

## Global Impacts of Deforestation in the Amazon Rainforest

Kimberly Dudeck

Stockton University

### Abstract

The Amazon rainforest contains some of the most diverse species of plants and animals than any other ecosystem on the planet. The region is home to ten percent of all vegetation and wildlife species known on Earth, and the majority of them are endemic to this area (Greenpeace, 2014). Aside from its biodiversity, this rainforest also plays a critical role in our everyday lives. Rainforests, in general, are commonly known as the “lungs” of the planet because of their ability to absorb carbon dioxide and produce oxygen and water vapor. Not only do they allow us to breathe, but also help to stabilize the world’s climate, maintain the water cycle, prevent ocean acidification, and house a variety of foods and natural medicines. The Amazon rainforest has fallen victim to economic globalization; cattle ranching, industrial-scale soybean production, and illegal logging practices continue to fragment the great Brazilian wilderness. Over the past forty years, approximately twenty percent of the Amazon rainforest has been cut down – more than in all the previous 450 years since European colonization began. Scientists fear that an additional twenty percent will be lost in the next two decades (Wallace, 2011). This tremendous loss has greatly impacted the Earth and contributed to our current crisis involving climate change.

People all over the world have been participating in deforestation efforts for thousands of years. During the Industrial Revolution, huge chunks of forests were cut down in order to make room for developing areas. The favored technique of deforesting was burning trees and clear cutting, commonly known as the slash-and-burn method. This technique destroys trees without efficiently using them, and strips the soil of its nutrients so vegetation is unable to grow. Slash-and-burn techniques release large amounts of CO<sub>2</sub> into the atmosphere, including the carbon that was stored in the trees, which creates an overall warming affect worldwide. We have experienced a tremendous increase in deforestation over the past decade. For example, the Sierra Santa Marta area of Southern Mexico has lost more than ninety-five percent of its original rainforest cover (Durand & Lazos, 2004). Climate records from the past support this evidence. Historical records may be retrieved from tree rings, pollen records, and ice cores from around the world. This evidence allows scientists to compare current changes with past naturally induced ones.

According to Mastrandrea and Schneider (2008), tree rings and pollen rates taken from lake beds indicate that current temperatures are the warmest of the millennium, and that the rate and magnitude of warming over the past 150 years are greater than any previous changes during this period. Ice cores taken from Antarctica and Greenland may also provide temperature and atmospheric gas estimates, predominantly carbon dioxide and methane, from hundreds to thousands of years ago. These ice cores indicate that current levels of CO<sub>2</sub> and other greenhouse gases in the atmosphere are far above any seen in the past 650,000 years (Mastrandrea & Schneider, 2008). The main purpose of this paper is to explore issues of deforestation in the Brazilian Amazon, and relate them to the overall health of the planet.

Cattle ranching in Brazil is the leading cause of climate change in the Amazon. Today, the country is the world's leading exporter and producer of beef, which can attribute to sixty percent of all deforestation in the Brazilian Amazon (Butler, 2008). The methane gas produced by large herds of cattle increases the concentration of greenhouse gases in the atmosphere, which ultimately leads to a warmer planet. The effects of global warming are causing temperature increases and drastic changes in climate patterns. During the second half of the 19<sup>th</sup> century, the global average surface temperature is estimated to have risen 1.5 °F above average (Mastrandrea et al., 2008). Large, and potentially dangerous shifts in climate may result from these temperature fluctuations.

The continuous increase of greenhouse gas emissions released into the atmosphere will eventually lead to further climate changes across the globe. Some of these future changes are projected to include increases in Earth's average temperature, reduced ice and snow cover, increases in the intensity, frequency, and duration of extreme events, and shifts in the characteristics of the ecosystem. Mastrandrea and Schneider (2008) suggest that a heavy reliance on fossil fuels will drive emissions to increase significantly during this century. They project further global average surface warming of 2.4 - 6.4 °C by the year 2100. These changes will greatly impact our water resources, food supply, ecosystems, and the overall health of humans.

The process of converting portions of the rainforest into pastures for grazing cattle, as well as for agricultural purposes, can be attributed to climate change. Ranchers and farmers will clearcut large areas of forested land in order to make room for their livestock. A significant loss of trees can severely impact the ecology of the rainforest. While intact, the Brazilian Amazon is able to produce half of its own rainfall through the moisture it releases into the atmosphere (Wallace, 2011). The clearing of a large portion of its trees will eliminate this ability, causing the

remaining vegetation in the area to dry out and die. Along with the effect of droughts from global warming, this open patch of land could become increasingly prone to wildfires, those of which could potentially devastate the forest. Meanwhile, because trees are wantonly burned to create open land in the frontier states of Pará, Mato Grosso, Acre, and Rondônia, Brazil has become one of the world's largest emitters of greenhouse gases (Wallace, 2011). The natural greenhouse effect makes our planet much more habitable, about 33 °C warmer, than it otherwise would be. Intensifying the greenhouse effect traps extra heat and warms the surface further, resulting in abnormal increases in temperature (Mastrandrea et al., 2008). The choices Brazil's society makes today will affect the amount of greenhouse gases released into the atmosphere for years to come.

The Amazon is considered a carbon sink, meaning it stores carbon dioxide and prevents it from entering the atmosphere and fueling climate change. When a tree dies, it decomposes, and the carbon that has been stored over its lifetime is released back into the atmosphere. The Amazon Basin stores approximately 100 billion metric tons of carbon, more than ten times the annual global emissions from fossil fuels (Greenpeace, 2014). This process of decomposition and carbon release is accelerated in trees that are prematurely cut down. Deforestation affects the global climate both by releasing the carbon stored in the plants and soils, and by altering the physical properties of the planetary surface. Adding CO<sub>2</sub> to the atmosphere through deforestation exerts a warming influence on the planet, and reduces evapotranspiration in the tropics (Bala et al., 2007). According to Greenpeace (2014), deforestation accounts for about ten to fifteen percent of global greenhouse gas emissions. In general, the release of CO<sub>2</sub> through deforestation in the Amazon will result in a warmer planet.

The carbon dioxide that has been released into the atmosphere can be absorbed into bodies of water. There have been noticeable transformations among the planet's oceans and glaciers as a result. There has been a significant rise in the average temperature of our oceans, and a dramatic increase in the concentration of carbon dioxide in the water. The records show lower pH levels, which indicate that the water has become more acidic. It is also becoming apparent that sea levels are rising due to melting ice caps and glaciers in the Arctic. During the 20<sup>th</sup> century, it was observed that the global mean sea level is rising 1.5 - 2 millimeters per year (Milly, Cazenave, Gennero, 2003). The mid 1970's experienced a rapid loss of ice volume followed by further acceleration in the last decade. At the time of this study, the annual average volume loss of ice was 147 millimeters per year (Dyurgerov & Meier, 2000). In the coming decades, our society and environment will be faced with many challenges as these changes become more evident.

Aside from heating up the globe and impacting our water sources, deforestation will also greatly impact biodiversity and soil quality in the Amazon. There will be a significant decrease in species diversity due to the destruction of natural habitats, those of which are home to various types of vegetation and wildlife. The loss of trees and their roots will result in greater amounts of soil erosion, as well as a decrease in soil quality. These open areas of cleared land are consistently planted with crops like bananas, palms, manioc, maize, or rice; the productivity of the soil declines after a year or two, and then the farmer will move onto a new area to repeat the process. The old, infertile fields are often used for small-scale cattle grazing or left for waste (Butler, 2008). No matter the consequences, deforestation will always have a negative impact on the environment.

In conclusion, if deforestation efforts in the Brazilian Amazon continue at these rates, the destruction of ecosystems will lead to environmentally harmful consequences. The deforestation of trees not only lessens the amount of carbon stored, but it also releases carbon dioxide into the atmosphere. Many species of plants and animals are also losing their habitats to deforestation, which can eventually lead to species extinction. The water cycle and soil erosion will also be affected by the destruction of the Amazon rainforest. Rainfall will no longer be absorbed by trees, which will lead to a reduction in the amount of oxygen and water vapor produced, and soils will be more prone to erosion, causing problems in vegetation growth. We must bear in mind that the preservation of ecosystems will ultimately lead to the prevention of further global warming, and a healthier planet overall.

## Citations

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