Governing the World's Forests

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Summary

The well-being of people is tied to the health of forests. Forested ecosystems purify water, prevent floods, and stabilize the climate. They build and conserve soil, and provide fibers, food, and medicine. They are home to hundreds of indigenous cultures, millions of poor farmers, and most of the world's plant and animal species. And, yet, they are disappearing faster than ever.

Cheap land, cheap labor, perverse market incentives, and weak governments in remote forest regions foster land speculation, illegal logging, and reckless agricultural expansion into forest regions that are unsuitable for crops. Cattle pastures, soybeans, oil palm, coca, and other croplands are displacing tropical rainforests, driven by powerful economic "teleconnections". For example, mad cow outbreaks and growth of the Chinese economy trigger global shortages in beef and vegetable protein, and explosive growth of ranching and agro-industry in the Amazon. Vicious cycles of drought, logging, fire and more drought are impoverishing vast forest ecosystems in Siberia, the Amazon, Borneo and Mexico, threatening to rapidly undo whatever modest reductions in greenhouse gas emissions are achieved through the Kyoto Protocol.

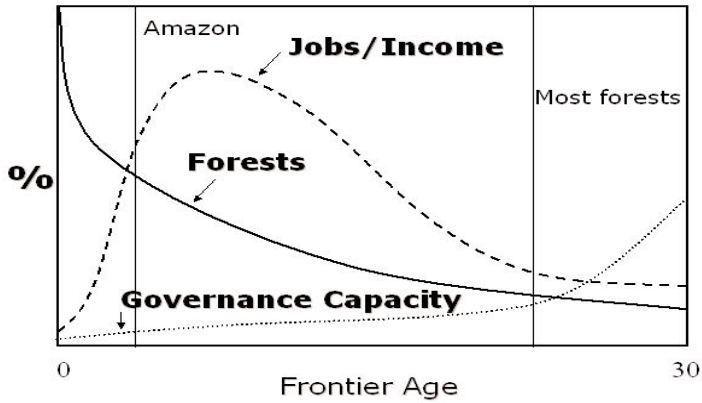
A forest conservation strategy is clearly needed that is big enough for the challenge. Parks, nature reserves, and other types of protected areas are an essential component of any global strategy of biodiversity conservation, but they are insufficient as a means of conserving the full range of services provided by forests to humanity. A successful global forest strategy will (a) strengthen and engage new political constituencies in support of forest conservation, (b) harness the potential of globalization to foster (and demand) good land use practices and forest conservation by agricultural and timber industries, (c) reward governments that are developing command and control capacity for enforcement of environmental legislation, (d) develop mechanisms for equitable compensation of property owners for the costs they incur in protecting society's interests in the forests they control, and (e) accelerate the transition to strong, transparent, democracies. In sum, we must govern the world's forests as a vital foundation of life on Earth.

I. Forests and Frontier Expansion

The forests of the world are falling as a predictable pattern of frontier expansion repeats itself again and again. The process begins when transportation networks are extended into remote forests wildernesses that were previously protected from economic activities by their isolation. The construction of roads, railways, and river shipping lanes-driven by economic and geopolitical interests-initiates the opening of the forest frontier. The "boom" phase of frontier expansion is fast, reckless, and often violent; land speculation and the harvest of timber, game, minerals, and fisheries generates wealth, power and conflict that outpace the capacity of governmental institutions and civil society to govern (Figure 1).

Indigenous groups, subsistence farmers, and law-abiding enterprises generally lose the war over natural resources as long as power is the rule of the land. By the time governance capacity emerges, it is too late: the boom industries of resource extraction have gone bust, and the forest is reduced to patches. In most cases, much of the land cleared for agriculture is abandoned as the limitations imposed

Figure 1

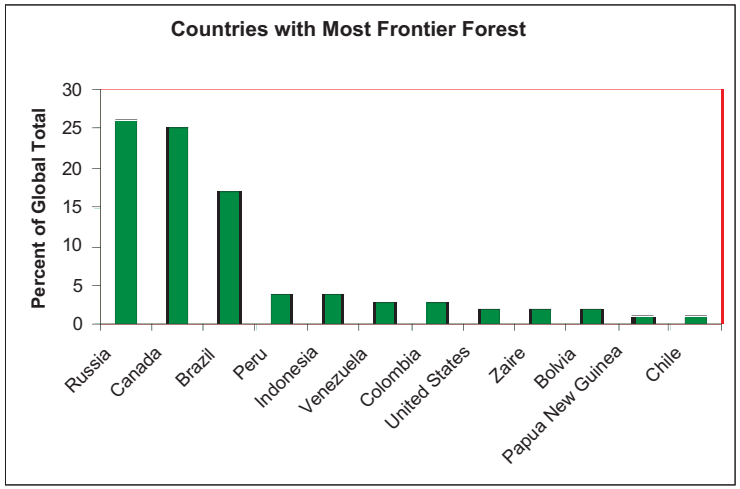


Typical sequence of forest elimination, job/income creation, and institutional governance capacity during the expansion of forest frontiers.

by inappropriate soils, climate, or shifting markets drive farmers and land speculators away. In the few cases where soils, climate, and market forces are favorable for permanent agriculture, the boom of resource extraction is followed by agro-industrial expansion; forest destruction is followed by the widespread use of agro-toxins, soil erosion, and nutrient loading of ground water, streams, and rivers.

Frontier expansion has already swept across much of Asia and Europe, the contiguous 48 states of the U.S., meso-america, southern South America, and the rainforests of western Africa. It is just beginning in the Boreal forests of Eurasia and North America, and the tropical rainforests of the Amazon Basin, the Congo, and Papua New Guinea. Two thirds of the world's remaining "frontier forests" - large blocks of intact forest - are found in Russia, Canada, and Brazil (Figure 2). The great losses of forests today are in the tropics, where annual clear-cutting of 15 million hectares of rainforests releases an average of nearly two billion tons of carbon to the atmosphere - one fourth of the net 7.8 billion tons of carbon released by humanity worldwide, mostly from combustion of fossil fuels[1].

Figure 2

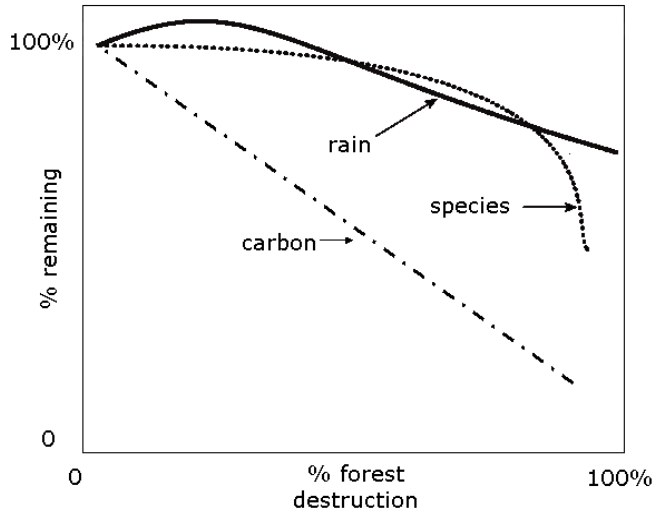


Percentage of the world's "frontier forests"[2] by nation. Two thirds of the world frontier forests are found in Russia, Canada, and Brazil.

Forest loss: what's the fuss?

Deforestation contributes one fourth of the world population's emissions of carbon to the atmosphere, it promotes local and regional changes in rainfall, and it drives species to extinction. Deforestation often increases flooding by rivers and streams, and reduces water quality through sedimentation and nutrient loading of streams and groundwater[3,4]. These ecological effects of forest destruction appear at different rates during the process of frontier expansion. The carbon loss associated with deforestation is a more or less linear response to the area cleared. Local rainfall, on the other hand, can be enhanced during the initial stages of forest clearing, then inhibited as clearings expand in size, as demonstrated in the Amazon Basin[5]. The number of plant and animal species contained in a forested landscapes declines precipitously only as forest clear-cutting surpasses 70 or 80% (Figure 3). By focusing on species conservation in the world's remaining blocks of forest, we run the risk of developing conservation strategies that are simply not ambitious enough.

Figure 3



The decline of carbon stocks, rainfall, and native species richness in forested landscapes as a function of forest loss.

Forest contributions to greenhouse emissions are, themselves, highly vulnerable to climate change. During the severe drought of the 1997/98 El Niño episode, an estimated 0.8 to 2.6 billion tons of carbon - 13 to 40% of global emissions from fossil fuel combustion - were released to the atmosphere through peatland forest fires in Indonesia alone[6]. By contrast, the Kyoto Protocol, if implemented, will achieve a mere 0.5 billion ton reduction per year in carbon emissions. An important challenge of forest conservation is to keep most of the 220 billion tons of carbon contained in tropical rainforests from escaping to the atmosphere through burning or decomposition.

II. The Causes of Forest Destruction

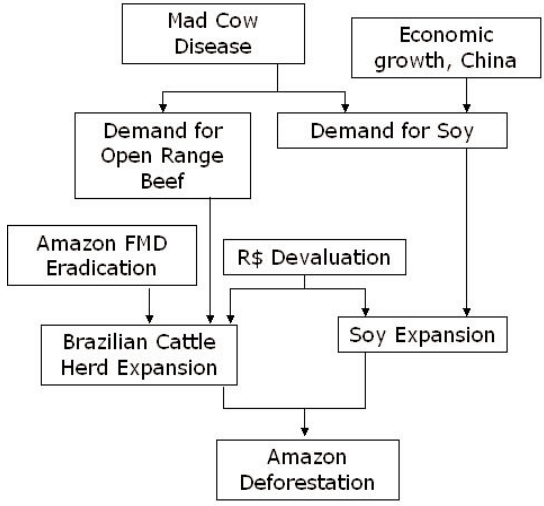
a. Economic teleconnections

The primary driver of frontier expansion in the world forests today is the search for economic wealth. Recent trends in the Brazilian Amazon are perhaps the best example of the global economic "teleconnections" that now link far flung places in the planet

with unexpected outcomes for the process of tropical forest destruction (Figure 4). For many years, the causes of deforestation in the Brazilian Amazon could be traced to federal government policies designed to integrate the region with the rest of Brazil - through road construction and agricultural settlement schemes - and to defend it from incursions by outsiders[7]. These policies moved forward despite the perception that the agricultural potential of the Amazon was considered to be quite low because of acid-infertile soils, and excessive rainfall[8]. Amazon beef production during the 80s and 90s was excluded from markets outside of the Amazon by the occurrence of foot-and-mouth disease. Mechanized grain production was trivial in the Amazon during the 80s because of technological barriers, such as the lack of appropriate varieties of grains for the hot, wet conditions of the region, and because of inadequate infrastructure for storing and transporting grain.

Several independent events and trends in recent years have now shifted the drivers of Amazon deforestation from Brazil's domestic economy and policies to the international market (Figure 4). From

Figure 4



"Economic teleconnections" of Amazon deforestation.

the supply side, most of the region's primary cattle production regions have eradicated foot-and-mouth disease[9], winning access to beef markets in southern Brazil, where production costs are higher[10]. The southern Amazon cattle industry has also modernized; some Amazon slaughterhouses are now closing deals directly with European beef importers and with markets in southern Brazil. Trade liberalization treaties currently under negotiation could greatly stimulate Amazon beef exports to both Europe and the U.S.[11] by lowering import tariffs.

Meanwhile, investments in new soybean varieties have surmounted some of the barriers presented by the Amazon climate, although new diseases have appeared. Soy companies have built storage and port facilities[12]. Soy export via ports along the main channel of the Amazon River began in 2002, lowering transportation costs, and will increase further as all-weather roads are paved into the core of the region, connecting the soy-producing regions in southeastern Amazonia with these ports[13].

On the demand side, the outbreak of mad cow disease in Great Britain, Canada, and the U.S. has triggered an international beef shortage and a growing demand for open range, grass-fed cattle such as those produced in the Amazon. Abundant, cheap land, cheap labor, and improvements in agricultural technologies pushed Brazil to the top of the world's beef exporting nations in 2003, displacing Australia[14]. From 1999 through 2002, Brazil's cattle herd expanded 15% (from 161 to 185 million head); 75% of this increase took place in the southeastern Amazon region, where the herd has expanded 9% annually[15].

Worldwide demand for soybeans has also increased following the mad cow disease outbreaks as cattle carcasses were prohibited as a source of protein in cattle rations. The Chinese economy, which has grown 9% per year since 1999, has also bolstered international demand for soy oil and meal as a growing middle class consumes more soy-fed pork and chicken[16]. In 2003, China imported 21 million tons of soybeans, 10% of world production and 83% more than it imported in 2003. Brazil was its main source of soy[17]. These trends

have been exacerbated by the devaluation of the Brazilian currency, the "Real", which has undergone a 2.7-fold devaluation since 1997.

These economic teleconnections have greatly increased deforestation in the Brazilian Amazon. In 2002 and 2003, 23,000 and 24,000 km^2 of forest were cleared, more than 30% higher than in 2001[15]. Cattle ranching is the primary driver of deforestation, with an 11% growth in the Amazon cattle herd in 2002. The soy industry is just beginning to explode, but the potential is high for expansion into the Amazon. The Foreign Agriculture Service of the U.S. estimates a potential area of expansion in Brazil of approximately 1.5 million km^2, equal to the entire cultivated cropland area of the U.S. Approximately one third of this area is located in the Amazon.

Similar economic teleconnections are driving forest destruction in other regions. China's hunger for timber is the major force pushing logging in Russia[18]. In Indonesian Borneo, global demands for edible oil and structural readjustments imposed by the international finance community are driving industrial timber concessions deep into protected areas as timber concessions are converted to oil palm plantations[19].

b. Vicious cycles of forest destruction

Vicious cycles between land use, fire and drought are another major new cause of forest destruction. Logging increases forest susceptibility to fire, while swidden agriculture and cattle ranching provide abundant sources of ignition. Extensive forest fires are the result. In tropical regions, the smoke from forest fire inhibits the rain-forming processes of cumulus clouds, leading to more drought and more fire[20]. Forest conversion to pastures and croplands can also inhibit rainfall, favoring fire[21]. Land managers become caught in this vicious cycle, and are reluctant to invest in forest management for timber production or other tree-based production systems for fear of losing their investments to accidental fire. Instead, these land managers continue their extensive land uses, high-grading timber and expanding their holdings of fire-dependent cattle pastures[22]. This vicious cycle of forest impoverishment will only grow worse as global warming elevates evaporation rates, or as El Niño Southern

Oscillation (ENSO) episodes become more frequent and more severe.

It is impossible to measure the full extent of forest impoverishment caused by these vicious cycles, but a few studies provide a sense of the magnitude of the losses. During the 1998 ENSO episode, approximately 40,000 km^2 of Amazon forest caught fire[23]. One third of Amazon forests (1.5 million km^2) were so dry that they could have caught fire if exposed to ignition sources. An even larger area of rainforest burned in Indonesia during this year through drought and logging[24,25], while 130,000 km^2 of boreal forest burned in the Russian far east[26].

III. Getting to Forest Governance

Against the very powerful forces that are transforming the world's forests into cropfields, pastures, and scrub, the conservation community is struggling to provide an equally powerful strategy for protecting forests. Unlike the very successful global effort to curb stratospheric ozone depletion, in which a clear cause was identified and a rather simple solution implemented[27], global efforts to govern forests have encountered many barriers. As summarized by the Report of the World Commission on Forests and Sustainable Development[4], the difficulty of advancing solutions to world forest loss in scale to the problem have been frustrated by the great diversity of forests and forest ownership systems, concerns about national sovereignty, inadequate pricing of forest products and services, and frail institutional capacity to implement environmental legislation. It is clear that a global forest conservation strategy will require new approaches and a much greater financial and political commitment if it is to succeed.

An effective forest policy will foster governance capacity early in the process of frontier expansion, allowing societies to avoid the clearing of forested landscapes for agricultural uses that are inappropriate, and short-lived (Figure 1). This policy will protect the role of forests in maintaining watershed functions, in storing and

regulating the flow of greenhouse gases, in stabilizing regional climate systems, in supplying food and fiber, and in sustaining populations of forest-dependent indigenous groups and forest-margin farmers. Important components of a global forest strategy are briefly described here.

a. Beyond parks

The suggestion that it is possible to conserve most biodiversity by protecting a tiny portion (1.4%) of the Earth's land surface in "hotspots"[28] provides a dangerously misleading message to policymakers and donors. The hotspot strategy assumes that the survival of plant and animal species (including humans) worldwide could be achieved with the preservation of tiny pieces of real estate. Terrestrial parks and reserves are critical components of a global conservation strategy, but they are designed chiefly with the conservation of large terrestrial animals in mind. Rarely do parks protect the headwaters of watersheds, which are critical for the conservation of aquatic resources. Since they severely restrict economic activities, parks rarely conserve more than 5% of a nation's native forests, and therefore have little effect on greenhouse gas emissions or regional climate systems. The goal of forest conservation is no less than the protection and restoration of ecologically healthy forested landscapes everywhere. It is only with a goal of this scope that we can hope to conserve even a fraction of the goods and services provided by forested ecosystems.

b. Reforming the industries that are driving forest destruction

Large-scale forest conservation will require intervention in the way that forest-destroying industries do business. Free enterprise must be punished for destroying forests and rewarded for protecting them, a circumstance that has rarely been achieved in the world. The most important tools available to achieve this goal are: (a) command and control enforcement of ambitious environmental legislation and (b) market-based instruments to reward industries that invest in environmental protection. Either of these tools in isolation is ineffective. Examples abound of industries ignoring well-intended environmental policies, as described recently for Indonesia[29], while the certification of timber has fallen far short of its potential,

particularly in tropical regions. (After 14 years of effort, only 0.5 % of the timber produced in the Amazon is certified - only six of more than 2000 timber companies.) But command and control approaches combined with market-based rewards may hold great potential to promote large-scale forest conservation.

c. Environmental enforcement

The political and economic viability of command and control enforcement of ambitious environmental legislation is undermined by the high costs paid by producers (in lost production) to defend ecological benefits, many of which are perceived as accruing primarily to society as a whole. This line of reasoning is particularly relevant to the conservation of biodiversity and carbon stocks in forests, which are often viewed as concerns primarily of rich developed nations. And it is this line of reasoning that often restricts the expansion of parks and other protected areas to no more than 5% of a nation's territory. Clearly, environmental enforcement must be coupled with economic rewards and an expanded political constituency pushing for natural resource conservation, as described below.

Important experiments in environmental enforcement in expanding forest frontier regions demonstrate the potential of command and control approaches to conserve forests. In the Brazilian Amazon state of Mato Grosso, where 18,000 km^2 of forest and savanna were converted to pasture and soy fields in 2003, the state environmental agency has established a satellite-based system of deforestation licensing that holds great promise[30]. "FEMA" (Fundação Estadual de Meio Ambiente de Mato Grosso) confers licenses only after property holders have demonstrated that they are in compliance with legislation that requires 50 to 80% of each holding to remain in forest, and that requires protection or restoration of gallery forests along streams and rivers. If satellite-based maps of 8 million hectares of licensed properties are put on the web over the next few months, opening the door to public scrutiny, the Mato Grosso government could increase the transparency and legitimacy of its environmental law enforcement. This system comes at a high economic and political cost, however, and will fail in the long run unless land holders - and the government - are rewarded for their compliance.

d. Rewarding forest conservation

The success of timber certification in reforming the timber industry has been disappointing. Relatively few industries (especially in the tropics) have decided to adopt sound forest management practices in order to gain a somewhat larger market share, or somewhat higher timber price (depending upon the rather fickle preferences of consumers), through environmental certification systems. One of the barriers to a broader adoption of certification is illegality. As long as most of a timber industry is lowering its operating costs by fraudulently avoiding costly forest regulations, environmental certification and compliance means lower profits.

The Amazon soy industry demonstrates the potential for greatly increasing the power of market-based instruments to reform forest-destroying industries. In the case of soybeans, some Swedish soybean buyers recently declared that they would no longer purchase Amazon soybeans without environmental certification. In the meantime, an International Finance Corporation loan to the Mato Grosso soy sector (Grupo Maggi) carried requirements of environmental compliance on 400 soy farms receiving financing from this loan. Soy producers, including the world's largest individual producer, Blairo Maggi (who is also the governor of Mato Grosso), are increasingly aware that their access to world markets may depend upon environmental certification of their production. The industry's shift to sound land management practices is reinforced by the state's deforestation licensing system. Unlike the Amazon timber industry, in which certified companies compete with more lucrative illegal companies for an uncertain market advantage, environmental certification of Mato Grosso soy farms could come to represent the economic incentive that is needed for Mato Grosso government to fully implement its state-of-the-art environmental enforcement program, forcing the entire industry to implement forest conservation practices on private holdings. A similar proposal is under development for the Mato Grosso cattle industry.

e. Expanding environmental constituencies

The long-term viability of large-scale conservation will depend upon an expanded and consolidated environmental constituency. Ambitious environmental legislation and compliance by rent-driven industries will depend upon vigorous and broad-based political support and watchdog activities by organized civil society. Indigenous groups, folk societies (e.g. rubber tappers in the Amazon), smallholders, human rights and hunger movements, and industries that have invested in environmental compliance, could be united by their common interest in policies that foster the sound management of forested landscapes. One of the strongest forces behind regional forest conservation and development planning along the Transamazon highway is the 30,000-member "Movimento Pelo Desenvolvimento da Transamazonica e Xingu" (MDTX - Movement for the Development of the Transamazon Highway and Xingu). This union of smallholder farmers was once identified as the villain of forest destruction, but has now emerged as an important movement in the fight against land speculation-driven deforestation and rural conflict. An expanded environmental constituency will be possible within a vision of forest conservation that emphasizes local benefits (such as water quality, local climate regulation, and forest products) and that pro-actively engages traditional "enemies" of conservation (ranchers, loggers, smallholders). It is in the context of broad local benefits of forest conservation that parks to protect pristine wilderness areas can find greater support. The MDTX is the major proponent of a 7-million hectare protected area mosaic that is in the midst of the expanding forest frontier of eastern Amazonia.

f. Equitable solutions

The risk of excluding and impoverishing economically marginalized rural populations from the benefits of forest governance are high. Smallholders, indigenous groups, and folk societies often lack the economies of scale, the product quality, and the experience with commercial enterprise to effectively engage in market-based approaches, for example. Moreover, these populations often have a history of conflict with powerful regional elites within the dominant agricultural and forest industries, making them reluctant to trust or

collaborate with these industries. An important trend in community-based forest management, for example, has been the exclusion of the timber industry through the vertical integration of timber production by communities with insufficient experience/expertise to succeed in running timber companies. As a result, Latin America is strewn with failed community forestry operations. But industry-community partnerships in the Amazon[31] and elsewhere demonstrate the tremendous potential for forest based communities to improve their livelihoods through forest management systems. Here, too, the MDTX of the Amazon has led the drive to develop an ambitious program of internationally-supported payments for on-farm forest conservation and restoration that has now been adopted as Brazil's national "family agriculture" program. Strong social movements can dramatically reduce the transaction costs of linking populations of smallholders, indigenous groups, and other rural poor with emerging markets for carbon and other forest goods and services.

Equity must also be sought at the international level. The risk of imposing environmental certification as the only means by which Amazon soybeans and beef can enter world markets, for example, is that it gives an unfair advantage to non-tropical producers, who are already the beneficiaries of generous subsidy programs. "Developed" nations must take a leadership role in improving forest conservation by their agricultural and forestry industries as they finance innovative new approaches to forest governance in developing nations and emerging economies.

Conclusions

These steps towards forest governance will require, simultaneously, substantial financial leadership by rich nations and considerable progress in the transition to strong democratic governments in places like the Congo, Indonesia, and Russia. But what is more easily reached - and potentially more important - is a broader vision of forest conservation that moves beyond species extinction to embrace the full range of benefits that flow from well-managed forested landscapes.

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