DRIVERS OF AMAZONIAN DEFORESTATION

Schaeffer and Rodriques list a plethora of socioeconomic and societal factors that likely influence Amazonian deforestation, many of which we have previously assessed in detail (*1-9*). Nonetheless, despite the seeming complexity of deforestation drivers, it is dangerous to obscure the central role of new highway and infrastructure expansion in promoting rapid forest loss.

Contrary to the implication of Schaeffer and Rodrigues, new deforestation drivers in Amazonia (such as soybeans) have not replaced the "old" drivers that were promoting deforestation 25 or more years ago. Rather, they have been added to the list of existing drivers, making the deforestation process even more formidable once it begins. All evidence indicates that the relationship between road building or paving and burgeoning forest loss along highway routes is as strong today as it was decades ago (*3, 5-7*). Our conclusions regarding the environmental costs of planned infrastructure projects are, unfortunately, as valid as ever.

Moreover, Brazilian plans for infrastructure expansion in Amazonia are readily amenable to policy modification (*5*), whereas many of the endemic societal and institutional problems cited by Schaeffer and Rodriques are less so. These authors are correct that many environmental problems plaguing Amazonia—such as widespread illegal logging, deforestation, mining, colonization, and land speculation—are thriving under weak frontier governance. Yet, despite these weaknesses, the Brazilian federal government is pushing ahead with a dramatic expansion of Amazonian highways, roads, and other transportation projects. The net result, we believe, will be further acceleration of already-rampant rates of forest loss and degradation. Equally alarming is that, under current development schemes, forests throughout much of the basin will be fragmented (*5, 10*); in the future, the surviving fragments will be far more vulnerable than are intact forests to predatory logging, wildfires, illegal colonization, and other threats (*3, 8*).

In addition, Schaeffer and Rodrigues misunderstand the key role of highways and roads in promoting past deforestation, especially during the 1990s. Contrary to their claims, the 1990s did see significant expansion of highways and roads, such as paving of the 800 km-long Manaus-Boa Vista highway (BR-174) that is promoting dramatic changes in central Amazonia, highway paving in Acre and Mato Grosso, and construction of many secondary roads ramifying out from existing highways. Moreover, highway and road construction not only has an immediate impact on deforestation, as they imply, but also longer and more pervasive effects that persist for many years. Forest loss in the 1990s would certainly have been less severe were it not for the infrastructure created in preceding decades.

Finally, it is vital to emphasize that new highways and roads exacerbate many current development pressures. By continually opening up new frontiers for colonization, such projects promote land speculation, weakening incentives for more-sustainable land uses, such as perennial crops and plantations (*3, 5, 6*). Abundant, cheap land means that destructive, fire-based agriculture, such as cattle ranching and slash-and-burn farming, will continue to thrive. In Brazilian Amazonia, an area the size of France has already been deforested, a large fraction of which is now degraded cattle pasture with minimal benefit for Brazilian society. A vital step in promoting more-sustainable development is to intensify land-uses in these already-degraded areas, rather than opening up immense new tracts of primary rainforest for exploitation.

William F. Laurance[1]*, Ana K. M. Albernaz[2], Philip M. Fearnside[3], Heraldo L. Vasconcelos[4], Leandro V. Ferreira[2]

[1]Smithsonian Tropical Research Institute, Apartado 2072, Balboa, Panama. [2]Museu Paraense Emílio Goeldi, Avenida Perimetral 190, Belém, PA 66077-530, Brazil. [3]Departamento de Ecologia, Instituto Nacional de Pesquisas da Amazônia, C.P. 478, Manaus, AM 69011-970, Brazil. [4]Instituto de Biologia, Universidade Federal de Uberlândia, C.P. 593, Uberlândia, MG 38400-902, Brazil.

*To whom correspondence should be addressed. E-mail: laurancew@tivoli.si.edu

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