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CLIMATE ENVIRONMENT IN INTERNATIONAL SECURITY : THE CASE OF DEFORESTATION IN THE BRAZILIAN AMAZON

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ABSTRACT. Deforestation in Brazilian Amazonia can affect the security of other countries if it contributes to climatic changes such as those expected in a world warmed by the greenhouse effect. Conversion of Brazil's Legal Amazon to cattle pasture, a transformation now rapidly proceeding, would add significantly to atmospheric CO_2 and trace gas releases. It would also reduce rainfall in the region and in neighboring areas through reduction of evapotranspiration. Foreign countries can help slow deforestation by refraining from activities that speed the clearing, such as financing highways and similar developments, direct investments in enterprises that clear forest, importation of products produced unsustainably, and funding unproductive public works that fuel the inflation that drives land speculation and consequent deforestation. Positive contributions from foreign countries could include research on such subjects as the impacts of deforestation, sustainable uses of standing forest, and economic mechanisms that would encourage sustainable management and discourage competing nonsustainable uses. Foreign sources, including multilateral development banks, can play an important role in financing alternative means of support for the population now migrating to Amazonia, including industrial development to create urban employment in the migrant source areas.

1. INTRODUCTION

General agreement exists that climate change affects international security. The countries affected by climatic change are often not the same ones where the processes that provoke the changes are located. Means must be developed to channel international efforts such that the roots of unfavorable climate changes are effectively attacked. This must be done without offending the sovereignty of the countries involved, otherwise the measures will be ineffective and will create additional strains on the international security of all concerned.

A case in point is the link between deforestation in tropical areas, especially Amazonia, and the greenhouse effect provoked by carbon dioxide, methane, nitrous oxide and other products of forest combustion

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and decomposition. Many of the most immediate climatic impacts are in polar and temperate regions. I have calculated that converting Brazil's 5×10^6 km^2 "Legal Amazon" region from its original vegetation to cattle pasture would release about 50 gigatons (G tons) of carbon; were this to occur over the next 50 years (a conservative assumption), one G ton would be released per year, or about 20% of the present global total release from fossil fuels and all other sources (Fearnside, 1985a, 1987a). This has been disputed by Lugo and Brown (1986) and defended by me (Fearnside, 1986a). Calculations based on the very low estimates for forest biomass made by Brown and Lugo (1984) result in smaller contributions from tropical deforestation (e.g. Detwiller and Hall, 1988), but examination of available data supports substantially higher values for average biomass in Amazonian forests (see Fearnside, 1987a). While far from the entire problem, the potential contribution of Brazil on the order of 20% is very substantial over the coming decades when forest is being felled. The measures that would be needed to restrain the trend of forest conversion to pasture in Brazil have a high financial and political cost. Many of these measures will have to be taken by the Brazilian government itself, but international sources can contribute significantly to give these changes the speed and effectiveness they merit.

2. INTERNATIONAL RESPONSABILITY FOR PREVENTING DEFORESTATION

A portion of the deforestation now occurring in Brazil is the direct or indirect result of actions by other countries. These activities constitute an appropriate starting place to focus international efforts aimed at slowing or halting forest loss. An additional set of international activities should be encouraged in order to provide financial and scientific support for measures to reduce forest clearing.

Activities that should not be continued by foreign countries, especially those in the industrialized portion of the Northern Hemisphere, include the financing of destruction through multilateral and private banks. Loans from such sources as the World Bank and the Interamerican Development Bank often fund the key component within the system of forces that drives deforestation : construction of highways into rainforest areas (Fearnside, 1987b). This is precisely the factor to which deforestation appears to be most sensitive, since the presence of roads sets in motion a cycle of immigration, land speculation and population turnover that leads to clearing and is beyond the control of government authorities (Fearnside, 1984, 1986b, 1987c).

A second set of activities from abroad that contributes to deforestation is direct investments by foreign firms. Volkswagen's 139,000 ha Rio Cristalino Ranch in Pará is the best known example (although its sale to Brazilian investors is under negotiation). Others include the 72,000 ha Armour-Swift/Brascan ranch in Pará and the 678,000 ha Suia-Missú Ranch in Mato Grosso of the Italian multinational Liquigas (also under negotiation for sale). While the thousands of Brazilian ranching operations account for most of the clearing by this sector, the presence of international firms is not insignificant (see Fearnside, 1983, 1986c).

Foreign countries also contribute to deforestation by importing many products that are produced in deforested land or are taken from the forest in unsustainable ways. The "hamburger connection" between Central American beef exporters and North American markets is the best known (Myers, 1981; Nations and Komer, 1983), although hoof-and-mouth disease (Afthosis) protects Amazonia from this scourge. Pig-iron exports, principally to Japan, will soon add a new and mighty force to deforestation in eastern Amazonia once production from the Grande Carajás area reaches its expected scale. Pig-iron is to be produced using charcoal which, were it produced from planted Eucalyptus, would require an area ten times that of the managed plantations at Jari (Fearnside, 1988). Since plantations on this scale are expensive and risky, the wood can be expected to come from native forest for as long as accessible stands remain in existence.

A fourth means by which foreign countries speed deforestation in Amazonia is indirectly through the contribution their activities make to Brazil's astronomical inflation. Protection from inflation is a major motivation for land speculation, which leads to deforestation in order to secure title to the land and to keep squatters or other speculators from usurping the claim. Inflation is driven by expenditures for large public works that do not contribute a proportional return to the economy. When people earn money in constructing such a public work they create demand for products in the marketplace; since supply remains the same, demand exceeds supply and prices increase. Examples of massive unproductive investments include the Angra nuclear power plants near Rio de Janeiro (with equipment sold and financed by Germany) and the Balbina hydroelectric project near Manaus (with equipment financing and purchase from France). Even when developments are more productive than these notorious examples, the return from the projects is often so slow that significant inflation can be expected in the meantime. The inducement of easy financing for such projects leads political leaders to initiate new projects as fast as they can. The direct and indirect impact on the forest is generally the last consideration in these decisions.

In addition to the above types of activities that foreign countries should avoid, many positive activities should be pursued. These include research on the climatic and other impacts of deforestation. One major impact with potentially severe consequences within Brazil itself is alteration of the water cycle (Marques et al., 1977; Salati et al., 1978, 1979; Villa Nova et al., 1976). The impacts on rainfall would extend to neighboring areas, such as south-central Brazil (Salati and Vose, 1984). Because of the high variability of rainfall in the region and the critical contribution of evapotranspiration to precipitation during the dry season, reductions could lead to burning within the standing forest as occurred in Borneo in 1982/1983 (see Malingreau et al., 1985), and/or set in motion a positive feedback loop leading to less rainfall and more open xerophytic vegetation (Fearnside, 1985b). Better studies of both the contributions of the forest to maintaining climatic equilibria and the potential impact of climate change on the forest are urgently needed. One major effort being planned to improve our ecological understanding tropical forest and its relation to global processes is the International Biosphere-Geosphere Program. Unfortunate-

ly, the program appears to intend to assess tropical forest from study sites in such politically attractive places as Puerto Rico. Because of Amazonia's great size relative to other tropical forest areas of the world, there can be no substitute for data collected in the region itself if globally-relevant conclusions are to be drawn. Results from studies carried out in Amazonia can also lend important weight to arguments aimed at convincing Brazilian decision-makers to make halting deforestion a top priority.

Research on substainable uses of the forest is also needed. This concludes forestry management studies and collection of the basic ecological information needed to give a secure founding to systems that maintain the structure of the forest intact. It also includes studies of non-wood products that can be obtained from the forest, especially the many pharmacological compounds contained in forest plants and animals. The only feasible means of surveying the vast store of potential compounds is to use the knowledge of indigenous tribes in the region. These tribes are rapidly disappearing; their protection is not only a moral but also an economic and environmental imperative.

Some of the principal barriers to sustainable use of Amazonian forest are economic and social rather than technological. Considering the importance of the task, very little is being done to identify the measures that the government might take to make sustainable systems profitable and the competing non-sustainable ones unprofitable. Some needed changes are obvious, such as an end to financing and tax incentives for pasture, heavy taxes on capital gains to impede land speculation, and disallowing cattle pasture as benfeitoria (improvement) for purposes of establishing land tenure claims. Many other changes that might be made are not yet sufficiently well understood to be translated into operational suggestions. For example, evaluation of forestry management plans must be based on criteria that give appropriate weight to long-term gains (rather than simple comparison with a banker's discount rate), and that include non-monetary environmental and social benefits (Fearnside, 1989). Foreign researchers and funding sources can contribute to filling these important lacunae.

Major funding from international sources will be needed to rechannel development in ways less damaging to the forest. Migration from other parts of Brazil, such as the south-central state of Parana, is a major factor in the exponential increase in deforested areas observed in the Amazonia states Mato Grosso, Rondonia and Acre. The migrants are being forced to leave small farms in Parana because of continuing concentration of land tenure and transformation of agriculture from labor-intensive crops to mechanized cultivation, especially of soybeans for export as cattle feed to North America and Europe. One government initiative has been land reform, now stalled due to strong opposition from large landholders. Clearly this would be very expensive if property owners are to be adequately compensated for land that is redistributed. Land redistribution is a prerequisite if large populations are to be maintained in the countryside. Whether or not land reform is implemented, population exodus is likely to continue : Brazil cannot expect to keep 32% of its population in the countryside (Brazil, IBGE, 1987:57) when its agriculture is transforming into systems similar to those in

North America where less than 5% of the population is rural. Many people leaving the countryside have moved to favelas (shantytowns) around large cities like Sao Paulo where their visible povery, crime, and tendency to support opposition political parties are unwelcome to national leaders. Diverting this population flow to Amazonia by paving highways and establishing colonization projects is a financially and environmentally costly, as well as temporary, solution. International funding sources can play a vital role in promoting industrial developments to provide urban employment as an alternative for these people. The international funding now used to build highways and other projects causing deforestation in Amazonia must be redirected to these ends.

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