TROPICAL DEFORESTATION

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As the global crisis deepens, deforestation...cries out for the geographer's attention. Human manipulation of the plant cover, especially through agricultural clearing...is the most evident of all human relationships with the physical earth and is thus central to cultural geography (Parsons 1994).

The most extensive footprint of human habitation of the Earth’s surface is inscribed on the landscape through forest conversion for agriculture, logging, and urbanization. The planet's intact old-growth forests have dwindled to approximately one-fifth of their original cover.

During recent decades, deforestation has accelerated and is now almost totally concentrated in the tropics. While not one developed nation had a positive rate of deforestation during the 1990s, only India and Vietnam (with reforestation rates of 0.1 percent and 0.5 percent respectively), experienced net afforestation among tropical nations with substantial endowments of humid forests (FAO 2001).

Estimates of land-use change over the last few millennia are crude, but research suggests that approximately 50 percent of the area of tropical forests has been removed by human influence in Africa and 40 percent in Latin America and Asia (CSAHEI 1993). As forests have dwindled worldwide, deforestation rates have accelerated (approximately 40 percent from the mid-1980s to the mid-1990s). A slightly greater percentage of forests were cleared in Asia and Africa (34–38 percent) than in Latin America (approximately 28 percent) during the last century, though a far greater absolute amount was cleared in Latin America due to the vastness of the Amazon basin (Carr and Bilsborrow 2001). The lion’s share of this deforestation occurred during the twentieth century’s last four decades. If tropical deforestation rates continue as during the last decade, the most biologically rich forests on the planet will be erased within 50 years.

Understanding human-environment dynamics has increasingly been recognized as a priority of global environmental change research. Yet what we know about tropical deforestation is limited by the paucity of existing data.

D. G. Janelle et al. (eds.), WorldMinds: Geographical Perspectives on 100 Problems, 293–298.
Figure 47.1. Frontier forests

at the household level and by poor estimates for forest cover at the macro scales. Geographers have played a key role in redressing some of these inadequacies. But research by geographers represents only about a fifth of all research on the topic (Geist and Lambdin 2001). Thus, much work remains
for geographers to apply our comparative advantage linking human-environment interactions at diverse spatial scales.

FRAMEWORKS

The great diversity of human systems of forest change carves widely varied patterns across regions and nations. Our understanding has moved beyond simple Malthusian assumptions to dynamic and complex multi-scaled causal mechanisms. Recent frameworks consider a host of proximate and underlying causes to land-use and land-cover change (e.g., Lambdin et al. 2001; Geist and Lambdin 2001). From the research on tropical deforestation explicitly categorizing proximate causes, three essential types of land use emerge: agricultural expansion, timber extraction, and infrastructure development. Literature on the underlying causes of deforestation typically identifies the following broad types of factors: demographic, socioeconomic, technological, political-economic, and environmental. To date, macro-scale analyses are based on rough estimates, and local and household studies remain largely de-coupled from regional patterns. A principal challenge ahead is linking these processes across different spatial scales and over time.

CAUSES

A burgeoning literature has identified a host of causes thought to be driving tropical deforestation (e.g., Geist and Lambdin 2001). As mentioned above, it is increasingly evident that a concatenation of variables interacts across spatial and temporal scales (Mather et al. 1999; Turner et al. 2001). Small farmer agricultural expansion along forest frontiers is probably the primary proximate cause of forest clearing on the planet – followed by in-situ agriculture and pasture expansion, timber felling for fuel and construction, and infrastructure expansion. The last two processes often antecede frontier expansion; the first two often follow it. Underlying these proximate causes are demographic, political, economic, and environmental processes.

Some scholars have estimated that population explains half or more of the variation in worldwide deforestation patterns and indeed the great majority of deforestation case studies involve demographic dynamics at some level. However, population is never the sole cause but interacts with other proximate and underlying factors. Political economic factors also play key roles. For Example, Mather and Needle (1999) have observed that forest impacts are low in the early phase of development, accelerate during development, and again are reduced at later stages when primary resource extraction is moved to a new developing region. Politically, the wealthiest and most democratic
countries usually enjoy stable or expanding forests, while poor and despotic countries tend to experience rapid forest loss.

Much of the research on tropical deforestation has been conducted in Latin America. The region harbors the greatest area of closed tropical forests in the world and over half of all freshwater on Earth. Small farmer agricultural expansion along forest frontiers has been the primary proximate cause of forest clearing in Latin America. Examples of rapid forest conversion following colonization are abundant in the literature and satellite imagery has illustrated particularly high rates of clearing adjacent to new roads. Thus, a prerequisite to frontier deforestation is road building resulting from corporate and state policies favoring certain regions for economic or geopolitical reasons.

In these remote rural environments of abundant (but often insecure) resource access and scarce labor, most forms of agricultural intensification represent an unnecessary labor burden and are uneconomical, inefficient, or too risky for small, semi-subsistence producers, leading to an extensive swidden land-use pattern. Soil nutrients are depleted in oxidized tropical soils in a matter of two to four years, encouraging farm abandonment once the swidden cycle is complete. Over time, farms are consolidated in the hands of rural elites, who take advantage of abandoned farms for raising cattle, spurring exodus among the poor, often to a subsequent forest frontier, where the deforestation cycle begins anew (e.g., Walker and Moran 2002). An important point that is neglected in the literature is that demographic, ecological, and political-economic pressures elsewhere foment migration to the frontier, and this migration process is a necessary antecedent to frontier forest clearing (Carr 2002).

Contrary to Latin America, in Africa a greater proportion of deforestation has come from the expansion of sedentary, intensive (non-frontier) agricultural expansion and fuel wood harvesting. International trade has brought indebtedness, maintaining pressures to produce for export, and has promoted increased agricultural expansion and timber extraction. Among peasant farmers, high rural population densities depending on scarce woodland for fuel have also been a major driver.

In Asia, despite a rapid fertility transition in many countries, notable deforestation continued through the 1990s due to increasing demands on timber resources and the continued migration of swidden rice farmers into formerly remote areas opened by logging roads. Today, in some of the smaller Southeast Asian nations, such as Malaysia, deforestation has claimed virtually all but a handful of forest reserves.

IMPACTS

Deforestation may be largely confined to the tropics, but its impacts are global. Tropical forest conversion influences global biogeochemical cycles, hydrological flows, and soil degradation. Tropical forest conversion also threatens
to exacerbate climate change at local and global scales. The geographic literature has highlighted spatial variation in the environmental impacts of each of these processes. For example, forest clearing is likely to warm the Earth’s climate disproportionately in the tropics and subtropics (Defries and Belward 2000). Similarly, geographic research has elucidated the importance of not merely the total amount of forest change but also of how patterns of forest clearing distinctly impact physical landscapes (Walsh et al. 2001). For example, forest fragmentation can inhibit forest re-growth, decrease biodiversity, and threaten the integrity of ecological systems (Roth 1999). Temporal scales are also important. Some scholars have shown, for example, how interannual land-cover changes can be considerably more notable than long-term change in some regions (Lambin and Ehrlich 1997).

Geographers have also investigated how forest conversion threatens the rich biological integrity of tropical ecosystems (e.g., Phillips 1997). In recent years, virtually all species extinctions have occurred in this biome covering only 7 percent of the Earth’s terrestrial surface. Species elimination irreparably damages the planet’s biological gene pool, invaluable for the advancements of science, medicine, and food production.

A disproportionate number of global species extinctions are concentrated in those places set up to protect them, such as national parks and ecological reserves. As governments expand the area of wild lands under protection and as little unclaimed forest remains outside of these areas, protected areas represent an increasingly large proportion of unoccupied land available to migrant farm households.

CONCLUSION

Our understanding of the processes of deforestation remains inchoate; indeed, even estimates of current tropical forest cover remain notoriously unreliable. We are learning more every day and geographers have contributed a formidable corpus of research on tropical deforestation. But given the enormity of the phenomenon to human and environmental systems, we can do much more. Practitioners in our field conduct a fraction of the research on the topic. Yet geographers are strategically positioned to pioneer future research endeavors. The multidisciplinary strengths of geographers are featured in the widely diverse research methods on the topic, including remote sensing, GIS, ecosystem processes modeling, surveys and interviews, participant observation, and stakeholder analyses. Tropical deforestation is quintessentially geographical. Forest clearing represents the most salient mark of the human ecological footprint on the Earth’s surface and is inherently linked to place and space. When it comes to research on the causes and consequences of tropical deforestation – to echo UN Secretary General Kofi Annan – “the great adventure of geographic exploration is far from over” (Annan 2001).
REFERENCES


