Deforestation success stories

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A case study about recent changes in some parts of the Amazon rainforest

Synopsis

This GeoFile looks at recent changes in deforestation in the Amazon, and the reasons for those changes.

Until 2004 rates of deforestation were rising and Brazil was one of the world’s worst polluters of greenhouse gases. Political change in 2002 and pressure from NGOs in 2006 led to a decline in deforestation.

The use of satellite images and GPS has enabled the Brazilian government to monitor deforestation.

In addition, Brazil was paid to preserve its rainforest. Although Brazil could have earned money from the sale of timber or from farming, living rainforests provide a range of ecosystem services such as flood control, climate regulation, pollination etc. NGOs and the international community were vital in the success of reducing rates of deforestation.

Brazil appeared to have passed through a forest transition curve. Other countries are at various stages on the transition curve. However, over the last two years, total rates of deforestation have risen. This is a worrying trend.

Elsewhere, in other parts of the Amazon, deforestation is taking place due to energy developments, such as oil exploration in the Peruvian Amazon. This is destroying trees, polluting rivers and causing health problems among local residents.

Key terms

deforestation, ecosystem services, land-use changes, forest transition curve, moratorium/moratoria

Learning outcomes

At the end of this case study, you will have learned about:

- how rates of deforestation have changed
- why rates of deforestation have changed
- the forest transition curve

- the varied nature of ecosystem services
- the role of NGOs in stopping multinational companies from destroying the forest
- why success is only partial and may only be short-term.

Exam Board | Link to specification
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WJEC | Unit G1, Unit G1, Changing Physical Environments, Theme 2, Investigating Tectonic and Hydrological Change, see page 20 [http://www.wjec.co.uk/uploads/publications/6312.pdf](http://www.wjec.co.uk/uploads/publications/6312.pdf)
CCEA | Unit A2: Physical Geography and Decision-making, Sections A: Physical Geography, the Dynamic Earth, see page 29 [http://www.rewardinglearning.org.uk/qualifications/results.aspx?q=1&t=1&l=R&s=0&v=0&f=0&q=182&d=d](http://www.rewardinglearning.org.uk/qualifications/results.aspx?q=1&t=1&l=R&s=0&v=0&f=0&q=182&d=d)
International Baccalaureate | Geography Diploma Programme, Core Patterns and Change, Patterns in Environmental Quality and Sustainability [http://ibgeog2009.wikispaces.com/Environmental_Quality_Sustainability_Patterns](http://ibgeog2009.wikispaces.com/Environmental_Quality_Sustainability_Patterns)
Deforestation success stories

A report by the Union of Concerned Scientists has claimed that there has been success at reducing tropical rainforest deforestation at a variety of scales. This ranges from whole countries and regions, such as Brazil and central Africa, to relatively small areas in parts of other countries, such as in Madagascar, Kenya and Mozambique. Some funding has been provided by the bilateral REDD+ programme (Reducing Emissions from Deforestation and forest Degradation), from carbon credits and some from private donations. Deforestation has been reduced for a number of reasons:

- The development of policies to reduce emissions from deforestation.
- The promotion of reforestation or afforestation.
- Payment for ecosystem services (Figure 1) e.g. in Mexico and Costa Rica.
- In a few cases, such as central Africa and El Salvador, there has been considerable success, due to socio-economic changes as well as policy reforms.

However, nearly all the successes are partial ones – although in some locations deforestation has been reduced and reforestation increased.

The main reason for success appears to be the REDD+ programmes. These provide both financial and political support from the international community for tropical countries’ efforts to reduce deforestation. These programmes can include:

- payments for ecosystem services, whereby landowners who protect forest carbon, water quality, biodiversity, and sources of environmental value are paid to keep the trees standing
- efforts to enforce existing laws often combined with increased use of technology e.g. the use of satellite images and GPS to monitor the rate of deforestation
- government reforms of many kinds, including the recognition of land tenure and protecting the rights of indigenous populations and reducing corruption
- moratoria (bans) on permits to deforest or on purchases of commodities that comes from deforested lands
- combining environmental actions with social and economic development efforts.

Rates of deforestation

In the 1990s, deforestation was destroying about 16 million hectares of forest a year and was responsible for about 17% of total greenhouse gas emissions. Brazil and Indonesia were the fourth and fifth largest emitters of CO₂. By 2004 deforestation was down by 19% to 13 million hectares annually.

A forest transition curve (Figure 2) shows that over time the amount of forest in a country changes. It begins with high levels of forest cover, and then deforestation causes the amount of tree cover to be reduced. Finally, the level of forest cover begins to recover.

Some countries and regions, including Guyana and central Africa, are today in the early stages

<table>
<thead>
<tr>
<th>Supporting services</th>
<th>Regulating services</th>
<th>Provisioning services</th>
<th>Cultural services</th>
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<tr>
<td>These are the essentials for life and include primary productivity, soil formation, and the cycling of nutrients. All other ecosystem services depend on these.</td>
<td>These are a diverse set of services and include pollination, regulation of pests and diseases, and production of goods, such as food, fibre and wood. Other services include climate and hazard regulation and water quality regulation.</td>
<td>These are the services people obtain from ecosystems such as food, fibre, fuel and water from aquifers, rivers and lakes. Goods can be from heavily managed ecosystems or from semi-natural ones.</td>
<td>These are derived from places where people interact with nature, providing cultural goods and benefits. Open spaces – such as forests, lakes, and wilderness – provide opportunities for outdoor recreation, and improvements to human health, both physical and mental.</td>
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<td>(The supporting services, including primary production and nutrient cycling, are not listed as they are considered necessary for the production of all other ecosystem services.)</td>
<td>Climate regulation† Flood regulation† Erosion control† Disease and pest control† Air and water quality regulation†</td>
<td>Timber* Species diversity* Fuelwood* Fresh water*</td>
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<td><strong>Figure 1</strong> Types of ecosystem services</td>
<td>Timber* Species diversity* Fuelwood* Fresh water*</td>
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| **Key** Items marked * denote goods
Items marked † denote services | Recreation and tourism* Aesthetic values* Education* Sense of place* Health benefits* |
The forest transition curve of the forest transition. Guyana still has high levels of forest cover. Others, such as Madagascar and Tanzania, have had a high deforestation rate and have lost much of their forest cover. Further along the curve and approaching the low point are Mexico and Brazil. Finally, Costa Rica and India have passed the bottom of the curve and are now increasing their levels of forest cover. Nevertheless, the changes described by the forest transition curve are not inevitable. Indonesia is probably the country with the largest emissions of carbon from land use change.

Since 2004 Brazil’s emissions of greenhouse gases have decreased (Figure 3). This net decrease was more than 750 million tons of CO₂ equivalent annually, a reduction of nearly 33%. It was caused due to a reduction in the land-use sector, where emissions fell by a billion tonnes while in other sectors they increased.

Only a little over a decade ago, Brazil’s rainforests were disappearing at an alarming rate, making Brazil the leader in deforestation worldwide at the time and the world’s third-largest source of carbon emissions, after the United States and China.

Political and economic change
The start of Brazil’s reduction in deforestation goes back to the establishment of new protected areas in the Amazon, including indigenous reserves and sustainable use areas. This effort was expanded and became part of a broad plan to combat Amazon deforestation – the PPCDAm (Plan for the Prevention and Combating of Deforestation in the Amazon) – after the election of President Lula in 2002. Lula’s Workers Party had its social base in the trade unions, landless peasants’ organisations, and forest people’s movements such as the rubber tappers’ union.

Marina Silva, Lula’s first Minister of the Environment, came from the Amazon state of Acre. As Minister, she championed the creation of protected areas and recognition of indigenous lands as well as enforcement actions against illegal logging and other violations of laws relating to conservation. However, during the first three years of the Lula administration, there was little success. Indeed, deforestation rose to a high point in 2004–05, driven by the expansion of soybean and beef production in response to increasing international prices.

The soy moratorium
In the 20th century, deforestation was seen as necessary for development. That attitude appears to have changed, and now it is seen as a wasteful and exploitative destruction of resources. A number of environmental pressure groups helped change public opinion and political will.

The first dramatic change came in the soy industry. In 2006 Greenpeace released Eating up the Amazon, a report that showed the connections between the soybean industry and deforestation, global warming, water pollution, and slave labour. It had a particular focus on two multinational companies, Cargill, an enormous soy and grain trader, and McDonald’s, the largest fast food chain in the world.

Within weeks, the soy industry declared a moratorium on deforestation, pledging not to buy any soybeans produced on Amazon lands that were deforested after 24 June 2006.
By 2009–10, only 0.25% of land with soybean crops had been planted in areas deforested since the moratorium began. The monitoring enabled by the use of remote sensing data, combined with land tenure information, provided the evidence of the moratorium’s success. Paradoxically, despite a slow-down in the amount of land being cleared for farming, the soybean industry has actually done very well by increasing yields and through multiple cropping (more harvests per year). The harvest for 2013–14 is estimated at 95 million tonnes, up from 88 million the previous year, enabling Brazil to overtake the United States and become the world’s largest soybean producer.

**The cattle moratorium**

After soy, the next driver of Amazonian deforestation – the beef and leather industry – came under the spotlight in 2009 (Figure 4). Two NGO reports, Friends of the Earth (Brazil)’s *Time to Pay the Bill* and Greenpeace’s *Slaughtering the Amazon*, made the connection between expansion of cattle pasture and destruction of the Amazon forest. The slaughterhouses agreed to buy cattle only from ranchers registered with the rural environmental land registry. As a pre-condition for registration, the ranchers needed to provide the GPS coordinates of their property boundaries, thereby allowing comparison of a map of ranch locations with a map of deforestation. The cattle moratorium has forced change, but it has come more slowly than with soy. Further, the moratorium does not apply to all producers.

**Expanding indigenous reserves and other protected areas**

Another important contributor to reducing emissions from deforestation has been the continuing expansion of Brazil’s network of indigenous lands and protected areas across the Amazon since 2002. More than 50% of the Brazilian Amazon forest is now under some form of legally recognised protection, and nearly half of this land is reserved for indigenous peoples. The kinds of protected areas vary a great deal. Some follow the traditional model of national parks and wilderness areas, but many others are used for sustainable extraction of resources by rubber tappers and other forest peoples.

The indigenous peoples’ reserves are held in collective tenure and their owners have the right to use them (usufructure rights) for sustainable forest management and the utilisation of timber and non-timber forest resources. As a result, the rate of emissions from these reserves for deforestation is only about 10% of those of neighbouring areas.

**International support**

The Brazil-Norway agreement is the largest REDD+ program anywhere in the world, and it has already provided $670 million in compensation for the reductions made in the first few years after its signing. The Amazon forest is assumed to contain 100 tons of carbon per hectare (although it is probably higher over much of the region), and the estimated reduction in emissions is paid for at a fixed rate of five dollars per ton of CO₂. However, the importance of the REDD+ agreement with Norway is political and symbolic, not just financial. The same is true of Germany’s support for early action in Acre. The impacts of the soy and cattle moratoria and the REDD+ agreement are illustrated in Figure 5, showing a reduction in annual deforestation rates.

**The future**

However, two changes in 2013 cast doubt on the future of Brazil’s success: amendments to the Forest Code that provide amnesty for previous deforestations, and data showing a 28% increase in the 2012–13 deforestation rate compared with 2011–12. Although the increase in 2013 was 28% compared with the previous year, that percentage change was high because deforestation had already been reduced to a low level. Even with this rise, the 2013 figure was 9% below that of 2011 and 70% below the 1996–2005 average.
Satellite data showed that almost 6,000 sq km of forest were cleared during that period, mainly in the states of Para and Mato Grosso, where most of Brazil’s agricultural expansion is taking place. More than 1,000 sq km have been cleared in each state. The worst year since the Brazilian government began tracking deforestation was 2004, when almost 30,000 sq km (11,580 sq miles) of forest were lost.

Besides agricultural expansion, the upsurge in deforestation is due to illegal logging and the invasion of public lands adjacent to big infrastructure projects in the Amazon, such as roads and hydroelectric dams.

**Oil and rainforest in Peru**

During 2014 five separate oil spills along a main oil pipeline through the Peruvian Amazon have deposited thick black clots of crude oil across rainforest and swamp and polluted local fishing lagoons with dead fish. Many of the indigenous peoples living downstream on the banks of the Marañón River have experienced increased bouts of illness: headaches, nose bleeds, nausea and stomach aches. Locals blame the illnesses on exposure to oil in the water and in the fish that are the main staple.

The Peruvian government is promoting a rapid expansion of oil and gas operations in the Amazon – with devastating consequences for local indigenous peoples and the environment. Illegal logging and forest clearance by oil companies now account for about two-thirds of Peru’s carbon pollution. Since 30 June, there have been five separate breaks associated with Petroperú’s main northern pipeline. The pipeline, the North Peruvian, runs for more than 850 km from San José de Saramuro in Loreto department, cutting across the Amazon rainforest and the Andean mountains, before emptying into a refinery at Sechura Bay on the Pacific coast. Indigenous peoples and campaigners claim that the state-owned oil and gas company have not done enough to maintain the pipeline, which dates from the early 1970s.

Foreign oil companies have been operating – and polluting – this part of the Peruvian Amazon for more than 40 years. Oil companies have cleared forests to build roads and helicopter pads. They have cut down a vast swathe of the Amazon for pipelines and other installations, and they have pumped the hot, muddy, toxic waste directly into the rivers. Since 2008, oil developments have increased at a dramatic pace after Lima offered up 75% of the Peruvian rainforest to oil companies.

In recent years, the Peruvian government has declared environmental emergencies in all four headwaters of the Amazon.

**Conclusions**

There are conflicting trends in the rate of deforestation. In some parts of the Amazon, deforestation has declined. It is much lower than at its peak in 2004. However, in recent years there has been an increase in the rate. It also varies between countries, partly according to political will and partly due to the resources held beneath the trees. There is also a forest transition – countries increase their rate of deforestation as they initially develop, and then slow down as their economy matures. It is likely that pressures on the rainforest will increase on account of population change, the need for more food, climate change, the need for more reservoirs and so on. It is a very dynamic system, subject to constant change.
Focus questions

1. Outline the range of goods and services that ecosystems provide.
2. Describe the Forest Transition Curve. Suggest reasons to explain why it occurs.
3. Examine the role of (a) donor conor countries and (b) NGOs in achieving reductions in deforestation.
4. Explain why areas of tropical rainforest are likely to experience increased pressures over the next decade.

Learning checkpoint

After working through this unit, consider the following questions:

• What are the main services provided by ecosystems? Make a list.

• Why do rates of deforestation vary spatially and temporally (over space and time)?

• How can granting land rights to indigenous people help reduce deforestation?

• Briefly explain the forest transition curve. You could do this by annotating a copy of the diagram (Figure 2).

• Why do countries/companies want to change forest into other land-uses?

• Outline the on-going pressures on tropical rainforests. Who are the players in terms of exploitation, production and trading partners?