

AMAZON UNDER THREAT

Climate Change and Deforestation in the Amazon basin

The rainforests and tropical woodland savannahs of the Amazon basin contain up to 30% of the terrestrial biological diversity. It is the largest contiguous tropical forest on the planet, almost continental in scale. It is a vast, remote and mysterious rainforest teeming with undiscovered plant and animal life and home for hundreds of Indigenous groups, several of them not yet contacted by non-Indigenous.

The Amazon plays an important role in the global climate system, storing very large quantities of carbon and water. The water of the Amazon basin is 'recycled' within the ecosystem – 75% of the rainfall returns to the atmosphere through evapotranspiration – leading to a substantial cooling of the region, rather like a massive regional air conditioner.

But the Amazon is currently caught between two destructive forces – deforestation and climate change.

Deforestation

The most recent deforestation losses for the period from August 2003 to August 2004 amount to about 23,000 square kilometers according to Brazilian official data. In the last 11 years, the Brazilian Amazon alone has lost 200,000 square kilometers, – an area the size of England and Scotland together. Logging, road building, forest fires, human settlements and the recent burst of conversion of Amazonian lands to cattle farming and agriculture – primarily soya production – are the main culprits.

Climate Change

There is also a growing body of evidence that climate change is having an impact on the forest, making it drier and leading to more forest fires and that these impacts will accelerate over the coming decades. In the worst case scenario, this could lead to the collapse of the Amazon and its transformation into a desert or semi-arid state. A recent study by scientists at the Hadley Centre in the UK, based upon a modeling exercise that includes the vegetative carbon cycle, paints an alarming picture. With the rise in global mean temperature the Amazon gets drier, which leads to more forest fires and forest die-back. This 'positive feedback' loop leads eventually to the collapse of the Amazon system. (While this is only one model, it captures both the actual weather and the impact of the El Nino phenomenon better than other models and is therefore cause for grave concern).

The destructive Cycle

Disentangling the effects of human activities from those of human induced climate change appears very difficult, as the impacts of climate change are being felt at the same time as the destruction of the forest from direct human activities. Together they create a destructive cycle that threatens to flip the ecosystems of the Amazon from forest to savannah or a semi-desert state.

- The range of human activities that fragment the forest make it even more susceptible to the impacts of global climate change and when these factors are included, it may mean that less extreme drying of the forest will be required to trigger the positive feedbacks modeled by the Hadley Centre.
- Another factor to be considered is the increased smoke in the atmosphere from the increase in forest fires and burning for the purpose of land clearing, which has an impact on local weather patterns. The presence of large quantities of smoke tends to lead to a reduction in rainfall, exacerbating the drying effect from other factors.
- Increasing CO₂ levels initially lead to the plants in the Amazon system needing less water as water use efficiency increases and the leaf area expands. Despite the larger leaf area, there is a point at which the plants are giving out less water than is needed to maintain the natural air conditioning of the forest. At some point the system is unable to keep up and the CO₂ increase begins to have a negative effect, contributing to the drying out of the forest.

In general, these self-reinforcing feedbacks mean that the forest is unable to recover between increasingly frequent episodes of drought and fire, combined with forest fragmentation and loss. Additionally, as most of the water within the Amazon is recycled within a 'closed loop' system a threshold is eventually reached. If the increased temperatures and forest clearance proceed beyond a certain point, the system collapse becomes unrecoverable. There is a general concern that we are very close to this threshold, but it is impossible to pinpoint at this time.

What can be done?

But if human degradation and clearance of the Amazon were stopped or stabilized, what would the impacts of climate change look like?

There would still be a substantial risk, if not a significant likelihood, that human induced climate changes external to the basin could result in either complete collapse or in substantial degradation and major losses of biodiversity.

Consequently, the question of climate change induced impacts on the Amazon emerges as one of the paramount issues confronting international policy on climate change. There is an overwhelming imperative to enact urgent measures to stop the direct destruction of the forest, while at the same time taking urgent measures at the global level to protect the Amazon from the threat of global climate change.

Further Reading:

Amazonian forest dieback under climate-carbon cycle projections for the 21st century. P.M.Cox, R.A. Betts, M. Collins, P.P. Harris, C. Huntingford, and C.D. Jones.

2004 .*Theoretical and Applied Climatology*

Contrasting simulated past and future responses of the Amazon forest to atmospheric change. S.A Cowling, R.A. Betts, P.M. Cox, V.J. Ettwein, C.D. Jones, M. A. Maslin and S.A. Spall 2004. *The Royal Society*

Assessment of Knowledge on Impacts of Climate Change – Contribution to the Specification of Article 2 of the UNFCCC: Impacts on Ecosystems, Food Production, Water and Socio-economic Systems. W.Hare. 2003.

http://www.wbgu.de/wbgu_sn2003_ex01.pdf