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ENVIRONMENTAL AND ECONOMIC ASPECTS OF FOREST DEGRADATION

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Abstract

This study explores information on forest regions located all over the world, as well as the characteristics of those forest that have been destroyed because of deforestation. The forest percentage to land ratio fell by 2.54 percent in 2012 compared to 1990. The regions of Latin America and Sub-Saharan Africa had the most significant declines. A small increase was observed in North America, Europe, and portions of Asia. Countries with high-income levels, as opposed to nations with medium and low-income levels, are less likely to see a fall. From 1900 to 2012, the percentage of forestry products' production in a country's GDP has constantly dropped. The data also reveals a consistent upward trend in greenhouse gas emissions from 1990 to 2012 across all areas. With an R squared of 83%, the regression demonstrates an association between decreased forest area percentage on land and increased greenhouse gas emissions. The data analysis reveals that, while forest usage for economic purposes has reduced in comparison to other activities, deforestation continues to have negative externalities in the form of increasing greenhouse gas emissions. The trend indicates that clearcutting will be consistent in the future. As a result, effective strategies to minimize deforestation are required.

Keywords: environment, economic, forest, deforestation, degradation

INTRODUCTION

According to the Food and Agriculture Organization (FAO) (2020), forest degradation occurs when a forest's ability to supply products and services decreases. Biomass, carbon sequestration, water control, soil protection, and biodiversity preservation are some examples of services that could be provided. In addition, the Intergovernmental Panel on Climate Change (IPCC) (2007) also defines forest degradation as the destruction of at least X percent of the carbon stored in the forest as a direct and immediate consequence of people's direct and immediate involvement in activities related to the forest over the

course of some length of time. This destruction takes place as a direct and immediate consequence of people's direct and immediate involvement in activities related to the forest. This elimination happens throughout the course of a certain period of time. This eradication takes place over the course of some length of time.

Forest degradation is mostly caused by human actions that transform forests for personal benefit. Human activities are responsible for most of the deforestation. Those activities that involve altering forests in order to provide advantages to people are key contributors. (J. Busch and K. Ferretti-Gallon, 2017). According to the World Bank, the proportion of woodland area in the world has decreased by 2.54 percent since 1990. Since about the end of the last big ice age, which occurred approximately 10,000 years ago, one-third of the world's forests have been eradicated (United Nations FAO, 2020). Two billion and a half hundred and fifty million hectares of forest have been cut down and cleared for agricultural and cattle grazing land, as well as for use as fuelwood (Kump, L. R., Kasting, J. F., & Crane, R. G., 2004).

According to several scientists, deforestation has a detrimental effect. Deforestation is a significant contributor to climate change (G. Singh and B. Singh, 2017). Forestry serves as a repository for carbon and other greenhouse gases. As the number of trees decreases, the amount of carbon stored decreases, resulting in less absorbent carbon dioxide in the atmosphere. As a result, the quantity of carbon in the air rises, resulting in global warming. According to Archana K. (2013), deforestation poses a hazard to the survival of forest animals. As the forest space gets smaller, the various species will become more isolated from one another. When the components that are essential to a species' continued existence begin to decline, that species becomes increasingly susceptible to extinction. In addition, Archana believes that the extinction of species contributes to climate change.

Forest degradation, on the other hand, is not solely linked to negative things. This fact can be explained by this information. The State of the World's Forests was released by the Food and Agriculture Organization (FAO) in 1995. Forests, they claimed, constitute an inextricable aspect of the country's economy. Woodlands, according to the FAO, are a vast resource that supplies a wide range of inputs for cultivation, energy, medication, housing requirements, and essential commodities. As a result, forest degradation should be minimized, and it should be done to meet human requirements. Infrastructure development is another form of legal deforestation, according to the FAO. Because of the development

of transportation infrastructure to facilitate transit between areas, forests have been intentionally decreased.

According to the United Nations (UN) Food and Agriculture Organization (FAO) (2020), forest function modification and adjustments to the roles that forests play in society are required to ensure the continued existence of both the nation and its people. The harvest is processed and transformed into a valuable export item, which adds to the general rise in the nation's Gross Domestic Product (GDP). To help the villagers boost their income, they cleared the ground and turned the surrounding forest into agricultural land.

This study explores information on forest regions located all over the world, as well as the characteristics of those forest regions that have been destroyed because of deforestation. It is possible for deforestation to have both positive and negative effects on the environment that surrounds it. The following section of the study explores the existing externalities, the policies that have been enacted, and the prospective solutions that could be found in order to improve the current situations.

RESEARCH METHODS

The information obtained from the World Bank, which was used as the major reference for the statistics, was utilized in order to arrive at the conclusions that were drawn from this inquiry. After conducting extensive research and collecting a large amount of data, the following information about total greenhouse gas emissions as well as statistics on forest areas, value-added agriculture, forestry, and fisheries were compiled: agriculture with added value, forest products, and fisheries were all reported as a percentage of gross domestic product; forest area was expressed as a percentage of total land area (Kt CO2 equivalent). We are going to undertake an analysis of specific information on a scale that spans the entire world, as well as regions and individual countries, as a part of the strategy that we are going to implement. When adopting this tactic, it is feasible to collect data on a wide range of topics, some of which include, but are not limited to, those pertaining to the economy and the environment, amongst others.

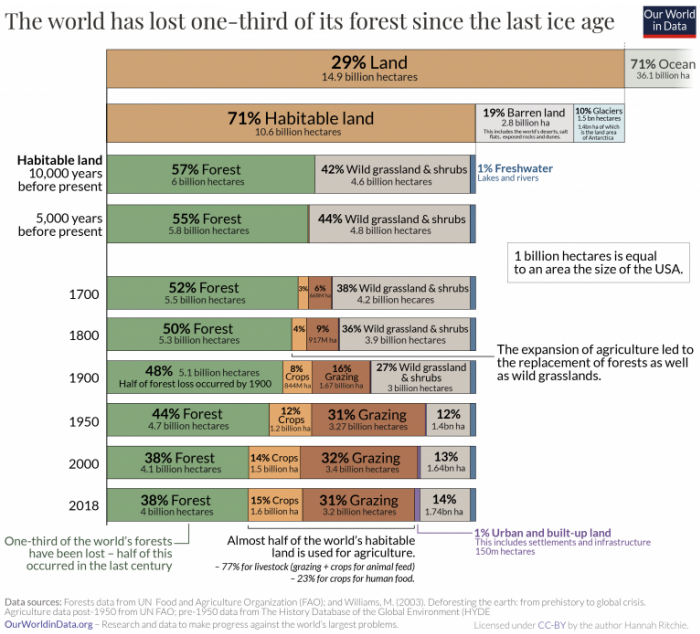
The research started in the year 1990 and continued all the way until it was completed in the year 2012. It was important to incorporate data on agricultural production, forest management, and fisheries, in addition to information on value addition, in order to analyze the probable monetary repercussions of forest management. These repercussions could be in the form of savings or losses. This item was done in order to ensure that appropriate

responses could be given in response to the questions that were being asked. The author also presents the data related to forests, covering forest areas, deforestation, forest loss, afforestation, and drivers of deforestation from the United Nations (UN) Food and Agricultural Organization (FAO) Our World in Data, which was published in 2020. These results are presented to add to what the World Bank found when they looked into the data. The comparison and analysis of the results of secondary research from the sources given above will be included in the conclusion section of this paper.

RESULTS AND DISCUSSION

According to the United Nations (UN) Food and Agricultural Organization (FAO) (2020), one-third of all of the world's woods have been lost in the time that has passed since the end of the most recent big ice age, which took place approximately 10,000 years ago. This has been lost in the time that has passed since the end of the most recent big ice age. This event occurred not too far away from the time when the conclusion of the most recent glacial age was drawing ever closer to being accomplished.

Figure 1. Worlds' loosed forrest area

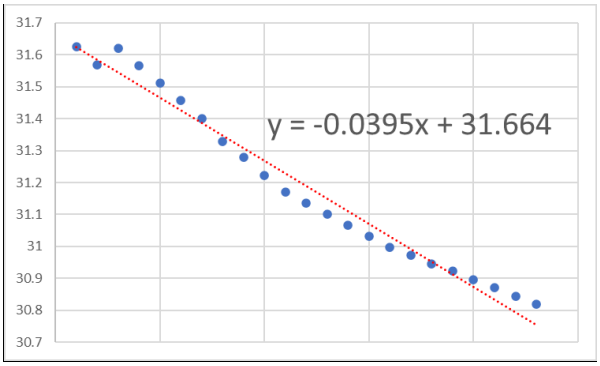


From Figure 1, we can see that glaciers encompass ten percent of the earth's surface, and another nineteen percent of the planet is made up of uninhabitable terrain such as deserts, salt marshes, beaches, sand dunes, and exposed rocks. This results in what is referred to as habitable terrain. A little more than one-third of the land that is suitable for human habitation

is covered by forests (38 percent). This fact accounts for approximately one quarter, or 26 percent, of the overall land area, which includes both habitable and inhospitable terrain.

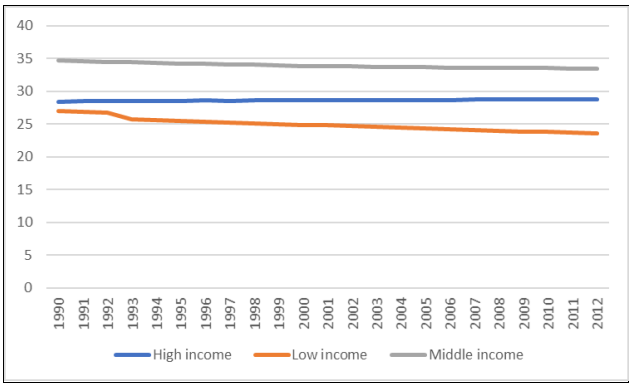
We can see that, as a direct result of the expansion of agricultural methods around the world, the proportion of land that is covered in forests has drastically decreased. More than half of the arable land that can be found anywhere on the globe is currently being utilized for agricultural purposes, and these uses take up the majority of the space that is being used for agricultural purposes. In particular, the land area that is utilized for cattle ranching is comparable in size to that of all of the forests that can be found across the entirety of the planet. This issue is owing to the fact that there is a need for a substantial amount of land in order to raise cattle on a ranch.

Figure 2. World forest area (as a percentage of land area), 1990–2012



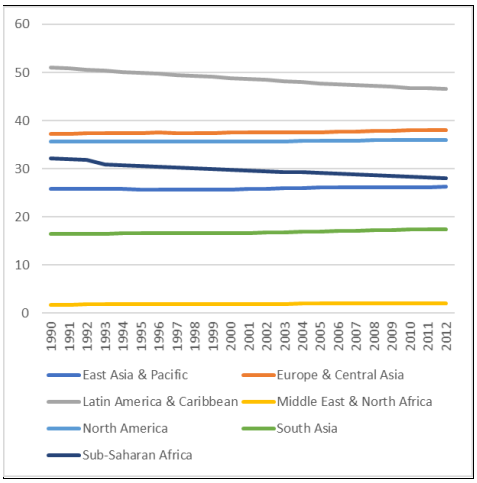
As seen in Figure 2, the percentage of land that is covered by forests is continuing to fall. Only once, in 1992, was there ever an increase in the number. In 1990, it was estimated that there was around 40,267,002.15 km2 of forest cover across the world, which is equivalent to approximately 31,624 percent. The downward trend is still apparent, as evidenced by the slope of -0.0395 and the intercept of 31,664. The proportion of land covered by forests experienced a decrease of 2.54 percent, or 3,239,776,876 km2 in 2012 alone.

Figure 3. Forest area (% of land area), countries' income level (1990 to 2012)



The illustration in Figure 3 shows a country that enjoys a high degree of prosperity and has forest land that is generally stable. In point of fact, the percentage of land covered by forests in countries with high incomes had a 1.38 percent increase in the same year. In all other cases, countries with a moderate or low level of income experienced a reduction in the amount of land covered by forests as a percentage of total land. The rate of decline was 12.65 percentage points higher in low-income countries than in middle-income ones, where it was only 3.54 percentage points lower.

Figure 4. Forest area (% of the land area), per region (1990 to 2012)



As can be seen in Figure 4, the decline in the proportion of forested areas did not take place in all of the sites. The highest contributions to the rate of forest area loss were made by Latin America (8.7 percent) and Sub-Saharan Africa (12.83 percent), respectively. The combined amount of land that has lost its cover of vegetation in these two locations is 1,781,987.28 km2, making up more than half of the worldwide forest area's percentage loss relative to land area. On the other hand, the percentage of land covered by forests expanded in North America, Europe, and Central Asia, as well as East Asia and the Pacific, and South Asia.

Figure 5. Share of global forest area, 2020

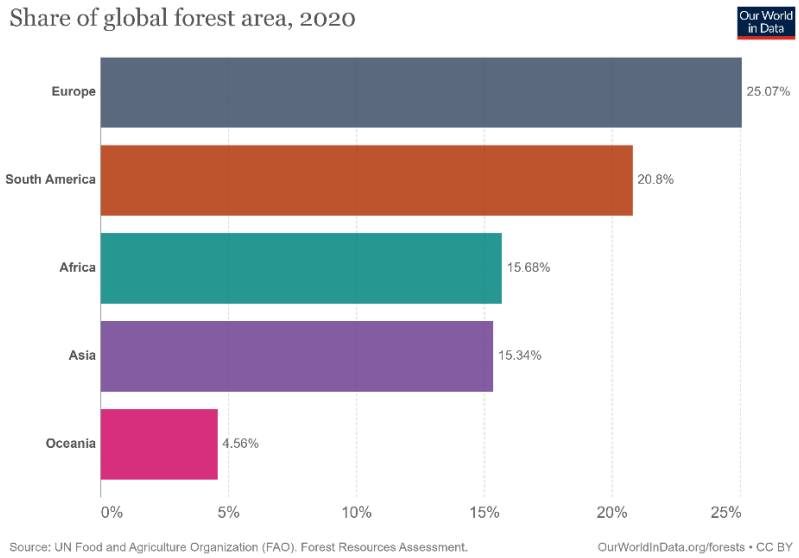


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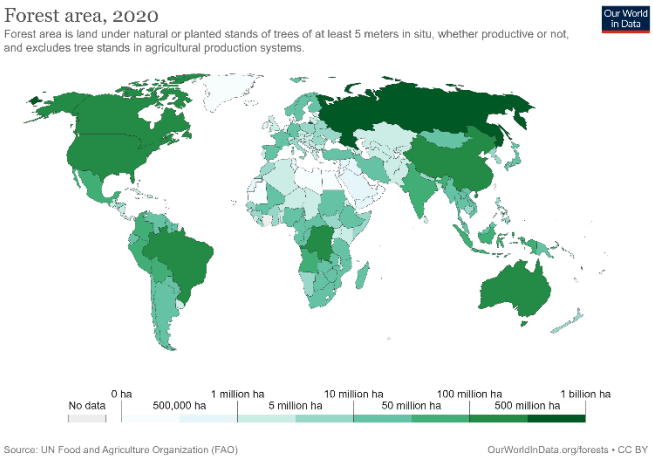
Figure 6. Total forest area across the globe by countries, 2020



If we elaborate again on the area of forests per country, from Figure 6, we will see that with an area covering 815 million hectares, Russia has the biggest forest cover in the world. In addition, Brazil, the United States, Canada, China, Australia, and the Democratic

Republic of the Congo each have a forest area that is greater than 100 million hectares, making them the countries with the greatest forest areas. Figure XI is a graphic showing the distribution of the total forest area across the globe by countries in the year 2020, according to UN FAO Our World in Data.

Figure 7. Agriculture, forestry, and fishing, value added (% of GDP) from 1995 to 2012

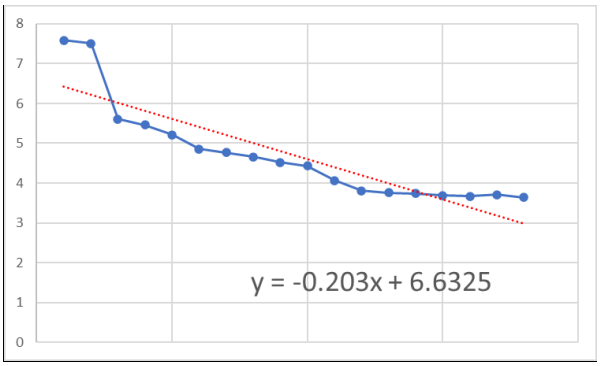
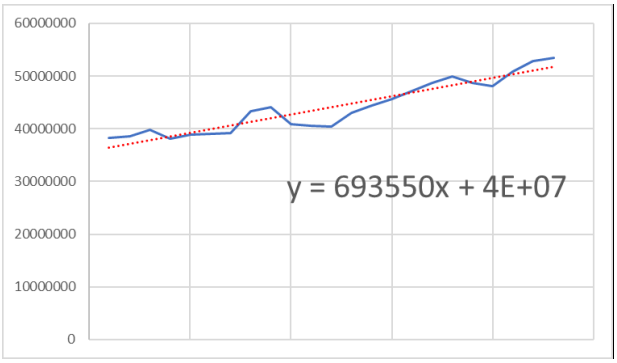


Figure 7 explains the economic consequences of forest extraction. According to Valqui et al. (2015), deforestation happens as a direct consequence of the utilization of forests for the benefit of human interests. Between the years 1995 and 2012, the contribution of forest output to the economy was evaluated based on its impact on the Gross Domestic Product (GDP). Since 1995, there has not been even the slightest reprieve from the prolonged economic downturn. The decrease, when expressed in percentage, was equivalent to 52.124 percent of the whole. From the results of the regression calculation, the trend data indicates a -0.203 slope with a 6.6325 intercept.

Figure 8. Total greenhouse gas emissions (kilotons of CO_2 equivalent).

Comparison of world-level and regional levels (1990 to 2012)



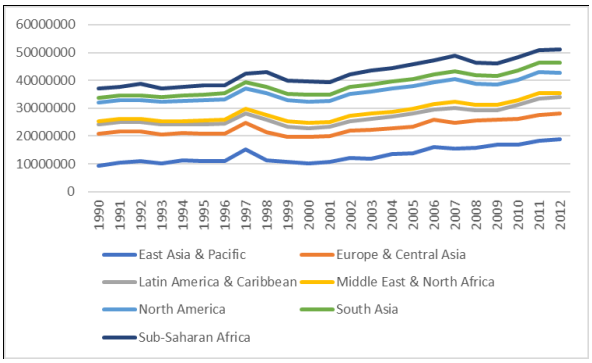


Figure 8 shows a rising trend in total greenhouse emissions, with a slope of 693,550 and an intercept of 40,000,000 kilotons of CO2 equivalent. In 2012, there was an increase in total emissions that was 40.0033 percent higher than in 2011. One way to think about it is that this increase happened pretty much everywhere in the country at about the same time.

Figure 9. Regression analysis of forest percentage area (y) and greenhouse gas emissions (x) (1990—2012) in log

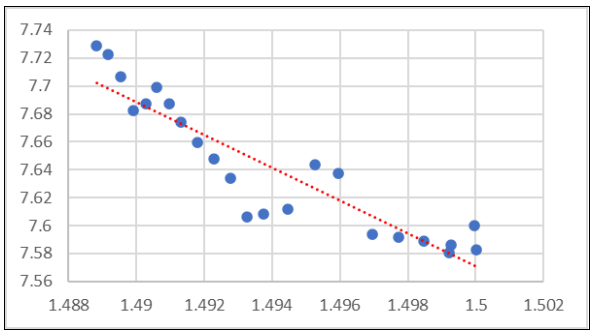


Table 1. Regression analysis of the percentage of forest area and greenhouse gas emissions (1990—2012)

Regression Statistics	
Multiple R	0.91083978
R Square	0.8296291
Adjusted R Square	0.82111055
Standard Error	0.02023807
Observations	22

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regressior	1	0.039889313	0.039889313	97.39093678	3.94947E-09
Residual	20	0.008191586	0.000409579		
Total	21	0.048080899			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	25.6217613	1.821658846	14.06507	7.83672E-12	21.82184758	29.42167511	21.82184758	29.42167511
1.500023786	-12.035315	1.219545974	-9.86868	3.94947E-09	-14.57924296	-9.491386314	-14.57924296	-9.491386314

We can see from Figure 9 and Table 1, the authors used a simple linear regression analysis to evaluate the effect of forest area percentage on land (an independent variable) on greenhouse gas emissions (a dependent variable). In order to prepare the datasets for the subsequent regression analysis, the format of the data is first converted to logarithmic form. The coefficient of determination (R squared) of 83 percent is shown in Figure 9 and Table 1. The relationship between these two variables reveals that the greater the proportion of forest to land, the lower the greenhouse gas emissions (negative correlation).

The increase in greenhouse gas emissions is a market failure that occurs when the percentage of forest land is reduced. Although not all regions of the world see a decline in forest areas, the impact of greenhouse gas emissions is felt all around the world. Numerous governments, particularly those in nations with extensive forest regions, have attempted to implement regulations to minimize deforestation.

According to the United Nations (UN) Food and Agricultural Organization (FAO) (2020), the adoption of stronger standards for which suppliers to source from and the implementation of zero-deforestation laws that stop the trading of items that have been produced on deforested land is one alternative. Another choice is to take both of these steps simultaneously. Another way that richer countries may contribute is by investing in technology that allows farmers to raise their yields. These technologies include improved seed varieties, fertilizers, and agricultural methods. That is beneficial for the economy as well as the environment.

In addition, the first thing that has to be done to accomplish this is for wealthy nations to step up their monitoring of how deforestation in other countries is affecting them (UN FAO, 2020). They need to maintain the goals they have set for reforestation in their own country in perspective with the overall influence they have had on the world's forests. There

are times when these reforestation efforts seem insignificant in light of the further forest loss they cause in other areas.

According to the Intergovernmental Panel on Climate Change (IPCC) (2007), four worldwide policies have been implemented to encourage countries to limit deforestation. Those policies are: (1) provision of support for forest planning policies, such as those pursued by the United Nations Forum on Forests and the International Tropical Timber Organization; (2) the World Bank's loan terms have been changed or modified so that forest conditions are not jeopardized; (3) initiation of legal action against illegal logging in countries that produce and consume wood (through the Forest Law Enforcement and Governance Initiative (FLEG), the G-8 and the World Bank collaborated on this project), and also (4) the Food and Agricultural Organization (FAO) helps member countries manage their forests in a way that is good for the environment through its Forestry Program.

In addition to international initiatives, the IPCC (2007) said that many governments have taken their own steps. Brazil, for example, uses licensing and monitoring procedures to ensure that landowners in the Amazon preserve 80% of their land in natural forest conditions. Another example is that deforestation is regulated by the governments of China, Thailand, and the Philippines in response to environmental and health concerns. Almost all deforestation management, according to the IPCC, is dependent on official action.

On the other hand, government interference frequently causes residents to become angry. Despite the fact that forest product production is dropping in relation to GDP, forest industrialization will continue, causing conflicts with local residents who wish to protect their environment (Minaketan Bag, 2019). Because the government favors forest industrialization, indigenous people had to be uprooted and their land had to be destroyed, according to Bag.

The local communities and the traditional leaders of those communities are the guardians of the customary lands on which the forest resources are located as well as the areas that are experiencing destruction and encroachment. Therefore, it is necessary for chiefs and their networks to be involved in the reforestation and regeneration programs being carried out (Kenneth A. Wiyo, Lameck Fiwa, & Weston Mwase, 2015).

In addition, Elinor Ostrom mentions one of the measures that might be used to protect forests (1992). According to Ostrom, the government might delegate and assist in the formulation of regulations for the Self-Governing Commons to communities. The government's position is to respect and facilitate property rights while avoiding the tragedy

of the commons (Anderson and Libecap, 2014). Locals are less prone to exploiting forest resources because they have a better understanding of their surroundings.

The conditions that Ostrom suggested for the success of the Self-Governing Commons are that the rules and boundaries are clear; rules that restrict use allocate benefits proportionate to the required inputs and take local conditions into account; individuals affected by the rules can participate in making and modifying the rules; regimes select monitors from inside the group, and the monitors are accountable to other uses; sanctions against breaking the rules are graduated, and users have access to rapid, low-cost, local arenas for conflict resolution. As shown by the IPCC, Brazil has started to adopt property rights, which can be strengthened by putting more emphasis on the influence of locals, as Ostrom suggests.

CONCLUSION

In the past several decades, there has been deforestation. The forest percentage to land ratio fell by 2.54 percent in 2012 compared to 1990, according to the data. The regions of Latin America and Sub-Saharan Africa had the most significant declines. A small increase was observed in North America, Europe, and portions of Asia. Countries with high income levels, as opposed to nations with medium and low-income levels, are less likely to see a fall. From 1900 to 2012, the percentage of forestry products' production in a country's GDP has constantly dropped. Valqui et al. (2015) say that the use of forests for economic reasons is a cause of deforestation, but the trend is going down.

The data also reveals a consistent upward trend in greenhouse gas emissions from 1990 to 2012 across all areas. With an R squared of 83 percent, the regression study demonstrates an association between decreased forest area percentage on land and increased greenhouse gas emissions. Overall, the data analysis reveals that, while forest usage for economic purposes has reduced in comparison to other economic activities, deforestation continues to have negative externalities in the form of increasing greenhouse gas emissions. In addition, the trend indicates that both the growth and decline will be consistent in the future. As a result, effective strategies to minimize deforestation are required.

The industrialisation of the forest is unstoppable. Consequently, forest exploitation for economic interests should be limited to the extent possible while forest harm is minimized. Implementing Self-Governing Commons by locals, as proposed by Elinor Ostrom, is one approach that can be used to address this situation (1992). Government

participation in forest management and protection is vital, yet it may result in a tragedy of the commons (Anderson and Libecap, 2014). Locals, according to Ostrom, are more informed about their environment and can govern it among themselves as long as the Self-Governing Commons' prerequisites are met. The government should play a more active role in recognizing and ensuring that property rights are properly implemented and at a reasonable cost (Anderson and Libecap 2014). According to Anderson and Libecap, if the federal government intervenes too much, political costs can arise, as well as potential environmental issues due to higher transaction costs. Those with more significant capital and a profit motive will benefit more than those who care about the environment.

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