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Brazil, Infrastructure

Brazil: A Conservative Infrastructure Development Plan

Brazil possesses different valuable resources within its border, allowing it to be a world hub of trade. However, there is a limiting factor to economic growth and water security in Brazil. Brazil lacks the essential components required to become a wealthy country, from transportation infrastructure to a suitable power and energy infrastructure. Brazil requires further improvement in its transportation, energy, water, and wastewater infrastructures.

Brazil's lack of transportation infrastructure renders it incompetent when it comes to developing a robust national economy. Road systems in the country are largely undeveloped, except for the urban areas, making the interstate transport of goods difficult. Compared to the United States, Brazil has seventeen and a half times less road infrastructure per square kilometer (Costa, Carla & Bertol). Also, Brazil lags behind first-world countries in railway infrastructure, with their network being just fifteen percent of the United States or China (Costa, Carla & Bertol). To better understand Brazil's predicament, Brazil's economy is ranked ninth globally, yet its infrastructure has been ranked just seventy-third (Costa, Carla & Bertol). If the Brazilian economy can already perform well with such limited transportation infrastructure, the opportunities are limitless with further improvements made in this sector. To combat this ongoing issue, Brazil needs to build new roads to previously unreachable areas, expand its railroad network, and improve its airport infrastructure continually to compete with the rest of the world. One way to fund Brazil's transportation infrastructure is by increasing its infrastructure budget. Currently, Brazil dedicates around two percent of its GDP to infrastructure, yet evidence suggests that a percentage upwards of 6% or 7% of the GDP would be highly beneficial. Countries like China and India invest similar percentages of their GDP into infrastructure with encouraging results (Costa, Carla & Bertol). In addition to government funding, which is hard to acquire in Brazil, the government can collect money per unit of measurement on agricultural goods to increase infrastructure spending. In this process, the government would collect a small amount of money per unit of measurement of cash crops from farmers' profits. The capital collected would directly fund the development of necessary transportation infrastructure across Brazil. For example, a farmer growing corn would be assessed ten cents per bushel of corn they produced. What differentiates this system from a tax is that the government will return the money taken from profit to farmers after the government invests it. Conceivably, the improved infrastructure would increase economic activity and thus increase tax revenue, earning interest on the money taken from farmers. A similar system continues to be implemented in the United States, with grain farmers to great success. In Brazil, however, this assessment ideology would not necessarily be restricted to grain crops. However, it can also apply to other cash crops grown in Brazil, with the rate of collection varying in accordance with the profitability of farming. Since agricultural operations are multiplying in Brazil, this method would provide increasingly higher revenue for the government. Furthermore, agricultural operations would expand and grow the economy once new roads grant accessibility to more land. Additionally, taxes could be temporarily raised on high-income citizens to boost funding. The government could also encourage private entities or companies to invest in transportation infrastructure for their benefit and the country's benefit. This increase in infrastructure spending would enable unprecedented growth in the Brazilian road systems, railroad network, and consequently, the Brazilian economy and standard of living. In particular, railway systems would be at the forefront of Brazil's transportation investments due to low maintenance, reliability, speed of transportation, and the unprecedented low cost of interstate transportation. The railroads would not need to be entirely funded by the financially struggling Brazilian government. Private companies, in many cases, would be interested in building such infrastructure because of the historical profitability of owning rail lines or rail stations. To incentivize companies to take this risk, Brazil could

give grants or low-interest government loans to provide the necessary capital for investments. Brazil could even offer eminent domain to companies, so access to land would be no hassle. Sections of land could still be set aside and untouched for wildlife. For government-funded projects, tax revenue raised from the increased production, sale, and distribution of products and goods would hopefully enable the railways to pay for themselves in time. As previously mentioned, Brazil also lacks basic road infrastructure. Like railroads, the increased government budget for infrastructure could be dedicated to constructing unimpeded interstate highways and road systems connecting secluded portions of the country. Yet, the most promising and financially sure method of producing roads would be through the widespread use of public-private partnerships or PPP. In public-private partnerships, contracts, often long-term, are signed, binding both parties to fund construction, take part in the ownership and most importantly, split the revenue generated from the said project(s). In this scenario, PPP could be used to construct roads. Private companies would ensure costs will be kept to a minimum since money would be coming out of their pocket while the government could assure the quality of the project. After construction, toll booths could be placed on roads. A predetermined portion of the toll revenue would be given to the company or companies involved in the public-private partnership. The constructed road systems would reduce the time required to transport goods from one part of the country to another while simultaneously decreasing the cost of transportation. Such benefits would undoubtedly be taken advantage of by Brazilians, stimulate economic growth, and increase commercialism. Brazil is in desperate need of transportation infrastructure. Massive investments are required to bring Brazil's infrastructure up to par with the rest of the world

Equally important, Brazil's energy infrastructure is well behind its first-world counterparts. Currently, Brazil cannot produce enough electricity to power the nation. As a result, frequent blackouts occur due to a lack of electricity. Low-quality power lines often contribute to frequent power outages worsening Brazil's energy crisis (Brazilian Energy Market). Likewise, distributing energy from power plants to consumers over long distances is a daunting task for Brazil, complicated because Brazil's power plants are often many miles away from consumers (Brazilian Energy Market). To expound upon this issue, 65% of Brazil's electricity is generated in hydroelectric dams, best utilized in locations far away from coastal regions (Brazilian Energy Market). Nevertheless, approximately 80% of Brazil's population of two hundred million people lives near the coast, so the distribution of power over long distances poses a real challenge (Brazilian Energy Market). Fortunately, Brazil has an enormous capacity and potential for green energy using hydroelectric dams, windmills, and solar panels, giving them an advantage over other countries (Brazilian Energy Market). Although less eco-friendly, Brazil has a bountiful supply of fossil fuels that could be utilized to generate electricity and make a competitive job market (Brazilian Energy Market). Natural gas, which Brazil has in reserve, is a fossil fuel that leaves a smaller carbon footprint than traditional fossil fuels. Brazil could use its natural gas resource in power plants to provide clean, environmentally friendly energy. Brazil could take advantage of its location near the equator and moreover reduce its carbon footprint by investing heavily in solar power. Being situated on the equator exposes Brazil to considerable amounts of solar energy from the sun consistently throughout the year. The location on the equator also ensures steady rainfall in certain regions of the country, as seen in the Amazon Rainforest. Consequently, the rain causes the formations of the extensive river systems seen throughout the nation, making Brazil perfectly suited for hydroelectric power. Brazil could further utilize various water bodies such as the Amazon, Parana, Paraguay Rivers, and countless others for their hydroelectric power capacity. Existing hydroelectric dams such as the Itapúa and Irapu Dams could be duplicated on various rivers increasing electrical generation drastically without increasing carbon emissions. Additionally, windmill farms could be installed in the sparsely populated Brazilian states of Pernambuco and Bahia, where the wind is ample supply (Brazilian Energy Market). Due to the sparse population in this windy region, acquiring land for the wind farms would be of little concern to investors. However, due to its remoteness, new wind farms would still require long-distance transportation of electricity due to the low electricity demand in the surrounding area (Brazilian Energy Market). Large-scale construction of high voltage power lines would be necessary for any and all of these energy

production suggestions to be considered. One solution to funding such construction would be to expand Brazil's infrastructure budget so that Brazil can install a state-owned power grid system suitable for the available electricity. The state could then receive revenue from the utilities they provide to the population. On the contrary, Brazil could privatize the power grid allowing companies to build power grids and produce their electricity profitably. These private companies could work closely with the renewable energy goals of the Brazilian government and potentially receive government subsidies for their growth and development of Brazil's energy infrastructure. Additional subsidies would be distributed for their acknowledgment of Brazilian green energy policies. Each has its pros and cons, but still, private companies cannot compete with government-run programs. Privatization of industries, for example, sparks advancements and prompts research and development due to the competitiveness of capitalism (Lewis). A competitive market would lead to cost reductions and greater profits (Lewis). However, free privatization would mean companies have sole control over the prices of energy in Brazil. Unstable and likely high energy costs would be detrimental to Brazil as a whole. On the contrary, government-run infrastructure frequently runs over budget and fails to fulfill the needs of the public despite the larger budget (Lewis). Often, government programs are not as effective, efficient, and more costly as privately run businesses (Lewis). Still, since the government is nonprofit, it can keep prices steady regardless of deficit. For better results, Brazil would privatize energy and sell portions of the existing state-run energy corporation, Eletrobras, to private companies. The selling of Eletrobras would give privatization a jump start and fully open the door for a new competitive market in energy infrastructure. To ensure the transition, Brazil could provide subsidies to companies to increase their involvement with energy infrastructure. Nonetheless, energy prices for consumers would be regulated by the government to maintain a low, consistent energy price in Brazil. Fortunately, Brazil seems to be on the right path with the recent passing of the Eletrobras Privatization Bill in June of 2021 (Mandl). As of now, many Brazilians cannot depend on the existing energy infrastructure. When Brazil's energy infrastructure fully develops, it would lead to a period of intense economic growth and shift focus onto other important matters. Not to mention, strong energy infrastructures would significantly improve the national standard of living in Brazil.

Another issue in Brazil is the subject of water infrastructure. Brazil has an abundant supply of water within its borders. Brazil is estimated to have access to around 14% of the world's freshwater pool (Garrido & Goldstein). However, the Amazon Rainforest holds the vast majority of this freshwater, and as noted previously, 80% of the Brazilian population lives near the coast (Brazilian Energy Market). Just six years ago, in 2016, a staggering 15% of households lived without access to fresh, treated water (Costa, Carla & Bertol). What this means is most urbanized areas of Brazil have minimal access to a sanitary water supply. Limited access to water, among other issues, results in enormous slums amidst Brazil's population centers where access to drinkable water is limited, and there is little to no sanitation (Garrido & Goldstein). Brazil has to counter the impending threat of polluted waterways soon.

However, in the meantime, a viable method to supply population centers with clean water would be to construct an aqueduct system. The aqueducts would import water from the country's wetter interior region. Another solution, although costly and energy inefficient, would be to desalinate seawater into drinkable fresh water. Given the state of Brazil's energy infrastructure, the first option is far more realistic. The process of building an aqueduct would doubtlessly be expensive, so companies using large quantities of water could be called upon to fund aqueduct construction. Brazil's ethanol industry, being the second largest in the world behind the United States, uses enormous quantities of water in Brazil, so they and other companies or industries utilizing large amounts of water could be taxed for their water usage (International Trade and Export). The companies would be taxed a small fee per gallon of water used for the production of goods. The tax revenue would directly fund aqueduct construction. Not only would this tax give funding for a needed project, but it would additionally incentivize companies consuming large amounts of water to consume less water and find new environmentally friendly methods to operate. Ideally, companies would voluntarily invest in the production of industrial-scale aqueducts

because it would expand their available realm of operation. Foreign aid could also be called upon to support the up taking of an interstate aqueduct project. Finding consistent, clean sources of water and providing Brazilians with freshwater is of utmost importance.

Finally, wastewater poses a viable threat to the health and wellbeing of Brazilians and the environment. Available water supplies in populated areas are often heavily polluted since Brazil is financially incapable of treating its wastewater given its current circumstances (Garrido & Goldstein). Additionally, Brazil's sewage system is far underdeveloped. For example, in the urban area of Sao Paulo, it is estimated 21% of the population does not have access to sewers, and six years ago, in 2015, 40% of households in the entirety of Brazil, lived without any access to sewage systems (Costa, Carla & Bertol). Furthermore, of the sewage collected, just 62% of the sewage is treated (Garrido & Goldenstein). The rest of the raw sewage water sits in the sewage system or is released into the environment, causing a breeding ground for disease in waterways and city slums (Garrido & Goldenstein).

First and foremost, since Brazil is incapable of treating wastewater, the Brazilian government needs to hold companies and individuals accountable for breaking water pollution laws (Slater). Currently, Brazil takes little action to enforce laws protecting the conditions of Brazil's existing water supplies (Slater). In order to combat the rising threat to Brazil's water supply, random bimonthly water tests and inspections will be taken on industrial facilities producing large amounts of wastewater. Excessive fines would be levied on companies found to break existing water pollution laws, ideally deter other companies from further contaminating water sources. Otherwise, after two fines have been paid, the business will be condemned. After industrial pollution has been reduced to an acceptable level, the current issue of wastewater treatment infrastructure can become addressed. Wastewater infrastructure consists of purifying already used water back into its original form through an industrialized process. Such measures are necessary to decontaminate wastewater from homes, businesses, or industries before reusing or releasing it into the environment (Waste Water Treatment Use). Dozens of wastewater treatment plants need to be constructed throughout the country, especially in heavily populated areas. The plants would convert raw sewage collected by existing sewage systems to a form that can be harmlessly released to the environment. If possible, said facilities would be constructed with additional population growth and further sewage system development in consideration. Afterward, when 100% of sewage water is being treated, Brazil can begin building onto its existing sewage system until the entire nation is provided access to sewage systems. Again, developing countries like Brazil do not always have the budget capacity to spend on such infrastructure leading to poor sanitation and heavily polluted waterways (Slater). Regardless, money must be accumulated to provide such necessary services. By reorganizing its spending plan, Brazil could solicit money from other government programs of lesser importance and put the saved money towards wastewater treatment. Still, foreign aid might be called upon to give adequate capital for large-scale wastewater treatment. Even if it means accumulating moderate amounts of debt, the government will benefit in the long run from wastewater infrastructure. Monetary matters pushed aside, should wastewater infrastructure successfully clean most of Brazil's wastewater, the sanitation and living conditions of Brazil's inner cities would improve drastically. Brazil's waterways would no longer appear as polluted as those of third-world countries. Real estate values would rise, and there would be a new desire for people to move to urbanized areas because of the better living conditions. Simply put, Brazil's current wastewater infrastructure is in a poor state and many times nonexistent, leaving millions of Brazilian citizens exposed to unsanitary wastewater. Brazil must act to invest in wastewater and sewage infrastructures.

The nation of Brazil has enormous potential to become a first-world country. However, Brazil's insufficient infrastructure hampers this possibility. Its transportation system restricts economic expansion from occurring throughout the nation. An inadequate power grid prevents industrialization. Limited access to clean freshwater impedes the country's quality of life, and an inability to adequately treat

wastewater results in unsanitary living conditions in large parts of the country. Brazil requires further improvement in its transportation, energy, and water, and wastewater infrastructures.

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