2. Avoided Deforestation

Book chapter extract: Halting deforestation is essential for climate stability

This is an edited extract from the book *Why Forests? Why Now? The Science, Economics and Politics of Tropical Forests and Climate Change* by Frances Seymour and Jonah Busch, 2016. Source: https://www.cgdev.org/publication/ft/why-forests-why-now-preview-science-economics-politics-tropical-forests-climate-change

Forests exert a profound influence on the atmosphere. Terrestrial vegetation, dominated by tropical forests, breathes in 123 billion tons of carbon every year through photosynthesis, and breathes out nearly as much through respiration. This is 15 times more than all annual emissions from burning fossil fuels.

When forests are converted to agriculture, pasture, mining, or urban areas, the atmosphere suffers threefold. First, the atmosphere suffers because a steady net flow of carbon from the atmosphere to forests is lost. Left undisturbed, natural forests are a carbon sink, meaning that growing trees in the forest trap more carbon through photosynthesis than dying trees release. Forests continuously stock carbon away in everincreasing biomass and in the soil. Big old trees actually remove carbon from the atmosphere faster than younger trees; a discovery that overturned longstanding conventional wisdom. Of the 10.4 billion tons of carbon dioxide taken out of the atmosphere every year by forests, 4.4 billion tons is taken up by mature forests.

Next, the atmosphere suffers from deforestation because the massive stock of terrestrial carbon that has accumulated over many years in the trees and soil is rapidly released to the atmosphere. The world's tropical forests store 471 billion tons of carbon — more than all the carbon ever emitted from burning fossil fuels. And every year 5 to 11 billion of these tons are released to the atmosphere from deforestation.

Finally, the new land use is usually an ongoing emitter of carbon flows to the atmosphere. Agriculture, the largest driver of tropical deforestation, releases 5.4 billion tons of carbon dioxide globally every year. All in all, deforestation harms the atmosphere by releasing a carbon stock and reversing a carbon flow.

Developed northern-latitude countries have been clearing their forests for centuries. As a result, about one-third of all human-caused greenhouse gas emissions since 1750 have been from land-use change—mostly deforestation in Europe, North America, and temperate Asia. In recent times deforestation in the northern latitudes has given way to rotational forestry, which is far more benign from a climate standpoint than permanently converting forest land to other uses.

However, deforestation has now shifted to the tropics. Every year 92 thousand square kilometers of tropical forests are lost — an area the size of Portugal — while only 21 thousand square kilometers are allowed to grow back. The pace of tropical deforestation is actually accelerating by 2,100 square kilometers each year.

Because tropical forests are so rich in carbon, the climate impact of deforestation in these latitudes is even greater. A typical hectare of tropical forest stores 164 tons of carbon aboveground, while typical hectares of temperate forest and boreal forest store just 61 and 47 tons of carbon, respectively. And this is even before counting the carbon that is stored below ground.

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The damage is compounded when deforestation takes place on the carbon-rich peat soils common throughout parts of Southeast Asia and South America. When peat soils are stripped of their protective forest covering, drained by canals, and planted with plantation crops, the peat carbon oxidizes and leaks greenhouse gases continuously to the atmosphere for decades. As a result peat emissions produce 1.1–2.0 billion tons of carbon dioxide per year (as much as Japan or Russia).

Deforestation contributes especially strongly to global warming when it occurs in the tropics for another reason too, related to the reflection of sunlight. Dark surfaces absorb more heat than light surfaces, as anyone who has worn a black outfit during summertime understands. The thick white clouds that are generated by tropical rainforests reflect the sun's warming rays back to space, while darker cleared ground absorbs this warmth.

Together with the oceans, which absorb 8.4 billion tons of carbon dioxide each year, forests form a "subsidy from nature" that buffers against climate change being even worse. Since the start of the industrial revolution, oceans and the land, dominated by forests, have removed 315 GtC that would otherwise have remained in the atmosphere. Because of these natural sinks, the atmospheric greenhouse gas concentration is increasing by only 2 parts per million each year rather than 4 parts per million.

The total contribution to climate mitigation of stopping deforestation and continuing reforestation could be as high as 31 percent. When the sequestration provided by mature forests is factored in as well, the contribution of forests is even larger. Carbon sequestration by tropical primary forests removes 8 percent of total annual emissions. If all deforestation were halted tomorrow, and if damaged forests were allowed to regrow and mature forests were left undisturbed, then the change in carbon flows from tropical forests would offset up to 38 percent of total annual greenhouse gas emissions, or up to 48 percent of all greenhouse gas emissions from non-forest sectors. Actions to slow, halt, and reverse deforestation are thus a priority for mitigating climate change.

Forest restoration, as is taking place in East Asia and South Asia, can and should be accelerated. But the global mitigation response can't be limited to just planting more trees. Restoring damaged forests and reducing degradation are important for climate mitigation, but are secondary priorities after stopping the loss of intact forests. Once deforestation has released the carbon stock of a mature tropical forest, it takes decades for a replanted or regenerating forest to sequester the equivalent amount of carbon back from the atmosphere. The diversity of animal and plant life once provided by the original forest may not be regained for centuries.

In sum, continued clearing of tropical forests both releases a major stock of heat-trapping carbon into the atmosphere and reverses an existing planetary-scale flow of carbon from the atmosphere into growing forests. Carbon stocks liquidated into the atmosphere from deforestation will require decades to rebuild, meaning that planting trees alone is not enough. The course of action is clear: stop tropical deforestation and allow damaged forests to regrow, thereby capturing almost half of human-caused emissions from other sources.