

## Direct and indirect threats to the tropical rainforest

In this section, you need to know how tropical rainforests are threatened directly through deforestation, and indirectly through the changes brought about by climate change.

Deforestation will be our first focus. Deforestation refers to the deliberate conversion of forested areas into non-forested areas. It threatens the TRF in numerous ways:

1. With no trees to hold the soil together, heavy rain washes it away.
2. Without a tree canopy to intercept rainfalls and roots to absorb it, more water reaches the soil. This can leach away nutrients and also increase flooding.

But why does deforestation happen?

### Deforestation: subsistence and commercial agriculture

**Commercial agriculture**, when crops or livestock are grown and sold for profit, is **the leading cause** of TRF deforestation. For example, 75% of rainforest deforestation in Brazil over the last 25 years was for cattle farming – beef is one of Brazil's key exports. In the most recent years,

**Subsistence agriculture** is when people farm to feed their families. Trees are cut down on a small plot and the undergrowth burned; crops are then planted. The nutrients in the soil are quickly leached out and weed growth takes over. At this point, the farming family often decides to clear another plot. For poor farmers, this 'slash and burn' method makes sense as no money is needed to clear the land. However, rapid population growth in developing countries means that many more people are clearing rainforest land. In the past, cleared plots would be left for a long time after each crop so they could recover some nutrients. Now population pressure means people are reusing plots straightaway. The soil quickly loses all its nutrients this way and has to be abandoned. Around one-third of all rainforest deforestation is caused by subsistence farmers.

### Deforestation: local demand for fuel wood

People living in rainforests, or near them, use them as a source of fuel. Population increase has sped up rates of deforestation.

### Deforestation: commercial hardwood logging

In the 20<sup>th</sup> century, many countries sold rainforest timber for money, known as commercial logging, to pay interest on international debts. Almost all countries now have strict controls on logging, but a lot of illegal TRF logging still goes on for several reasons:

- **Demand** – there is high demand for tropical hardwood timber, especially rosewood. Chinese buyers will pay a lot for this.
- **Poverty** – the people who live near rainforests are often very poor; illegal logging pays well
- **Corruption** – police and government officials often let illegal logging happen in return for money

### Deforestation: demand for biofuels, mineral resources and HEP

Nowadays, lots of deforestation in places like Indonesia happens so that **palm oil plantations** can be grown. Palm oil is a tropical plant whose fruit contains oil used in foods and cosmetics, e.g. shampoo. However, **it is increasingly used to make biofuel/biodiesel** as there is pressure to move energy reliance away from fossil fuels like coal oil and natural gas.

A further cause of deforestation is **mining**. Some rainforest areas are on top of valuable minerals. It is often most economic to use open-cast mining to extract the minerals, which affects large areas of rainforest. Roads built to access mines then encourage farmers and loggers to move in. It is estimated that 15% of deforestation is linked to mining and road-building.

Finally, there's deforestation happens for **dam building to provide hydro-electric power**. As you may know, many tropical rainforests have large rivers. Damming them provides a reliable and renewable energy source, but it does require forests to be cleared/floods large areas where the reservoir is.

### Climate change

After deforestation, the second major (indirect) threat to tropical rainforests is climate change via global warming. Warming global temperatures affect the atmospheric systems that bring wet seasons to the equatorial climate. Warmer temperatures help to shift the wet systems poleward, bringing LESS RAIN to the TRF. Conditions in the rainforest biomes are likely to become hotter and drier, with more droughts.

For example, the Amazon suffered two severe droughts in 2005 and 2010. Drought is not unheard of, but two are when they're so close together! At the time, the 2005 drought was described as a 1-in-100-year drought. Such changes cause **ecosystem stress**, which is a key threat. **Ecosystem stress** is where the productivity and processes in an ecosystem become difficult to occur due to some form of natural or human pressure. Ecosystem stress due to climate change in the TRF may take a number of forms:

1. Many areas that are currently TRF are likely to become more like seasonal tropical forest, with a consistent dry season each year.
2. Heatwaves will be difficult for species that are not adapted for them. Whole colonies of flying fox bats have died as heat levels have spiked above the limits they can tolerate.
3. Many plants will not be able to grow in the drier conditions; they will be out-competed by species that are adapted to this, like the baobab.
4. Drying out the leaf litter can cause the decomposers to die out, threatening soil fertility and the nutrient cycle
5. Leaves in the canopy may die, reducing food supply and disturbing food webs
6. With fewer trees, there is less evaporation and transpiration, meaning fewer clouds and even less rain. This is a negative multiplier effect.