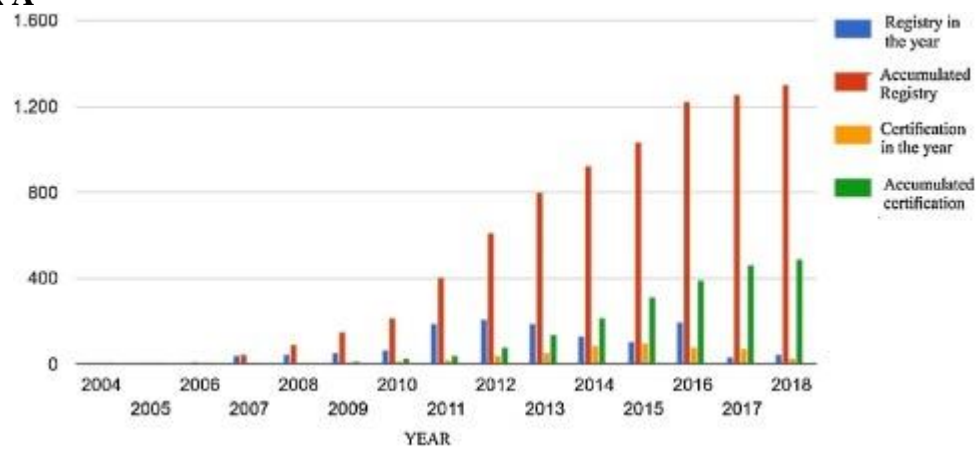
Trajber, R., & Mochizuki, Y. (2015). Climate Change Education for Sustainability in Brazil: A status report. *Journal of Education for Sustainable Development*, 9(1), 44–61. <https://doi.org/10.1177/0973408215569113>

Wachsmann, U. (2003). Wind power in Brazil—transition using German experience. *Renewable Energy*, 28(7), 1029–1038. [https://doi.org/10.1016/s0960-1481\(02\)00212-4](https://doi.org/10.1016/s0960-1481(02)00212-4)

Welfle, A. (2017). Balancing growing global bioenergy resource demands - Brazil's biomass potential and the availability of resource for Trade. *Biomass and Bioenergy*, 105, 83–95. <https://doi.org/10.1016/j.biombioe.2017.06.011>

Appendix

Appendix A



(Mukonza et al, 2021)

Appendix B

92

A. Welfle / Biomass and Bioenergy 105 (2017) 83–95

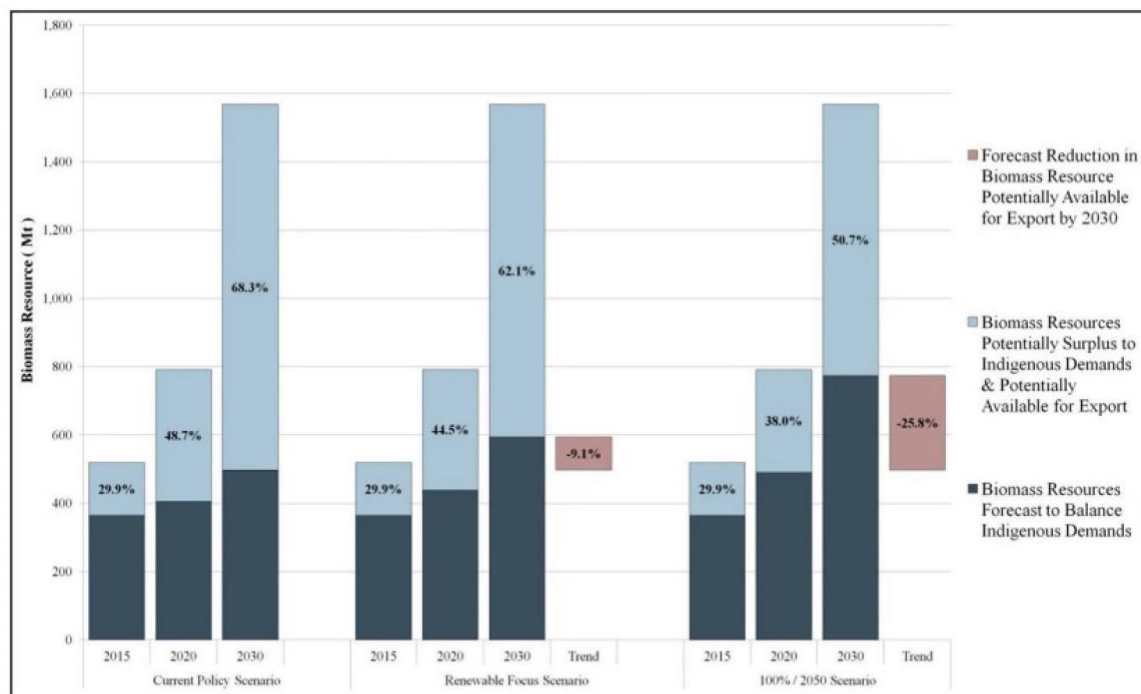


Fig. 5. Brazilian biomass resource balance analysis within future bioenergy scenarios.

Table 4

Forecast Brazilian bioenergy sector resource demands & surplus resources.

Resource balance	Current policy scenario			Renewable focus scenario			100%/2050 Scenario		
	2015	2020	2030	2015	2020	2030	2015	2020	2030
Resource Demand (Mt)	549.7	595.3	696.4	549.7	622.6	813.3	549.7	719.9	1083.8
Resource Surplus (Mt)	215.9	513.6	1360.7	215.9	488.8	1254.6	215.9	400.5	1009.3

(Welfle, 2017)

Appendix C

Wind Park	Installed Power [kW]	Type of Utilization	Owner	Place
Eólica	75	Public service	Companhia Energética de Pernambuco	Fernando de Noronha—PE
Eólica de Fernando de Noronha	225	Independent power producer	Centro Brasileiro de Energia Eólica-FADE/UFPE	Fernando de Noronha—PE
Eólica de Prainha	10,000	Independent power producer	Wobben Wind Power Industria e Comércio Ltda.	Aquiraz—CE
Eólica de Taiba	5000	Independent power producer	Wobben Wind Power Industria e Comércio Ltda.	São Gonçalo do Amarante—CE
Eólica-Elétrica Experimental do Morro do Camelinho	1000	Public service	Companhia Energética de Minas Gerais	Gouveia—MG
Eólio—Elétrica de Palmas	2500	Independent power producer	Centrais Eólicas do Paraná Ltda.	Palmas—PR
Mucuripe	2400	Independent power producer	Wobben Wind Power Industria e Comércio Ltda.	Fortaleza—CE
Total	21,200			

(Mukonza et al, 2021)