INTRODUCTION

Brazil has been a leader in global efforts for battling negative climate impacts—until Bolsonaro, a far-right President, whose presidential term started on January 1, 2019. Climate scientists and environmental organizations around the world have placed a great deal of importance on Brazil’s rainforests since deforestation, among other natural options, has the greatest potential for reducing carbon dioxide emissions. Unfortunately, President Bolsonaro has been implementing policies that are exposing the Amazon rainforest to harmful deforestation activities. The deforestation in Brazil has surged more than 30 percent just over the past year according to official data published by Brazil’s National Space Research Institute (INPE). INPE’s report also emphasized a dramatic jump in the frequency and scale of wildfires raging in the Amazon rainforest, 72,845 wildfires detected as of August 21, 2019, indicating an 83 percent increase from the same period in 2018. Unfortunately, more wildfires are expected in the Amazon since fire is one of the most common methods for cutting down trees in Brazil. Since taking office, President Bolsonaro has diminished 95% of the Ministry of Environment’s budget allotted for climate change activities, transferred the body responsible for certifying indigenous territory from National Indian Foundation to the Ministry of Agriculture, converted environmental fines into alternative compensations, and finally, changed the Forest Code to extend deadlines for enforcement measures. These policies have been and will continue to exacerbate deforestation in Brazil’s rainforests. Fortunately, according to Rainforest’s report, there are some state representatives of Brazil’s 27 states (federative entities) that were reported to have gathered and jointly committed to upholding the country’s previously submitted national commitment in the Paris Agreement to cut greenhouse gas emissions back in April this year (list of the 12 states was not available). Deriving from the framework of Shrestha’s work in looking at the socioeconomic factors as drivers of true “low” deforestation, some key questions will attempt to answer the following questions:

<Research Questions>

1. Which states are affected by deforestation?
2. Based on the following socioeconomic factors: population, human development index, and rate of primary education, which states are likely to support reforestation policies?
3. How likely are the deforested states to support reforestation policies?

Step 1. Deforestation Magnitude 2008~2019

Shrestha’s work argues that various socioeconomic factors such as population, income, urbanization, education, and human development index (HDI) are likely to be the strong drivers for reforestation in Nepal. Based on Shrestha’s framework, three socioeconomic factors — population, education, and HDI are used in the study to assess which states would support and how likely they are to support reforestation policies.

Population

Because Brazil is still a developing country, a state population is an important indicator of urbanization. There are 27 states, or federative units, in Brazil. Based on the Brazilian Institute of Geography and Statistics (IBGE), federative units with a population below 1 million were assigned a population score of 1, indicating a lower level of urbanization. Conversely, federative units with more than 9.5 million people were assigned a population score of 6, indicating a high level of urbanization. The whole operation was done through selecting attributes in the attribute table for precisely selecting the data, and a field calculator was used to assign scores between 1 to 4 accordingly.

Human Development Index (HDI)

According to United Nations Development Programme (UNDP), “The HDI was created to emphasize that people and their capabilities should be the ultimate criteria for assessing the development of a country, not economic growth alone.” This is one of the reasons why HDI is used in Shrestha’s work. The definition of HDI provided by UNDP mentions that HDI is a summary measure of economic achievement in key dimensions of human development, such as a long and healthy life, being knowledgeable, and having a decent standard of living; essentially a geometric mean of normalized indices for each of the three dimensions. In Brazil, the highest HDI is 0.824 in São Paulo, the lowest being 0.55 in Maranhão. As a comparison, the U.S’s HDI value for 2018 is 0.91 (higher the better). The HDI scores are then assigned a score of 1 and those with HDI levels above 0.74 were assigned a score of 4. The process of assigning the scores is identical to the population section above and will also be the same for the primary education section below.

Primary Education

Primary education is mandatory not only for continuous development but for secondary and post-secondary education as well. Educated people are more likely to be interested and aware of climate impacts, thus they will be more sensible in being supportive of reforestation and other commitments that Brazil has already promised in Paris Agreement in 2015. Similar to population and HDI scores, federative units with low primary education rates were assigned a score of 1 and those with high rates were assigned a score of 4.

Combining All Scores

All the socioeconomic factors’ scores were then combined in the attribute table to produce a comprehensive list showing which states are likely to support reforestation based on the three factors above. Since each factor was assigned a value between 1–4, the highest score that can be achieved for each state is a maximum of 12.

Step 2. State-level Socioeconomic Data

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Step 3. Continued

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deforestation scores from step 1 in the raster data’s zonal statistics table were joined to the state’s analysis through joins and relates operation based on state names, increasing the total score achievable by each state from 12 to 16 (three socioeconomic factors + deforestation score). The combined data represented in vector format shows the likelihood of the 16 states (federative units) supporting reforestation based on each state’s combined socioeconomic scores.