Amazon Deforestation: Roads Matter

Câmara et al. (*1*) challenge our assertion that the unprecedented, planned expansion of highways and other transportation projects in Amazonia that was originally proposed under the 'Avança Brasil' (Advance Brazil) program is likely to lead to a dramatic increase in forest loss and degradation. In doing so they argue that our earlier spatial models (*2*) were overly simplistic and 'apocalyptic' in their projections. However, three points about our models merit emphasis:

First, the projections of our models—that 28-42% of Brazilian Amazonia would be deforested by 2020 if all the Avança Brasil projects proceed immediately—are in fact very plausible, and do not differ greatly from simple extrapolations using the current high rate of forest loss (*3*). Second, our models (which integrated 61 different data-layers and underwent rigorous peer review before publication) incorporated key components of regional heterogeneity in Amazonia, including spatial variability in forest vulnerability to fire, logging, and mining. Third, independently derived scenarios of future forest loss (*4*,*5*), including a recent model that incorporates much of the region's biophysical and economic heterogeneity (*6*), also indicate that new and planned highways are likely to play a central role in determining future patterns of Amazon deforestation.

If a new highway penetrates into a large forest tract and promotes spontaneous colonization by farmers, loggers, and ranchers, is the highway causing forest loss or the other drivers? Clearly, it is both—but the crucial point is that such transportation projects play a pivotal role in determining where forest destruction occurs. The truly alarming aspect of the Avança Brasil program is that it will criss-cross the Amazon with some 7,500 km of paved highways and many other transportation projects that will penetrate deep into the heart of the basin. The net effect will not only be increased deforestation, but fragmentation of forests on an unprecedented spatial scale (*2*). In the future, these fragments will be far more vulnerable than are intact forests to colonization, predatory logging, wildfires, and overhunting. Moreover, by continually opening up new frontiers for colonization, the Avança Brasil projects will help to depress land overall prices, weakening incentives for more-sustainable land uses such as perennial crops and plantations (*7,8*). Rather than concentrating development in the vast expanses of land that have already been deforested, the projects that promote frontier expansion will do precisely the opposite.

Contrary to the claim by Câmara et al., the dramatic upsurge in Amazonian deforestation in 2002-2003 includes many areas associated with highways and roads, including the notorious Santarém-Cuiabá Highway. Remote-sensing imagery of burning shows that this highway—a top priority for paving as a soy-transportation corridor—appears as a continuous band of fire at this very moment (*9*). Even the deforestation hotspot (São Félix do Xingu) emphasized by Câmara et al. is closely associated with privately financed roads (*10*), which are, after all, roads nonetheless. The point of our recent essay (*11*) is that the Brazilian government's efforts to slow rampant forest loss in Amazonia will be unlikely to succeed if the government proceeds with its most environmentally damaging transportation projects. We stand by this assessment.

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

[1]Smithsonian Tropical Research Institute, Apartado 2072, Balboa, Panama. [2]Departamento de

Ecologia, Instituto Nacional de Pesquisas da Amazônia, C.P. 478, Manaus, AM 69011-970, Brazil, [3]Museu Paraense Emílio Goeldi, Avenida Perimetral 190, Belém, PA 66077-530, 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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