Wet vs Dry Season and Climate Change Effects

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Abstract:

The water cycle has an important role in the Amazon Basin. The Amazon River has two seasons per year. The dry season which happens in the months of August to September and the wet season which happens during January to May. The dry season is the lowest flow period and has a width of 4 to 5 kilometers. The highest flow period is the wet season and can reach up to 50 km. These seasons are caused by the amount of rainfall and the input of the snowmelt from the Andes. In the recent years, there has been a change in the seasons. The changes that the Amazon rainforest go through daily is deforestation which leads to a change in the hydrologic cycle. Another influence is climate change and the global temperature of the earth rising.

The Water Cycle

The water cycle has an important role in the Amazon Basin. Researchers call the Amazon the lungs of the world due to how much carbon dioxide is taken up by the plants. Twenty percent of the world's freshwater is in the Amazon. The Amazon rainforests ecosystem has a high humidity, heavy convectional rainfall and an abundance of vegetation. When the heat is reflected off the treetops (surface) and that hot air rises, then the air becomes cools and condenses causing cloud formation. The minimum amount of rain the Amazon receives per year is 75 inches. Another important part of the water cycle which involves trees is transpiration. Transpiration is when water is taken up by the plants and enters the soil. Within the past 40 years, about 20 percent of the Amazon has been cut down.

Due to the rising effects of deforestation, less trees equals less rain due to zero transpiration in the Amazon. By 2001, approximately 837,000 km squared of the Amazonian forests had been cleared (Betts, 2008). The Andes mountains affect the Amazon Basin's water cycle. Once more clouds form over the Amazon, the clouds follow the Andes and produce rain. The wind blows the clouds to the Amazon and causes heavy rainfall (Nature Conservancy, 2016) The water vapour content of the atmosphere has increased and strengthened the global water cycle. This would lead to wet regions getting wetter and dry regions getting drier (Chou, 2013). Do to Brazil's climate, the seasons are very crucial to the local environment. The Amazon River has inputs and outputs. The inputs include precipitation, Andes snowmelt, runoff and groundwater. The drainage system of the Amazon Basin has approximately 1,100

tributaries. 600-800 million tons of sediment per year are transported by the Amazon River. The average discharge of the river is 219,000 m3/sec of water (Meybeck,1976). The outputs include evaporation, transpiration, and river runoff.

Wet Season

The Amazon River's highest elevation is 5,598 meters in the Peruvian Andes (Kricher, 1997). The reason the Amazon River flows east to west is about 100 million years ago Africa and South America broke apart. The Andes mountains rose on the east side of South America and the water flowed to the center of the continent changing its flow. Over time the water was forced by ridges to just flow eastwards (Than, 2006). After the Andes rose years ago the Amazon river was forced to flow into the Atlantic Ocean. The river floods due to a lot of rainfall in the rainforest. Three percent of the rainforest are invaded by the river (Goulding, 1993). The river water can go in the forest up to 20 km on either bank.

The flooded forest or the wet season comes from seasonal precipitation and the input from the Andes snowmelt. During the months of January to May the highest flow period occurs. During the floods the insects move upwards. The Amazon has an abundance of freshwater fish fauna. The trees increase the amount of fruit they produce during the wet season (Goulding, 1993). As the rivers rises the forest begins to flood every year. The floods in the Amazon are controlled by the heavy rainfall and the mountainous regions. River water from the andes flow through the amazon lowlands. The water settles in the Amazon floodplains. The wildlife have to adapt to the change of

seasons. During the wet season, certain species benefit and others experience conflict. The width of the river can go up to 50 km. During the wet season, the climatological precipitation rates in the southern Amazon are 300 mm per month. According to Pra Que Rumos tour guide Rafael Estrela, the wet season went up to 29m in 2012 unlike the usual 18m. The wet season affects the local native people. Every year over 250,000 km2 of Amazon floodplain forests are topped by water from the river. These flood areas are called the *Varzea*. Most populations are higher in these areas because of the seasonal abundance of fishes, birds, turtles and fertile soil. However, the people who live there have to be willing to deal with the flooding cycle and occasional shortages of food. The floods also cause a benefit for the economy. The amount of fruit increases and the floods give easier access to fish.

Dry Season

During the months of August to September, the Amazon goes through the dry season every year. The dry season is the lowest flow period and has a width of 4 to 5 kilometers. Do to the forest getting removed, the transition from dry to wet season could be delayed and the length of the dry season will increase. According to recent data, a longer dry season could be more devastating to the Amazon's ecosystem than a decrease of rainfall. (Fu, 2004) The removal of the rainforest would result in a rapid loss of soil moisture. A lower soil water storage would decrease the surface latent heat flux during the dry season. Data shows that a drier surface soil and lower surface latent flux creates a change in the dry/transition season. The influence of land use on the start of the wet season and the length of dry season could depend on the characteristic climate

and ecological conditions (Fu, 2004). Many plants begin to flower during the dry season. The dry season canopy can lead to an abundance of fruit. The mean precipitation rate has dropped to 50 millimeters per month. Researchers data found that the decrease of the land surface latent heat flux initiates the decrease of rainfall (Fu, 2004).

Climate Change

Deforestation causes erosion and soil loss, and an unbalance in the ecosystem. An expansion of the urbanization can problems to the Amazon Basin. Water pollution such as agriculture pesticides, inadequate wastewater treatment and mercury from the gold mines will cause problems with the water quality. Due to climate change there is a change in the hydrologic cycle. The impacts of deforestation on the hydrological cycle are high biomass trees with roots that can access deep reservoirs of soil moisture are replaced with pastures. (Bagley, 2014). Land cover change reduced precipitation by 5.45% and evapotranspiration by 4.61% in the rainforest region during the dry season. The destruction of the forest will lead to a loss of freshwater fish species which is an important source of food for the native. There has been no policy to stop the growth of pastures for cattle ranches (Goulding, 1993). The biggest change to the forest ecosystems would be the precipitation would decrease during the dry season. The Amazon rainforests have been rising at a rate of 0.25°C per decade and should rise by 3 to 8°C over the coming years (Betts, 2008).

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The logging industry in Brazil has increased over the years. The illegal logging industry has been having the greatest effects on the rainforests. According to the Food and Agriculture Organization of the United Nations (FAO) global forests are disappearing at a rate of 0.2% per year. (Scotland, 2002). The Brazilian Amazon includes nine states and covers about 59% of Brazilian territory. The environmental crime law enforcement in the Amazon is done by Ibama, Ministerio Publico and the courts. The rainforests covered 14 percent of the earth's land surface but in recent years only covers 6 percent. One and one-half acres of rainforest are lost every second (Butler, 2008).

In Brazil, European colonists have destroyed around 90 indigenous tribes since the 1900's. Since 1970, over 230,000 square miles of Amazon rainforest have been destroyed in Brazil. Sixty to seventy percent of the cleared land is used for cattle ranches, thirty to forty percent is used for small scale subsistence agriculture, one to two percent is used for large-scale, commercial agriculture and lastly two to four percent is used for logging (Butler, 2008). The illegal loggers do not follow the correct regulations. Also dams interfere with the hydrological cycle and nutrient flows.

Journalists could be in danger with the logging industry and police do not monitor the loggers. The disappearance of activists are common. Madeireira is a sustainable logging company. Their rule is every 1 tree cut 3 trees are grown. They cut the side of the youngest part of the tree and prevent the tree from splintering when it falls. The hinge cut prevents the tree falling fast. They mark every tree they cut and the name of

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the species.

The problem with deforestation in Brazil is the logging industry are not sustainable. Many of the loggers due not follow the law and the trees can not replenish. The rainforest produces an abundance amount of oxygen and the logging industry does not understand the importance of the rainforest. Increasing sustainable logging and increasing the law enforcement can help the regrowth of the rainforests. Climate change is having an effect on the wet and dry season due to the increase of temperatures and the loss of trees. Seeing a change in the climate of the wet and dry season is alarming.

Conclusion

The wet season and dry season have effects on the local community and the local ecosystem. Many researchers have found data linking climate change to the change in the wet and dry season. They observe that the dry season will get drier and the wet season will get wetter. Climate change has been linked of recent and future weather getting more intense. Deforestation has increased in the Amazon and has been a huge problem to the environment. Many of the loggers work illegally cutting down the trees which is extremely unsustainable. Less trees will change the hydrologic cycle and the local ecosystem dramatically. If the state of Amazonas law enforcement become more strict with the logging industry, deforestation could decrease. The environmental law needs to be more of an issue in Brazil due to the Amazon Rainforest being very important to the earth due to the intake of carbon dioxide and the thriving ecosystems.

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