

Sensitive development could protect Amazonia instead of destroying it

Sir— After 40 years of government-induced settlement of the Brazilian Amazon, the core of this region has experienced surprisingly little deforestation. The agriculture and ranching that cause deforestation depend upon reliable roads, which are concentrated along the eastern and southern flanks of Amazonia (Fig. 1). This ‘passive protection’ of central Amazonia may soon be lost, however, unless the proposed paving of roads through the core of the region is reassessed.

The Brazilian government has revised its directives for Amazonian development as part of its *Avança Brasil* (Forward Brazil) plan. This is an ambitious programme for development in Brazilian Amazonia, involving infrastructure investments of US\$45 billion over the next eight years.

The plan emphasizes road paving, river channelling, port improvements and expansion of energy production (Fig. 1). If implemented, it will add 6,245 km of paved highways to the region’s road network, including the Santarém–Cuiabá and Humaitá–Manaus highways, which cut through the core of the region (Fig 1 A, B)¹. Paving these highways is justified by the transport cost savings that would accrue to soy farmers in north-central Brazil, but would have substantial attendant environmental costs, such as increased deforestation, logging and forest fires. Establishing these ‘export corridors’ would lead to further dilution of the state’s institutional capacity and of the limited resources available for social development within existing Amazon frontiers^{2,3}.

If the historical relationship between roads and forest loss continues, then the planned road paving will cause between 120,000 and 270,000 km² of additional deforestation, and further forest impoverishment through logging and understorey fire over the next two or three decades^{2,3}. Combined with deforestation occurring within the existing frontier, the deforested portion of the Brazilian Amazon could increase from 14% (550,000 km²) today to a third of the total area over the next 20–30 years. This would release 6 billion–11 billion tonnes of carbon into the atmosphere from forest clear-cutting alone³. The roads would come within 50 km of 22 conservation areas and 89 indigenous lands³.

If Amazonia is to avoid the ‘business-as-usual’ experience of frontier expansion that has consumed most of the world’s forests, Brazil should adopt an alternative development pathway in which

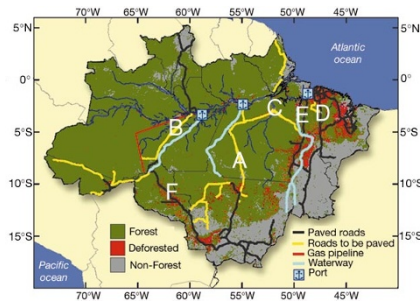


Figure 1 Infrastructure investments described in the *Avança Brasil* programme. The current frontier is indicated by deforestation (red).

investments are designed to strengthen the economic vigour and institutional capacity of existing settlement regions before roads are paved deeper into the forest.

Investments could be concentrated along the Transamazon, Belém–Brasília, PA-150 and BR-364 highways (Fig. 1 C–F, respectively), where ageing frontiers are languishing in the wake of timber depletion, gold mining and land speculation⁴. These investments include the improvement of local road networks, marketing facilities, technical support, schools and health systems. Financial incentives are needed for sustainable forest management and permanent agriculture initiatives. Institutions must be strengthened to streamline the land titling process, and to implement Brazil’s very ambitious environmental legislation through monitoring and control of predatory land-use activities. This approach would stimulate regional development, while preserving the world’s largest passive forest reserve.

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How electricity could power the car of today

Sir— Although I appreciate Stanford Ovshinsky’s kind words for my book, *The Electric Vehicle and the Burden of History* (*Nature* **408**, 289–290; 2000), his review misrepresents an important finding. According to Ovshinsky, my book argues that the historical trajectory of the electric

vehicle was determined by technological constraints — that the “burden of history” means that major technological breakthroughs are now needed to create a market for EVs. In fact, I argue exactly the opposite. The crux of the book is that the future of the electric vehicle (like its past) has relatively little to do with technology *per se* and everything to do with the social context in which owners and drivers choose to use motor vehicles.

The “burden of history” in my book’s title refers primarily to the burden of expectation heaped upon the electric vehicle ever since Edison first promised to revolutionize the automobile market with his super-battery in 1898. Such over-promotion has ensured that the electric vehicle is always the car of tomorrow, never the car of today.

The implications of the historical cases explored in the book are clear: policy-makers, manufacturers and drivers must lower their expectations regarding the ability of battery electric vehicles to compete head-to-head with internal combustion cars and look for existing applications where electric vehicles make economic sense.

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Did agriculture reduce human lifespan?

Sir— In his review¹ of Clark Spencer Larsen’s book *Skeletons in Our Closet: Revealing the Past through Bioarchaeology*, Christopher Wills concludes that “overall health was reduced by ... the introduction of agriculture”. He notes that there is little evidence that farmers lived longer than hunter–gatherers.

In the Indian epic *Ramayana*² one finds the following: “In the Golden Age, agriculture was abomination. In the Silver Age, impiety appeared in the form of the agriculture. In the Golden Age, people lived on fruits and roots that were obtained without any labour. For the existence of sin in the form of cultivation, the lifespan of people became shortened.” It is conceivable that food shortages in the pre-agricultural era produced healthier individuals because of reduced caloric intake, which is known to delay the onset of age-related pathologies and to extend the lifespan³.

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