

Deforestation and Climate Change

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Forests play many important ecological roles. From helping to mitigate climate change; providing homes for many species of plants and animals (some endemic to forested regions); providing food, medicine and livelihoods for people around the globe; to the intrinsic values of forests, these essential ecological powerhouses are irreplaceable—and at risk. Forests cover 31% of our planet;¹ the Amazon rainforest alone is home to hundreds of thousands of species of plants and animals.² Yet, despite everything forests do for the planet, they are being cut down at an alarming rate. Every year 46-58 thousand square miles of forest are lost to deforestation, which is equal to an astounding 48 football fields of forest disappearing every minute.³ Although there is much cause for concern when considering the degradation of forests worldwide, many still have hope that with the right changes in policy and perception, forests can still be saved.

Why are we cutting down forests?

There are many factors that contribute to deforestation, each with its own causes and negative environmental impacts.

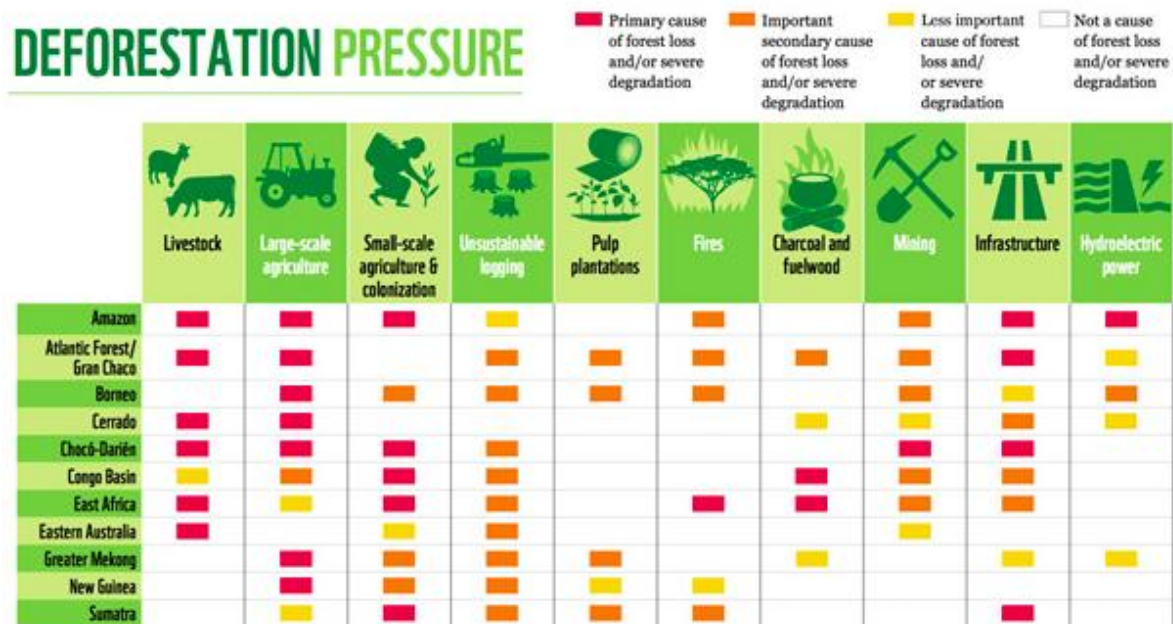


Table 1: Summary of Main Pressure of Forests in Different Deforestation Fronts

Source: Mongabay News. Deforestation Fronts Revealed

Agriculture

Agriculture is one of the most significant causes of deforestation.

The first form of agriculture that will be examined is slash-and-burn agriculture. Slash-and burn agriculture can be a sound agricultural practice in many instances, and has long been practiced by many aboriginal communities. Although the jury is still out on how sustainable this practice is, many believe that small scale practice of slash and burn, or “swidden,” as practiced by some aboriginal communities, can actually be beneficial to the soil and biodiversity.

Slash-and-burn:

Slash-and-burn agriculture is responsible for the loss of around 50 acres of land every hour worldwide.⁴

One of the issues with slash and burn is that fires intentionally set can unintentionally spread throughout the forest.⁵ When fire spreads to unintended areas, the protective forest canopy is destroyed. The resulting sun exposure to the forest floor intensifies the existing fire.⁶ The smoke then “hangs over the forest, and suppresses rainfall,”⁷ making it even more difficult to extinguish as the area becomes drier.

For example, in the Amazon rainforest the seasons are so extreme, in terms of precipitation, that there are just two named seasons: “wet” and “dry.” During the dry season, the problems with slash-and-burn agriculture are intensified. Although there are many, complex issues surrounding the use of slash-and-burn agriculture in the Amazon, the underlying rationale for the practice is very simple: the soil in the Amazon rainforest is infertile,⁸ much to the dismay of the estimated 250 million farmers working the poor soil of the tropical forests there.⁹ For impoverished farmers, the simplest solution to this problem is to cut down the trees, and burn what remains. This makes the soil more fertile¹⁰ as incinerated biomass provides nitrogen and other nourishing nutrients for the soil.

Unfortunately, this is a short term solution. The soil only stays nutrient rich for so long, about two years¹¹, after this time, the nutrients from the burned biomass are used up. When this happens, farmers pack up and move on to the next section of the rainforest, leaving their farmland behind for others to use for cattle rearing, or abandonment.¹²

Furthermore, slash-and-burn agriculture on this scale can also have devastating affects for the biodiversity in the area. With large areas of land being incinerated, many animal habitats are lost in the fire. This pushes animals out of the forest, decreasing biodiversity, and increasing the number of endangered and extinct animal species.¹³

Climate change impacts

Although in some instances it can be advantageous, burning biomass on such a large scale comes with many consequences. It is estimated that the total amount of biomass burned by humans make up a whopping 90% of the total number, where natural fires are only around 10%.¹⁴ According to NASA,

“Since fires produce carbon dioxide, a major greenhouse gas, biomass burning emissions significantly influence the Earth's atmosphere and climate. Biomass burning has both short- and long-term impacts on the environment. Vegetation acts as a sink—a natural storage area—for carbon dioxide by storing it over time through the process of photosynthesis. As burning occurs, it can release hundreds of years worth of stored carbon dioxide into the atmosphere in a matter of hours. Burning also will permanently destroy an important sink for carbon dioxide if the vegetation is not replaced.”¹⁵

In addition to its local effects, burning organic materials on a large scale, like what is done with slash-and-burn agriculture, emits greenhouse gases, which contribute to global climate change.

Raising Cattle

Cattle ranching has a massive impact on forests around the world, particularly tropical rainforests like the Amazon. Many farmers use deforested areas of land to raise cattle; however, it might surprise you to learn that corporations do this on a much larger scale. Fast food companies have been contributing to deforestation in places like the Amazon rainforest for quite some time, and only in relatively recent years have their actions been acknowledged by mainstream media. Companies that have been deforesting the rainforest in order to raise cattle for their hamburgers include: Wal-mart, McDonalds, Pizza Hut, and Burger King, just to name a few. Although some of these companies have made promises to be more environmentally conscious, some, such as Burger King and Pizza Hut, have made no plans to move away from this harmful and unnecessary form of animal agriculture.¹⁶

Causes of Deforestation in the Brazilian Amazon, 2000-2005

source: mongabay.com

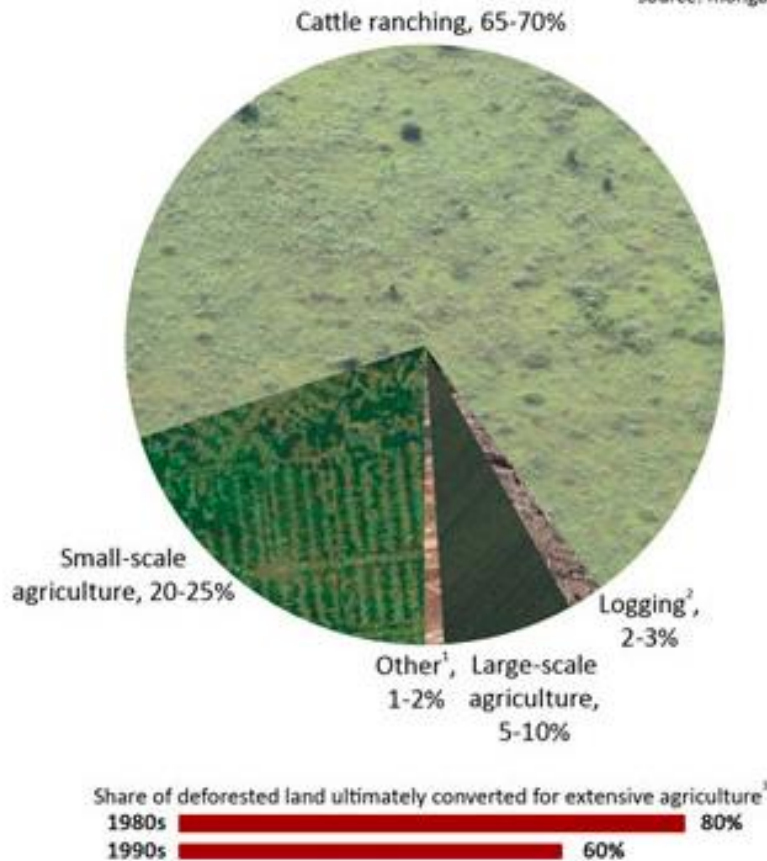


Figure 1. Source: Mongabay. Amazon destruction

Logging

Logging is also a common cause of deforestation as trees are cut down to use for paper products. There are several different types of logging: however, the most harmful one is called “clear cutting.” This is when an area of forest is completely deforested, leaving no trees alive in that area.

In some cases, areas of forest that have been clear cut are candidates for remediation. Remediation of clear cut areas of forest, however, comes with its own issues. Often times mono-planting is a go-to remediation plan, which is to say that only one species of tree is planted in that area. Although this does help to remediate the complete loss of trees, it doesn’t remediate much else. All of the biodiversity lost to clear cutting is not remedied by mono-planting. This is because biodiversity is supported by a diversity of flora as well as fauna. By simply planting 1,000 oak trees in an area which previously was home to many species of trees, the environment now only supports those animals that find food or shelter from oak trees alone. Mono-cropping is therefore not a sustainable solution to clear cut land.

Climate change

It is estimated that 25% of the world’s total greenhouse gas production comes from deforestation alone.¹⁷ Furthermore, forests around the world store more than double the amount of carbon dioxide than is found in the atmosphere¹⁸ This means that when areas are deforested, the carbon dioxide stored in those trees is released into the atmosphere.

Logging for paper products is one of the simplest causes of deforestation to solve. By recycling and not relying so much on paper products, the amount of land deforested for this purpose can be reduced.

Housing

Housing, also called “urban sprawl” is the final major contributing cause of deforestation. Urban sprawl is one of the most difficult deforestation-related issues to solve. This is due to the fact that, at its base, urban sprawl is driven by overpopulation. In fact, overpopulation is one the most complex and pressing issues at the base of many environmental problems. It is difficult to find a solution to overpopulation because of its nature—however a shorter-term solution, like changes in infrastructure, can be made to mitigate the issue. Environmentalists and architects alike have come up with numerous designs for cities over the years centred on housing the largest amount of people with the smallest environmental impact.

One interesting examples of such an infrastructure change is an architectural concept called “compact cities,” or what some people are calling “tiny cities” or “sustainable cities.” There are many different concepts for a compact city, depending on the available land as well as current and projected population density and growth: however, the idea is always the same. A compact city occupies a smaller area of land than a traditional city, and still houses a large amount of people, while remaining small enough to make vehicles obsolete, making your home, work, entertainment, green space and everyday businesses such as grocery stores and doctor’s offices within walking distance. These designs are usually achieved by designing exceptionally tall buildings in a small area, which would be broken up into sections; living, grocery, doctors- all in one skyscraper.

Climate Change

As urban sprawl moves into forested areas, it greatly contributes to climate change while also threatening the natural environment and biodiversity. According to one study, “projected urban expansion could consume hundreds of thousands of hectares’ worth of key biodiversity hotspots over the next twenty years, triggering the release of some 5 billion tons of carbon dioxide from direct land use change and further endangering hundreds of species.”¹⁹ The amount of carbon that could be released by urban sprawl is staggering. Furthermore, expanding out into forested areas, especially rainforests, decrease biodiversity. The decrease in biodiversity coupled with increasing rates of climate change will not only shift the way the land is used and the ecology of the land itself, but also increased the potential for the success of invasive species, which will only further change the environment around cities. “City populations are expected to grow by five billion people and

expand by 1.2 million square kilometers by 2030. Much of this expansion is forecasted to occur in the tropics, which contain the bulk of the world’s species. The new study attempts to quantify the impact of urbanization on the world’s so-called ‘hotspots’ — nearly three dozen areas with exceptionally high levels of species found nowhere else” which means “that by 2030, nearly three percent of hotspot areas will be urbanized, up from one percent in 2000. While the extent seems small, paving over marshes, forests, and grasslands could generate 1.38 billion tons of carbon emissions (5 billion tons of CO₂) from direct land use change.”²⁰

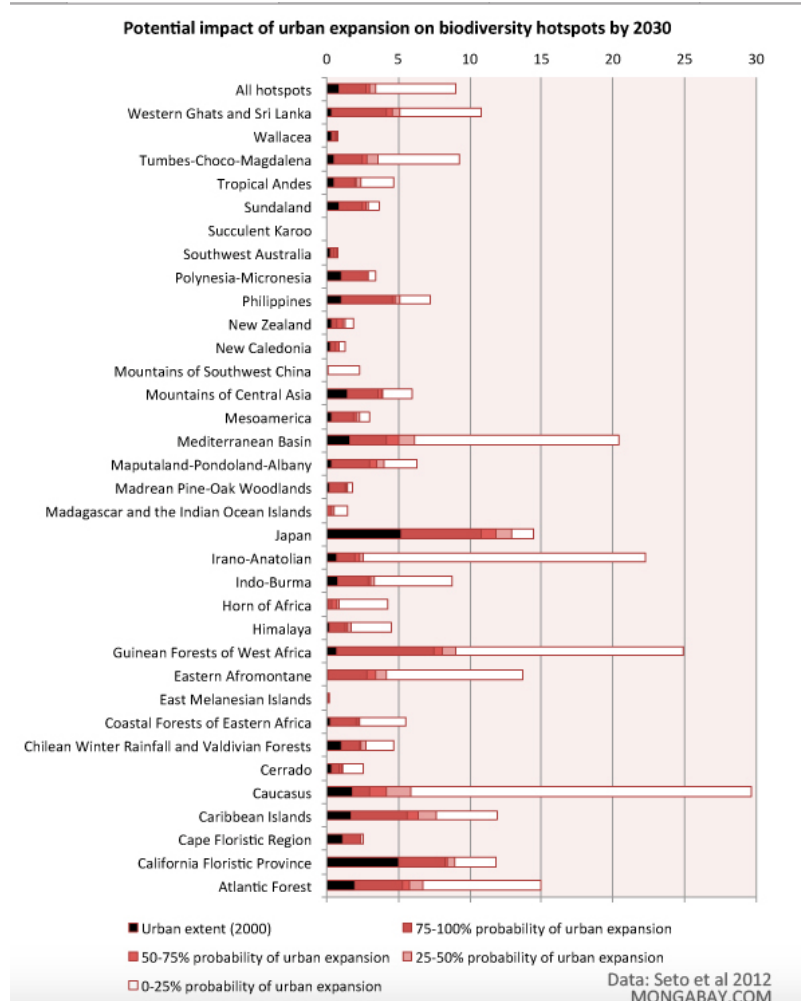


Figure 2. Source: Mongabay. Urban sprawl could doom some biodiversity hotspots by 2030

The figure above outlines the impacts that urban sprawl will have on specific regions with biodiverse hot spots.

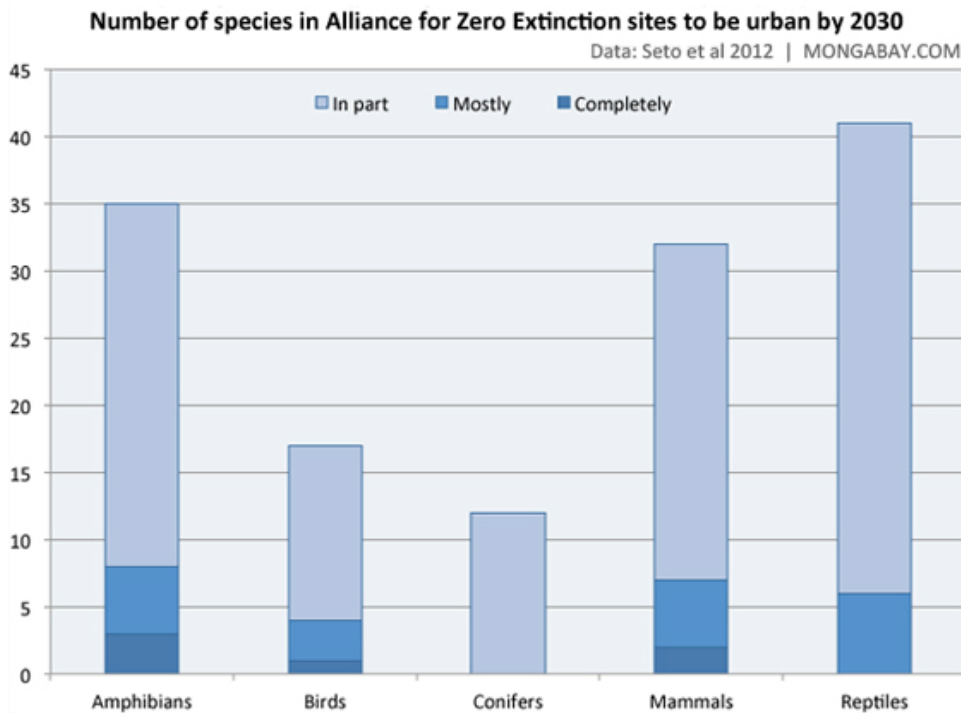


Figure 3. Source: Mongabay. Urban sprawl could doom some biodiversity hotspots by 2030

Other impacts

Deforestation affects climate change on a large scale, as discussed in the sections above; however, climate change is not the only negative consequence of deforestation. There are many other ways in which deforestation has negative impacts to the environment.

Water Cycles

Trees undergo a natural process called “transpiration.” This is when the leaves of trees secrete water which is evaporated into the atmosphere. When this water evaporates, it becomes clouds, which, as part of the hydrological cycle, swells with moisture and rains back down again.²¹ When trees are cut down in a forest, it eliminates or decreases the amount of transpiration, which means that the amount of rainfall in that area will decrease. This can lead to droughts in the area. When the trees in area are cut down for agricultural purpose, it actually affects the success of local crops. With less

naturally occurring water, farmers have to make a more intensive effort to ensure that their crops are properly hydrated, which can cost the farmers even more money.

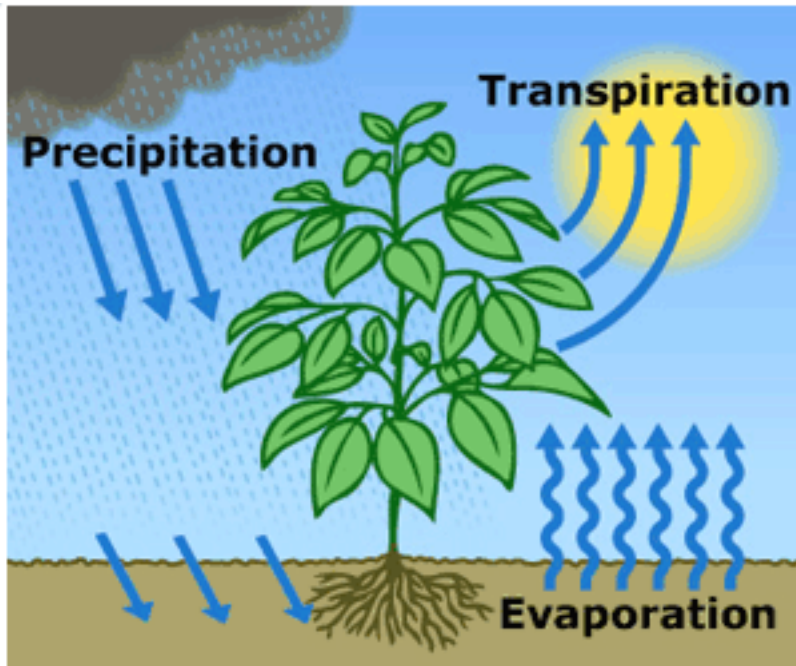


Figure 4. Source: United States geological survey. The water cycle

As shown in the image above, trees and plants are an integral part of the hydrological cycle, and the loss of plant and tree life can greatly influence local weather patterns.

Loss of Biodiversity

The loss of forests also means the loss of habitats for many species of plants and animals. “Seventy percent of the world’s plants and animals live in forests and are losing their habitats to deforestation.²² Naturally, the loss of habitat means the loss of species and therefore the loss of biodiversity. Loss of biodiversity has varied negative impacts regarding the environment. Once a habitat is lost on a large scale, it can be very difficult for local species to recover, especially endemic species, which are more common in areas such as tropical rainforests, which are so dense with endemic species they are referred to as “hot-spots.”

Soil Erosion

When trees are cut down, it means that the surrounding soil becomes loosened from the ground, and can be blown away by wind, or washed away by rain. This becomes an issue for farmers who deforested the land to plant crops. This problem can become very serious, as “The WWF states that scientists estimate that a third of the world’s arable land has been lost to deforestation since 1960. After a clear cutting, cash crops like coffee, soy and palm oil are planted. Planting these types of trees can cause further soil erosion because their roots cannot hold onto the soil.”²³ The loss of trees is the primary cause of soil erosion due to deforestation, and land-use practices in many cases exacerbates the soil erosion issue. Soil erosion can cause many issues not only for the environment, but also the health and wellbeing of people who live in the area. “The situation in Haiti compared to the Dominican Republic is a great example of the important role forests play in the water cycle,” Daley said. Both countries share the same island, but Haiti has much less forest cover than the Dominican Republic. As a result, Haiti has endured more extreme soil erosion, flooding and landslide issues.”²⁴

Where does deforestation happen?

Deforestation happens all over the world. However, the vast majority of deforestation takes place in rainforest around the globe, mostly concentrated mainly in the tropics.

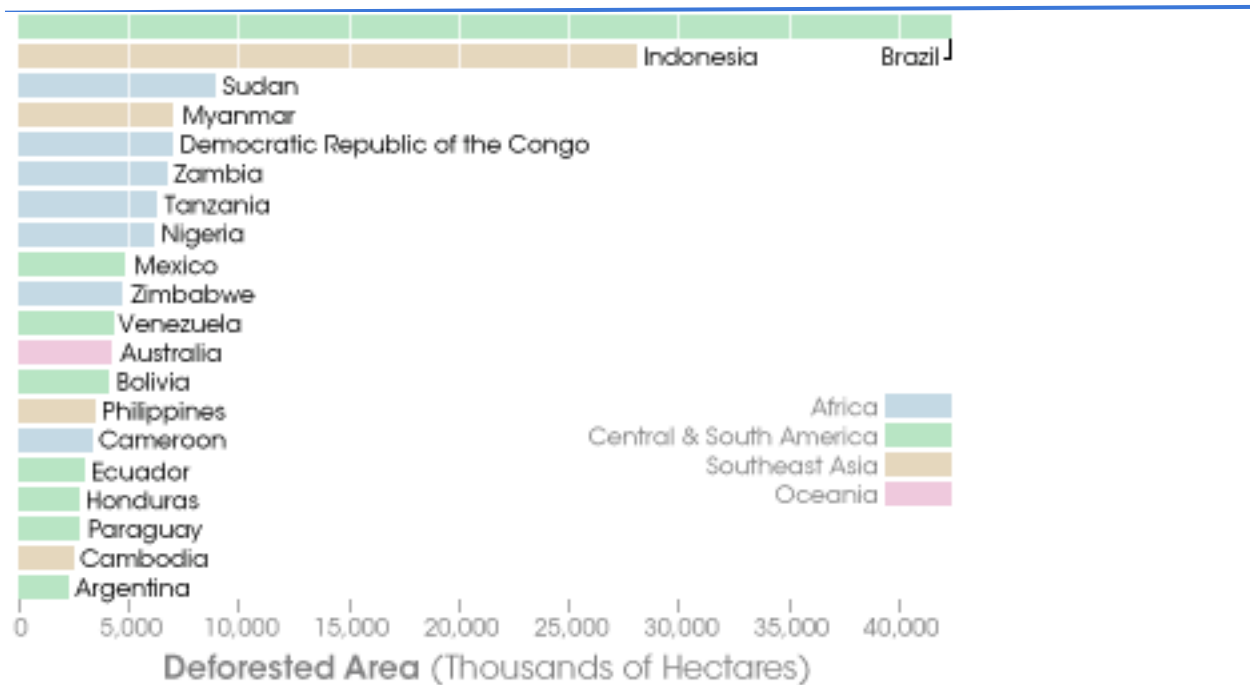


Figure 5. Source: NASA earth observatory. Causes of deforestation

The above figure shows the countries with the greatest amount of deforestation. Brazil has the most amount of land deforested between 1990 and 2005—in just 15 years, 40,000 hectares of forest was cut down in Brazil.

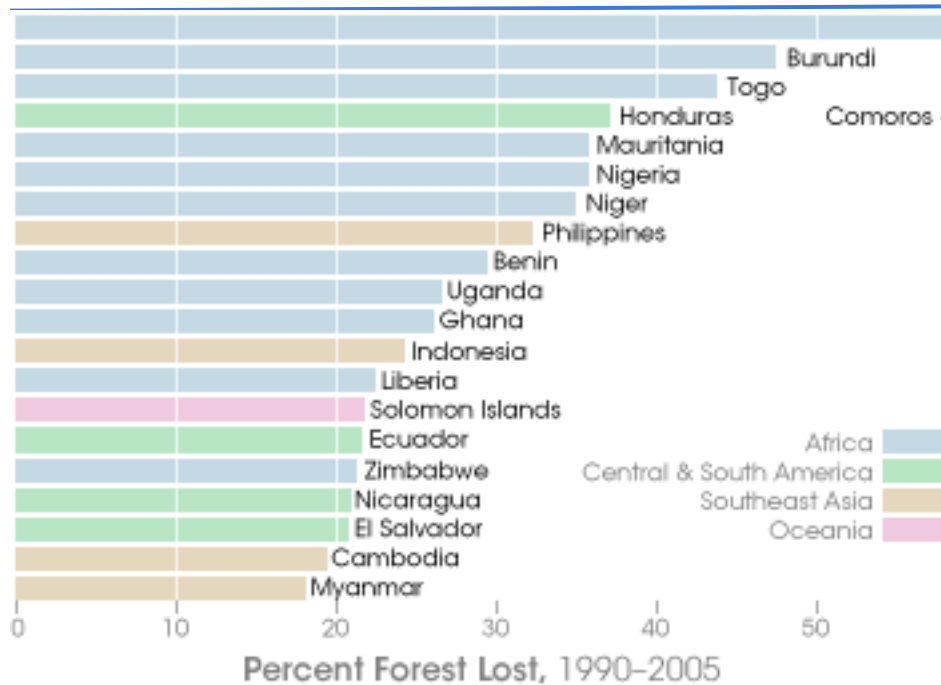


Figure 6. Source: NASA earth observatory. Causes of deforestation

Although Brazil has the most amount of forest loss measured in hectares, other countries have lost a much greater amount of forest as a percentage of their total forest cover. For example, although Comoros does not have the most hectares loss, it does have the largest percentage loss. In 15 years Comoros lost an astounding 50% of their forested land.

The Amazon rain forest is one of the most threatened forests on earth. The Amazon spans 670 million hectares across several countries, “Brazil, Bolivia, Peru, Colombia, Ecuador, Venezuela, Guyana, Suriname, and French Guiana,”²⁵ of which 17.7 million hectares has already been lost due to deforestation.²⁶

FOREST DATA FOR 8 AMAZON COUNTRIES, 2004-2012

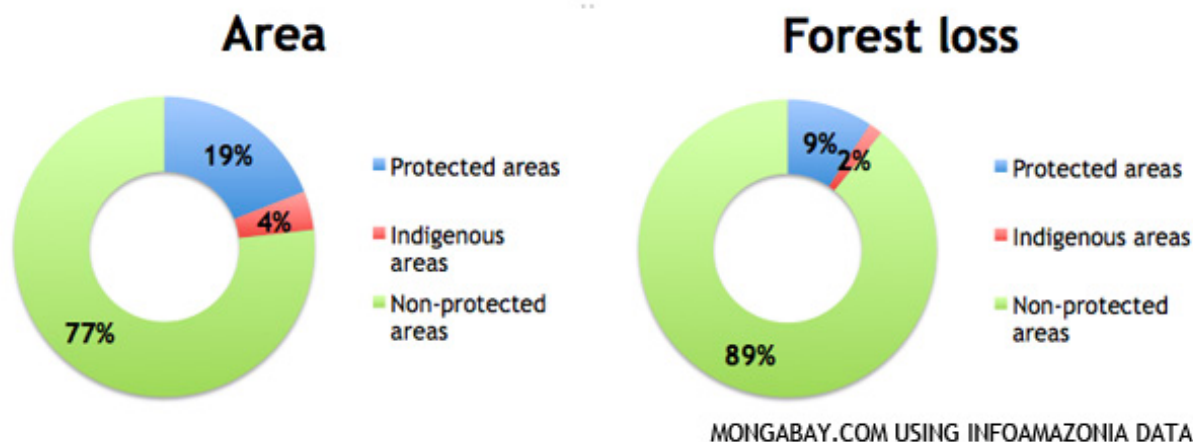


Figure 7. Source: Mongabay. Calculating deforestation figures for the Amazon

As you can see in the figure above, although there are some protection policies in place, they aren't always effective. 19% of the Amazon rainforest in eight countries is protected land; however, more than half of that percentage, 9%, of protected areas are still experiencing deforestation. Furthermore, half of the indigenous occupied areas in eight countries of the Amazon rainforest are also experiencing deforestation (2% of the 4% occupied by indigenous people.)

What will the future look like?

If we continue on this path, as much as 55% of the Amazon rainforest could disappear by the year 2030.²⁷ The damage to the Amazon alone is so great, in fact, that fires set for slash-and-burn agriculture, as well as the scars left on the Amazonian rainforest, can be seen from space. With the massive loss of trees in forests comes a massive loss in all the things that go hand in hand with this rich diverse environment. Animal species, plant species, medicine, livelihoods, weather patterns, and natural beauty will all be greatly affected following the loss of forested areas.

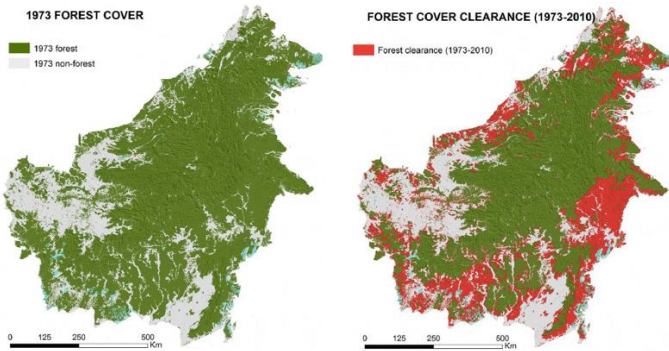


Figure 8. Source: Mongabay. 30% of Borneo’s rainforests destroyed since 1973

The two maps above show the damage to Borneo’s rainforest between 1973 (left) and 1973-2010 (right.)

The impact of losing 55% of the Amazonian rainforest would be incalculable. Scientists say that the 55% of forest loss is projected to make up “31 percent cleared and 24 percent damaged by either logging or drought, with a large portion of that damaged forest catching fire.”²⁸

Conclusion

Forests and Rainforests world-wide are at risk. There are many changes that must be made locally, and globally, in order to secure the existence and success of these ecologically and environmentally significant areas of land. Although recent trends indicate that deforestation is on the rise, there are also many who are fighting back. Following plans for environmentally based initiatives, the forests of the world can still be saved. The next generation, environmentally conscious and ready to make a change, may be the final key to unlocking the preservation and protection of forests.

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Notes

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