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The Curious Case of Disappearing Natural Ecosystems: A Case of the Amazon Rainforest

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Abstract

Earth's climate has been naturally changing over the billions of years of its history. This change has been slow and gradual. However, over the past century the Earth's climate has undergone a drastic change due to anthropogenic activities, and necessitated global conventions on controlling this climate change. This human induced climate change is influenced by a variety of factors and are part of a myriad complex mechanisms. One of them being imbalances induced in the Earth's natural systems by anthropogenic activities. Large scale natural ecosystems which are responsible for the maintaining the ecological and environmental balance of the Earth have been steadily shrinking. Since the latter half of the last century the rate of their disappearance has undergone a sharp increase. The roots of this phenomena lie in human's ever increasing population and sustaining its consequent needs. While technological advances have ensured that the needs of the human population are met, however, this has come at the cost of disrupting the natural balance of Earth, thereby, blatantly flouting the established global conventions on sustainable development and climate change. This article traces this case through the disappearance of the Amazon Rainforest due to anthropogenic influences and the role this plays in contributing to global climate change.

"blinded by present gains they knew not what damage they were causing for the future"

Introduction

Earth's natural order or system of functioning is unique and at the same time extremely balanced. We need not delve into the science of it all, but just a superficial understanding is more than enough. A prime example of this is, when as children we studied the water cycle, or for that matter the human bodily functions. Both are complex systems, but they are marvels of simplicity with respect to one fundamental tenet, and that is, of 'maintaining balance'. Nature exemplifies itself in maintaining this wondrous tenet of balance through the various natural cycles and systems, all of which while being distinct from each other, adheres to a natural whole. An example in this regard would be the monsoon of the Indian Subcontinent and South East Asia. This huge geographic area receives monsoon each year without fail due to a complex system of oceanic circulation in the Pacific Ocean off the South American coast, and atmospheric circulation above the Tibetan Plateau. Although, the oceanic and atmospheric circulation are distinct from each other, however, both are part of Earth's global oceanic and atmospheric circulation systems respectively, being responsible for redistribution of energy across the surface of Earth. In this regard it is interesting to note that ocean currents originate from the frictional drag of the winds, ie, atmospheric circulation. Thus, we can see that there are three levels of systemic balance being maintained for the Indian Subcontinent and South East Asia to receive rainfall, all of which are distinct but inextricably linked. Disruption at any one level would result in the region suffering from a drought like situation.

The global climate functions on a similar concept. There are large scale[1] natural areas like the ice caps of Greenland, Arctic Ocean and Antarctica, forested areas of South America and Africa, Siberia, and open plains of Central Asia, Siberia, Australia, and North America. These natural areas perform some key functions in maintaining the climate and various systemic functions of Earth, for example maintaining atmospheric and oceanic circulation, carbon sequestration, oxygen balance, fresh water balance etc. In many ways these

large scale natural ecosystems can be considered the engines on which Earth's climate runs. As can be imagined from the word 'engine', any problem or disruption in it will inevitably result in the machine's performance getting affected. The machine in this case is Earth's climate, the engines are these large scale natural ecosystems and the disruptions are anthropogenic activities. Until the eighteenth century everything was working just as Nature envisioned it to be. However, from the eighteenth century onwards we started to industrialize and modernize, which led to massive emissions in all forms, ie, solid, liquid and gaseous. It was eventually established in the twentieth century that such anthropogenic activities are causing severe environmental degradation and climate change. This in turn led to a rise in the cause for environment protection, activism, global summits for climate change prevention, and subsequent establishment of global watchdogs and institutions to further such causes.

At the same time from the eighteenth century onwards the human population started to increase at an exponential rate. This increased population required space to settle, work, trade etc, all of which can be summed up as built up areas. At the same time an increased population indicates more mouths to feed. So, the existing vacant areas started being steadily filled up either as built up areas or agricultural areas[2]. This process continued to the extent that soon humans used up the amount of land provided by Nature for the said purposes, and the issue of land scarcity started to emerge in various parts of the globe. However, humans, being the genius creation of nature, in order to tackle the issue of land scarcity, resorted to reclaim more land from Nature, a prime example of which is Mumbai, wherein the city was built by reclaiming land from the Arabian Sea. A more clichéd example would be the cutting down of forests to accommodate the needs of the ever increasing human population. However, Nature possibly took into account the delinquent nature of its prized creation and ensured checks in place to curb this wayward expansion of humans. These checks include a steep drop in the continental shelf which limits the amount of land that can be reclaimed from the seas and the oceans, or forests over plain lands transitioning into forests over mountains. Given the genius ways of humans, such checks of Nature too shall be overcome eventually, but only after other less troublesome and less expensive approaches to satisfy humans have been exhausted.

One such less troublesome and less expensive approach is the clearing of the Amazon forests in South America. The Amazon rainforest has long been recognized as an important repository of biodiversity and natural resources, not only for local people and indigenous communities, but also for the rest of the world(World Wide Fund For Nature, 2019). There are more than three billion trees, belonging to over 16,000 species in the Amazon rainforest which sequester 25% of the total CO_2 stored in the terrestrial environment (Amazon Aid Foundation, 2019). Unfortunately, the Amazon rainforests, have continued to disappear over the past several decades. Since the 1970s, 8,50,000 km^2 of the Amazon rainforest (an area roughly equal to Rajasthan, Gujarat and Madhya Pradesh put together) has been lost (Livemint, 2019) to 'development projects' like plantation farming, dams, logging and road building. According to a recent study, the carbon storage in the Amazon has declined by 30% since the 1990s due to higher tree mortality (Amazon Aid Foundation, 2019). This implies that the earth's atmosphere has, since the 1990s, had to deal with 30% more of CO_2 than it usually did. CO_2 being a greenhouse gas, has thus, contributed to global climate change in a more vigorous manner, owing to the disappearing tree cover in the Amazon rainforest.

Under natural conditions, trees remove CO_2 from the atmosphere and absorb it for photosynthesis, an energy-creating process that yields :

(i) oxygen, which is released back into the air, and
(Ii) carbon compounds, which helps the trees grow.

However, the carbon sequestration process is not just a one way process. What nature takes, it also gives back, unlike the human species. Owing to the recent widespread Amazon forest fire, huge quantities of the carbon compounds are getting burnt and are being released back to the atmosphere in the form of CO and CO_2, with official estimates stating it to be over 200 megatons (1 megaton = 1,000,000 tons = 10^9kg)(British Broadcasting News, 2019). Thus, the forest fire is not only adversely affecting the carbon sequestration process but also releasing huge quantities of greenhouse gases back to the atmosphere. The greenhouse gases being released due to the forest fire will, with immediate effect contribute to global climate change, and the diminished sequestration process will ensure that the greenhouse gases continue to contribute to global climate change in an unabated manner in the long term.

On a separate note, it is important to understand the contribution of trees to oxygen circulation. There has been a huge debate over the amount of global oxygen being supplied by the Amazon rainforests (Cable News Network, 2019). Some experts argue it is 20%, and there are others who beg to differ and state it is less than 10%. Irrespective of the fact how much oxygen is supplied by the three billion trees of Amazon rainforest, it should be noted that even one tree lesser means lesser oxygen supplied to the atmosphere, and lesser carbon being sequestered from the atmosphere, notwithstanding the recent Amazon forest fire of 2019 which has burnt down almost 20,000 km^2 area. If this area is aggregated into one place then this would roughly equal the area of Meghalaya or Manipur. Imagine a whole state of India burning! Imagine how many trees can be located in that area, and then imagine the damage caused to the global environment.

All forest covers, across the globe have another important role in the form of regulating the global and regional climate. Water released by plants into the atmosphere through evapotranspiration and to the ocean through the rivers by attracting rain clouds, influences world climate and the circulation of ocean currents. This works as a feedback mechanism, as the process also sustains the regional climate on which it depends (World Wide Fund for Nature, 2019), and the regional climate is ultimately a part of the global climate. Imbalances in any of the regional climatic patterns will have a cascading effect on other regional climatic patterns. The damage statistics provided till here only considers the climate change perspective, discounting the damage to biodiversity which provides edible, medicinal, recreational products etc to us, or the loss of indigenous lives and livelihoods.

The Amazon forest spreads across an area of 5 million square kilometres[3], of which approximately 60% falls within Brazilian

jurisdiction, 13% under Peru and the rest in Ecuador, Colombia, Venezuela, Bolivia, Guyana, Suriname and French Guiana. Of this area, 17% has already been deforested in the last 50 years at an average of 17,000 km^2 being deforested every year. In other words, every two years an area roughly equivalent to Bhutan is being cleared. It is estimated that if the deforestation rate crosses the limit of 25% then the whole Amazon ecosystem will collapse and eventually die out. Given such widespread knowledge and information pertaining to the damage caused by a disappearing Amazon forest cover, it is pertinent to ask why hasn't there been any constructive action with regards to protection of the forests. The reason being satisfying human needs is more profitable in terms of money rather than protecting the environment.

Till the 1970s, such a huge resource rich region was basically inaccessible except at the fringes and thus, useless for the people. So, to make it accessible the Brazilian government constructed the Trans Amazonian Highway in the 1970s and 1980s. At the same time it offered the land adjacent to the Highway free of cost to settlers. The settlers have been periodically clearing the forests on either side of the Highway to create land for agricultural purposes. Over the years this area came to be known as the Arc of Deforestation. These agricultural purposes are largely plantation in nature, with the farm produces being both crop and livestock. With increasing human population, the meat consumption across the world also increased. This led to an increase in livestock rearing activities in many parts of the world and at the same time an increase in soybean cultivation which is a cheap and high protein food source for the livestock.

The Arc of Deforestation contains large farms either for livestock rearing or soybean cultivation, the produces of which are sold to big conglomerate and food giants who process the same and sell them world over in the form of burgers, pizzas, packed/tinned food etc (British Broadcasting News, 2019). The demand for such food products is huge as they provide easy and hassle free food solutions to the young[4] and single working class in the large metropolitan cities/urban agglomerations of the world, including India. The profits from this business has disincentivized protection of the Amazon rainforest over the years, with a popular argument of successive governments who are responsible for its protection being in the lines of "the developed countries can afford to think about environment protection because they do not have to worry about their economy, while we cannot". Their argument of having to consider providing employment to their people and bolster their respective economies holds merit but not at the cost of endangering the future generation's well being. The future generations, ironically also include the people yet to be born in their respective countries as well.

Conclusion

The destruction of the Amazon Rainforest is a very planned and concerted effort, incentivized by profit. This phenomenon blatantly flouts all global conventions under the United Nations, and the very definition of sustainable development. It is ironic that four decades have passed since the term sustainable development was coined at the Brundtland Commission of 1983 and almost a decade since the first Sustainable Development Goals were adopted at the Rio Summit of 2012, yet, we are nowhere near in actually implementing it. This is no surprise given the fact that all such activities adversely affecting the environment, ecology and climate thrive on the bedrock of "tragedy of commons". Thomas Robert Malthus in 1798 wrote"An Essay on the Principle of Population" which stated that the earth's population is increasing in geometric progression while its capability to produce food in arithmetic progression. He was denounced by his contemporaries on grounds that Malthus did not consider the human species' capability to innovate and make technological advances. Here with the Amazon forest fires, we have an ideal example of what the contemporaries had implied back then. Technology is ensuring farmlands are being created to feed the hungry human populace. Unfortunately, nobody is worried about the cost of the same; the cost that we are incurring and the cost that we are forcing the future generation to incur. The future generation is truly unfortunate as they are going to incur the cost of something in which they neither had any role to play nor any capability to influence. We in the present generation have the capability to influence this in a positive manner and we should do so before it is too late, because in some cases the idiom of 'it is never too late' does not hold true.

Endnote:

1. *The term large scale is used as an indicative term to denote areas covering a large geographic area equivalent to pan continent, or multiple countries therein.*
2. *Agricultural areas is used here as an all-encompassing term to indicate living off the land through crop farming, pisciculture/aquaculture, livestock rearing, plantation farming forest plantations etc.*
3. *5 million square kilometres is equivalent to the area of India, Nepal, Bangladesh, Pakistan and Afghanistan put together.*
4. *Age group 18-40 years*

This narrative is intended to be part of a series where the cases of destruction of different ecosystems, and the resultant damage caused to the Earth's environment and climate shall be explained. The Case of Amazon Rainforest is the first in this series.

Disclaimer: This narrative attempts to analyze the issues of disappearing natural ecosystems across the world and bring out the story in a coherent manner for the readers. This narrative in no way denounces any particular economic activity, business or government (domestic and/or international). Any offence caused is unintentional and is deeply regretted. The views and opinions in the narrative are of the author himself and in no way does it represent the views and opinions of the organization where he works or that of the journal.

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