

Environmental Studies FACT SHEET



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Tropical Deforestation

Deforestation has been defined as the temporary or permanent clearance of forest. It occurs when forest is replaced by another land use. This means that selective logging, for example, is not considered as deforestation, especially if there is some policy of replanting.

The causes, can be summarised as

- conversion to agriculture
- commercial forestry
- shifting cultivation
- infrastructural developments e.g. roads, towns
- charcoal production for iron ore smelting
- local demand for fodder and fuelwood exceeds supplies.

Deforestation of tropical rainforests has been one of the most pressing environmental concerns globally and within tropical countries.

Tropical rainforests have many uses (Fig. 1).

Fig. 1 The value of tropical rain forests

Industrial uses	Ecological uses	Subsistence uses
Charcoal	Watershed protection charcoal	Fuelwood and
Saw logs	Flood and landslide	Fodder for agriculture
Gums, resins and oils	protection	Building poles
Pulpwood	Soil erosion control	Pit sawing and saw milling
Plywood and veneer	Climate regulation e.g. CO ₂ and O ₂ levels	Weaving materials and dyes
Industrial chemicals		Rearing silkworms and beekeeping
Medicines		Special woods and ashes
Genes for crops	Disease resistance	Fruit and nuts
Tourism	Income	

There are a large number of effects of deforestation including:

- disruption to the circulation and storage of nutrients
- surface erosion and compaction of soils
- sandification
- climatic change, and
- increased flood levels and sediment content of rivers.

In the 1980s and 1990s Brazil was cutting down up to 20,000 square kilometers of rainforest every year.

Recent changes in deforestation

In 1998 the Brazilian president claimed that he would triple the area of the Amazonian forest set aside for sustainable uses. At the time these appeared to be over-ambitious and unlikely to succeed.

By 2013 the Brazilian government had gradually added a collection of national parks and other protected areas of forest to create the Amazon Region Protected Areas (ARPA), a protected area 20 times the size of Belgium. In addition, the rate of deforestation has declined dramatically, less than 6,000 sq km of Brazil's Amazonian forest is cleared each year. In May 2014 the Brazilian government and a group of donors announced a plan to finance ARPA for 25 years, making it the largest tropical-forest conservation project in history.

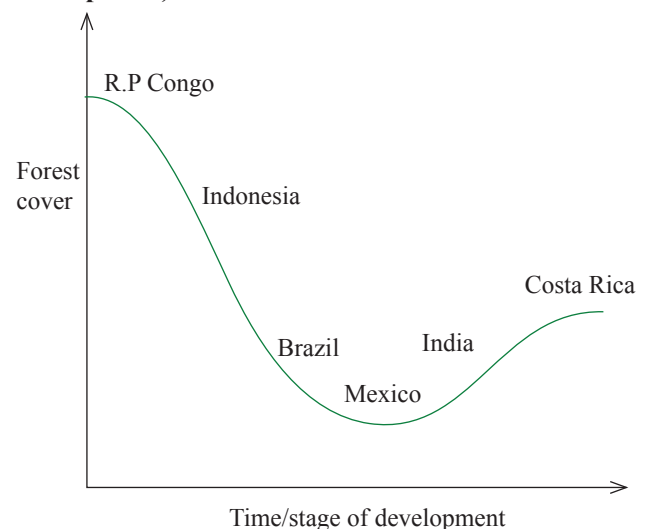
Brazil has about 5 million sq km of rainforest, almost as much as the next three countries (D.R. Congo, Indonesia and Peru) combined. Moreover, it may send an important message to the world: that tropical deforestation may be slowing down.

The forest transition model

A model of forest use and economic development has been suggested (Figure 2). It starts with poor countries in lands covered in trees. As the country develops, the forest is cleared for farms or fuel.

The country economic development progresses at the expense of the environment. However, once they have become rich, concern with preserving the natural environment occurs. This occurs at different times in different countries, but the path is similar in most: initially low rates of deforestation (forest cover remains high), followed by rapidly increasing rates of deforestation (forest cover reduces rapidly); a third stage, when rates of deforestation begin to reduce (but the forest cover is at its lowest); finally, afforestation and protection allow the forest to recover, but not to the same extent as the original forest. This is known as the 'forest transition curve'. Brazil seems to be nearing the bottom of the transition and there are a few countries that are increasing their forest cover, notably India and Costa Rica.

Fig. 2 The forest transition curve (tree cover and stage of development)



According to the Food and Agriculture Organisation (FAO), the net change in the world's forested land (deforestation minus afforestation) was 52,000 sq km a year in the 2000s. This is about 40% lower than what it had been in the 1990s.

According to the Intergovernmental Panel on Climate Change, ‘deforestation has slowed over the last decade.’

Nevertheless, some scientists disagree. There is some satellite evidence to suggest that the rate at which forest cover in the tropics was lost rose between 2000 and 2012, although this refers to all trees cut down, including those in managed forests that may be replanted. See Table 1 for a series of questions related to the definitions of deforestation and the data used to collect. The FAO excludes trees in plantations and agriculture generally (such as for shade-grown coffee).

Figure 2 shows a number of countries at different points along the transition curve. Deforestation rate in the countries of the Congo Basin, decreased from 0.16% a year in the 1990s to 0.1% in the 2000s (see Table 1). Perhaps partly due to political instability in the region, shifting cultivation and commercial agriculture has not taken off to the extent that many people expected as the country continued to develop. At the other end of the transition curve, Mexico has reduced its deforestation rate even more than Brazil. India and Costa Rica are replanting forests they once cut down. In 1980 India had about 640,000 sq km of forest left. Now, it has 680,000 sq km, and is replanting about 1,450 sq km a year. In the 1980s only 20% of Costa Rica was covered in trees. Now over 50% is.

Table 1: Definitions and data sources: some considerations

- What is defined as forest? Rainforest, mangrove, savanna, montane forest, cloud forest?
- What is defined as forest deforestation, e.g. does it include selective felling or just clear felling, coppicing, pollarding, cutting with replanting?
- How are the surveys carried out (satellites, field work, government estimates)?
- Do the data refer only to commercially useful species or do they include all species?
- Data for individual countries may include all types of forest vegetation, not just tropical rainforest
- Governments may wish to withhold information for strategic reasons.

Trees are different

A recent study for the Centre for Global Development (CGD), (What drives deforestation and what stops it?) examined 117 cases of deforestation around the world. They found that the influences most closely correlated with the loss of forests are:

- population
- proximity to cities, and
- proximity to roads.

In contrast, factors influencing the slowdown in tropical deforestation have less to do with forest management per se, but more to do with the easing of population pressure and improvements in farming from forested land.

Falls in fertility rates in Brazil, China and other well-forested nations may help explain why (after a time lag) rates of deforestation decrease. Demography may also help account for changes in D.R. Congo. Fertility rates remain high but many people are migrating to large to cities, notably Kinshasa. This results in reduced population pressure in more remote, forested areas.

Two of the countries in which deforestation has declined, also have impressive agricultural records. In the last twenty years, Brazil has become one of the world’s leading ‘bread baskets’ exporting food all over the world. Most of Brazil’s agricultural boom took place in the *cerrado*, the savanna-like region south and east of the Amazon.

Over the last forty years India experienced the green revolution (the application of science and technology to drive up agricultural yields). However, the green revolution took place mostly in India’s north-west and south, whereas its largest forests are in the east and north.

However, not all countries are winning the battle against deforestation. In Indonesia, fertility has fallen and farm output risen, and some 60,000 sq km of primary forests have been lost in the last decade; its deforestation rate overtook Brazil’s in 2011.

The main problem facing planners and policy-makers is that trees are usually worth more dead than alive; that is, land is worth more as pasture or cropland than as forest. In addition, land-owners may earn more money by selling trees for fuel wood or industrial uses, rather than they would receive for the ecological services that tropical forests provide. The benefits, such as capturing carbon emissions, cleaning up water supplies and preserving biodiversity, are hard to price, whereas a bushel of soyabeans is worth \$12 on world markets. The market for palm oil, much of which comes from deforested land in Indonesia, is worth \$50 billion a year.

The most successful policies tend to be top-down bans, rather than incentive, though these have been tried. In Brazil over 40% of the Amazon is now protected land such as national parks, wildlife reserves or indigenous reserves, where commercial farming is banned. In Costa Rica 50% of the forests are similarly protected, whilst in India around 30% are managed jointly by local groups and state governments.

Table 2: Changes in average deforestation rates

Central Africa (mainly DRC)	Average annual deforestation rate (%)	1990-2000 0.16	2000-2010 0.10
Indonesia	Average annual primary forest loss ('000 sq. km)	2001-2006 4	2007-12 6
Brazil	Average annual forest loss ('000 sq. km)	1995-2005 19	2006-13 6
Mexico	Average annual primary forest loss (%)	1990-2000 2.0	2005-2010 0.2
India	Forest cover (million sq. km)	1983 0.62	2010 0.64
Costa Rica	Forest cover % of land	1980s 20	2013 1950

Top-down bans require more than just writing a law. The most draconian restriction in Brazil, requiring 80% of any farm in the Amazon to be set aside as a wildlife reserve, is rarely enforced.

Two developments make bans easier to impose

- cheaper, more detailed satellite imagery show where deforestation is taking place
- democratisation, in part, may help explain the forest transition curve: authoritarian governments may permit, even encourage deforestation while countries are poor; in contrast, when opposition politicians, non-governmental organisations and a free press bring demands for accountability to bear, deforestation slows.

This may be one reason why Brazil has been able to reduce its deforestation more than Indonesia, for example. Brazil has had a democratic government for much longer (since 1985). The link between democratisation and slowing deforestation gives reason for hope.

Nevertheless, there is a time lag. In Brazil it took four free elections before deforestation became a priority. Even then, it took over a decade before much progress was made. Indonesia has had only two free elections.

Right for the wrong reasons

The Brazilian government wants to encourage farmers and indigenous people to keep the Amazon intact. This amounts to somehow boosting the incomes of forest dwellers, hoping they will look after the trees better. The CGD found that though income support sometimes works, it is often insignificant and more often associated with cutting down trees. The same is true of granting land tenure. It may encourage people to sell their rights to loggers.

In contrast, Mexico and Costa Rica have tried to develop a system of ‘payment for ecosystem services’. The idea is that users of clean water and other benefits from the forest should pay for them. Although the idea is sound, there are many practical problems. Governments have found it almost impossible to create markets for clean water downstream from forests. Trying to charge countries all over the world for carbon emissions that are absorbed by trees in the Amazon is almost impossible.

One group for whom subsidies and land-tenure improvements have been successful are indigenous people. Generally, they respond to incentives by protecting their land, for cultural, ecological and economic reasons. Globally, indigenous people have legal rights in only about 5m sq. km of forest, about one-eighth of the total and less than the area they live in. According to a new study, deforestation in indigenous areas of Brazil is more than ten times worse than in areas outside them. Therefore, expanding indigenous rights could have a major impact on deforestation.

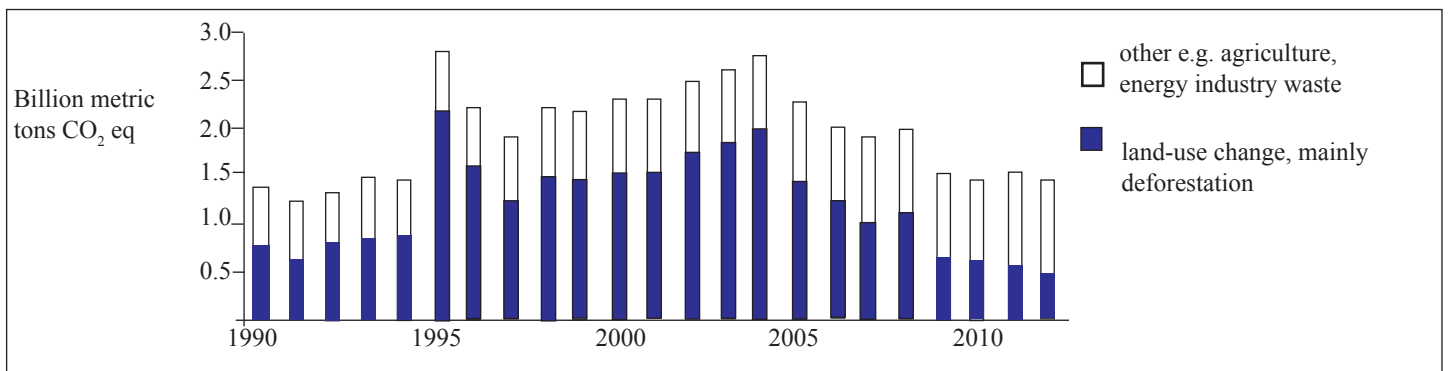
Conclusion

Fifteen years ago, the conversion of forest into farmland accounted for a quarter of total greenhouse-gas emissions and the rainforest was the symbol of worldwide environmental degradation. Now it accounts for only 12% of greenhouse gases. Although too much forest is still being turned into farms, there is evidence to show that in some areas deforestation is slowing. It varies considerably from place to place. But it is a step in the right direction.

Practice Questions

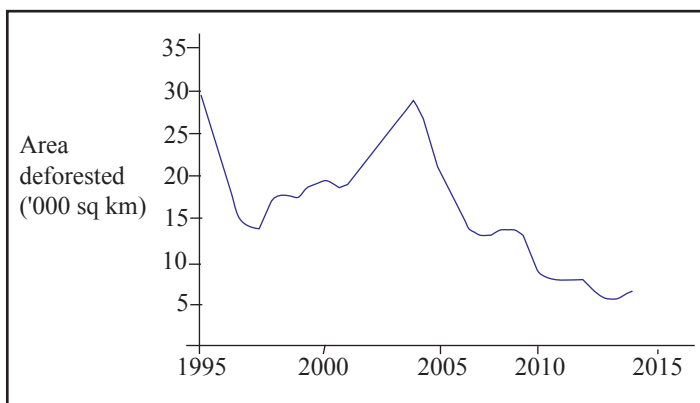
1. Comment on the contribution of deforestation to Brazil’s global warming emissions

Fig. 3 Brazil global warming emissions from 1990 to 2012, by land-use



2. Describe the changes in deforestation rates in the Amazon region of Brazil between 1995 and 2013.

Fig. 4 Annual deforestation rate in the Amazon region, Brazil



1. Until the middle of the 2000s decade, the majority of Brazil’s global warming pollution was due to deforestation. However, deforestation emissions have decreased by more than two-thirds since then, outweighing the increases in other sectors.

2. Initially deforestation rates were extremely high c. 30 000 sq. km in 1995. This fell to under 20 000 sq. km between 1997 and 2001. It rose until 2003, reaching c. 27000sq km. It has largely fallen since then, reaching a low of 5000 sq. km in 2012.

Answers

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