

What Roles Can International Law and Institutions Play in Restoring World Forests?

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The papers at this conference are part of an effort to develop a plausible and attractive “vision” for the world’s forest estate in 2050. Our working hypothesis is that intensification of production will make it possible to supply future needs for wood products (about 2.5 billion m³ per year in 2050) by harvesting on 20% or less of forest lands. The remaining 80% can be left for watershed protection, preservation of biodiversity, traditional sustainable uses by indigenous peoples, and other natural purposes.

This paper explores what role international law and institutions can play in securing the 80/20 vision. It examines the lessons learned from other areas of international cooperation, especially environmental protection and trade, and applies them to the forest situation. I make three arguments. First, international legal instruments do not regulate from the top-down; rather, they create frameworks in which stakeholders (firms, public interest NGOs, governments, scientists) can explore possibilities, stabilize expectations, and focus pressure on governments. Those instruments will be most effective if they include significant, long-term targets; however, governments do not know exactly what they can achieve nor the cost of meeting those goals, which will make them reluctant to adopt binding treaties. A nonbinding approach would be more effective. Second, I offer a set of specific targets and a critique of their pluses and minuses. Third, I argue that nonbinding targets will be most effective if they are combined with institutions that can supply data on the world forest situation, analyze whether countries individually and collectively are on track to meet the 80/20 vision, and spawn specific detailed regulatory agreements if needed. Nearly all of the needed institutional capacity exists already, and I suggest specific tasks that could be initiated along with the adoption of long-term targets.

I. WHAT WORKS ?

I begin by exploring the factors that have explained success in other areas of *international cooperation*. I focus on *international* cooperation because the 20/80 “vision” outlined in this project can’t be achieved unless essentially every major forested nation does its part. A few holdouts on the scale of Russia (18% of world forests), Canada (13%) or Brazil (11%) will make the task difficult or impossible for the rest. And I focus on *cooperation* because it is hardly assured that the 80/20 vision will occur automatically. Already temperate and boreal forests are rebounding (Kauppi et al., 2000), but not in the tropics (Skole and Tucker, 1993; van Kooten et al., 1999). Already production of pulp, paper and timber is shifting to high yield areas, but that has not eliminated pressures on natural forests (Bull, 2000; Bazett, 2000).

I begin my analysis with governments. They are not the only actors in the international system, but they play the central role. Governments negotiate and sign nearly all the major agreements of international politics; without governmental ratification, treaties do not enter into force. As the argument unfolds I will add the other

actors—NGOs, firms, entrepreneurs, and scientists who affect how “governments” think about their interests.

Nearly every effort at international cooperation includes two elements: (1) *negotiated agreements*, such as treaties, that codify collective goals and specific commitments for each nation, and (2) *institutions* that provide a framework for negotiating additional agreements, comparing data, coordinating research, and handling cases when countries fail to meet their commitments.

Historical research has uncovered literally thousands of factors that dictate when and why international agreements and institutions are effective (Haas et al., 1993; Young, 1994; Levy et al., 1995; Victor et al., 1998; Bodansky, 1999). Three factors are most important and should govern the effort to design agreements and institutions that can help the world achieve the 80/20 vision.

1. Interests: Do Governments want to protect forests?

Because governments hold the reins of power, international agreements and institutions are often weak and tentative. They are agents that sway in the winds of powerful states’ interests, with little personality of their own. They rule not by imposing standards and regulations from above; rather, agreements and institutions are means by which national governments coordinate actions that they agree make sense to pursue. Thus the starting point for any analysis of international cooperation must be the answer to the fundamental question: Do governments want to preserve and protect forests?

All governments are becoming aware that forests provide important goods such as safe water supplies and unique cultural sites. Viewed narrowly, however, these instrumental goods affect only a small fraction of the world’s forests—nearly every government has protected at least some forest area, but the total is only about 8% of world forests. Will they want to devote resources to protect ten times that amount? The answer depends on wealth and values.

In every area of international environmental law, the most wealthy and democratic nations have undertaken the strictest and most costly obligations (Raustiala and Victor, 1998). Wealth enables countries to pay the cost of environmental protection. But democracy—more accurately, what scholars call “liberalism”—has been the most important factor. Governments in democratic countries are exposed to public pressure and are more likely to have organized and effective public interest groups. Open nations are exposed to ideas from abroad, including the idea that forests intrinsically deserve protection. Liberal countries are distinguished by independent judiciaries and legal protections for minority groups, which probably helps to assure that forest protection laws are enforced and that indigenous peoples who live in forests are protected.

Do trends in wealth and liberalism bode well for forests? Table 1 summarizes some indicators for the last two decades in the 20 most forested nations that account for

78% of the world's total forested area. Wealth (GDP) has risen dramatically in each nation—an auspicious sign. However, liberalism—which I measure (albeit highly imperfectly) with the Freedom House index of “political rights”—has no clear trend. Dramatic improvements in political rights in Bolivia and the Central African Republic indicate the potential for turnaround in other countries over the long time-scale of our vision, but the slide in other nations is sobering.

Thus the broader economic and social trends may not, on their own, assure pressure to protect forests. If so, nations that care about broad forest protection have three options. One is coercion, such as trade sanctions against countries that don't protect forests. In a few other areas of international environmental law—such as the U.S. threat of sanctions in the 1980s against Iceland and Japan for their refusal to stop commercial whaling—sanctions have been decisive in getting governments to view their interests differently (Charnovitz, 1994; Friedheim, 1996; Andresen, 1998). In most cases, though, sanctions are not an option because they require many nations to present a unified front, often run afoul of free trade rules, and typically are easy to evade (Hufbauer et al., 1990; Martin, 1992). A milder form of coercion—market coercion through schemes such as certification and labeling—is more powerful but has limited leverage, which is a point I will return to later.

Second, countries that care about forests could compensate (bribe) countries that care less. Such schemes have been used with success in a few areas of international environmental law when it has been necessary to get reluctant countries to participate in a collective effort—the best example is the multilateral fund of the Montreal Protocol, which is distributing about one billion dollars to developing countries to compensate them for the “agreed incremental costs” of phasing out ozone-depleting substances. However, such schemes are extremely difficult to design when it is difficult to measure and value the compensation, which is the situation in forests—how much is a forest worth? Nonetheless, there has been some broad-based compensation through schemes such as public and private “debt-for-nature” swaps. Moreover, compensation schemes are emerging for particular goods that are correlated with the presence of sustainable forests, such as bioprospecting or storage of carbon. So far, however, bioprospecting has delivered only small sums of money for small areas of forests and is unlikely to be a major source of compensation for forest protection. Industrial biology is moving in a different direction—towards identifying specific traits and genetic precursors, rather than the blind assay of raw materials that has characterized bioprospecting. For carbon, there remain severe problems in designing the appropriate incentives and monitoring net carbon fluxes from forest stands (e.g., see Jonas et al., 1999). Estimates of carbon sequestration potential under realistic economic assumptions may be excessively bullish (Smith et al., 1999; Boscolo and Buongiorno, 1997); in principle, however, putting a price on carbon and letting parties gain credit for carbon in forests could dramatically alter the incentives that govern how forests are managed.

Third, countries' interests could change if it were simply uneconomic and uninteresting to threaten forests. That, fundamentally, is the hope of the 80/20 vision—that progress in wood production and agriculture will lower the value of untouched

forests and make it easier for all the other forest protection strategies—legal protection, coercion, compensation—to work more effectively. The closer that a country's own interests correspond with what is happening anyway, the easier it is to forge an international agreement that can help lock positive trends into place.

2. *Can Governments Agree?*

Because international agreements do not operate as top-down instruments for regulating behavior, cooperation depends on the ability of governments to agree on goals and specific commitments. In cases where nations have been able to agree, international institutions have been a forum for negotiating a contract, which is often codified as a *legally binding agreement*, also known as a treaty. International lawyers call treaties “binding” because they are negotiated by governments but then resubmitted to those same governments for legislative ratification. In some countries, such as the United States, the process of ratification is controlled by an arm of government (the Senate) that is separate from the one that negotiated the treaty (the President); in other countries, especially parliamentary systems, legislative ratification is an easier process because the same coalition that negotiates the treaty also usually commands a legislative majority. Regardless, the double review of negotiation and formal ratification nearly always assures that a country is committed to the outcome. Indeed, measured compliance with legally binding agreements has been extremely high because few governments enter into formal contracts unless they are sure they can honor their commitments (Downs et al., 1996; Victor, 2000). The few cases of noncompliance are usually not willful but, rather, the result of changed circumstances, bureaucratic bungling or low administrative capacity to implement commitments (Chayes & Chayes, 1995).

Contracting is not possible when governments can't agree on goals and commitments. In some cases, agreement is not possible because there is simply no agreement possible in which each government feels it benefits—or at least is no worse off—than without an agreement. More often are cases where contracting is difficult because governments do not know their interests—they do not know the scope of the problem, the best solutions or the cost of addressing the problem. In these cases, international institutions have been effective when they serve as a forum for exploring options and trying different policy experiments. Examples include the effort to limit pollution in the North Sea (Skjærseth, 1998). From the early 1970s to the mid-1980s, North Sea riparian governments were under mild pressure to clean up the mess in the Sea, but they achieved little because their only attempts at collective action were focused on negotiating binding treaties. Since not all countries could agree, the binding treaties they adopted were merely the lowest common denominator. Starting the middle 1980s public pressure grew, and some governments—Denmark, Germany, The Netherlands, Norway, and (eventually) the United Kingdom—sought to do a better job. But they still could not agree on exactly what should be done because the state of the North Sea was known only poorly; information linking particular pollution sources to particular consequences was even less complete. The most difficult source of pollution to control—nutrient pollution

that flowed from land-based sources such as farmers' fields—was the least well understood.

Their response was to set ambitious, simple targets for cutting pollution—a 50% cut in nutrients pollution, a 70% cut in heavy metal discharges, and a complete ban on dumping in the North sea. Ministers from the key governments codified the targets into nonbinding agreements because no government could be sure that it could meet those ambitious targets although all agreed that it made sense to make an attempt. Thus along with the targets the ministers also agreed to review progress that countries made with specific *actions* and *policies* every 2-3 years and to initiate research focused on assessing the state of the North Sea and pollution sources. Governments held the review meetings at high ministerial level to ensure that ministers themselves were accountable for the output and so that lessons learned from the reviews could feed directly into adjustment of the political targets. Over time, the process of research and policy review made countries more confident of exactly what they could implement and which policies were most effective, and gradually they codified specific actions into legally binding agreements.

In essence, the nonbinding agreement provided a framework for ambitious planning and experimentation; institutions helped ensure that there was follow-up and learning; and legally binding agreements then locked into place what was achieved. Similar stories have been told in many other areas of international environmental law, including protection of the Baltic Sea, regulation of trade in hazardous chemicals and pesticides, and efforts to limit acid rain in Europe (Victor, 1997). In every case, ambitious targets were adopted and effective because the instrument chosen was nonbinding and institutions were created to follow-up on implementation.

3. *Are Governments in Control?*

Even if governments can articulate their interests and arrive at an agreement on their collective goals and individual commitments, they still must worry about whether they can deliver on their promises. When governments have control over the activities that must change in order to comply with international commitments then they can make commitments that bind their own actions. Examples include strategic arms control agreements, which limited types and numbers of weapons. So long as the U.S. and the Soviet Union saw compliance in their interest, it was relatively easy for the governments to assure compliance because the funding and deployment of weapons systems was entirely within their control. Similarly, the 1947 General Agreement on Tariffs and Trade obliged governments to not to exceed maximum tariff levels; when governments saw the tariff bindings in their interest it was easy for them to comply because national governments themselves set border tariffs.

Often, however, governments are not in perfect control. One remedy has been to write international rules that target those activities that they do control. For example, the most effective international global agreement on protection of wildlife—the 1973 Convention on International Trade in Endangered Species (CITES)—limits only *trade* in

specimens from *known* endangered species and groups of species. The objective is to help address the problem of declining biodiversity, which would require that governments police the landscape and lighten threats to unique habitats. Most governments can't do that, so the treaty focuses on international trade which is easier to squeeze. Often these "choke point" strategies do not, by themselves, fully solve the problem because perfect choke points rarely exist. Thus governments also try to improve their administrative capacity to control the offending activities. Every major new multilateral agreement on the environment adopted in the last decade has included programs, funded by industrialized nations, to improve regulatory capacity in developing countries. The mission is a difficult one, however, because rarely is it possible to single out and strengthen just those aspects of a nation's regulatory system that pertain to a particular international issue; yet capacity-building programs have been easiest to design and most effective when they have been able to do exactly that.

Public interest groups, which are often the main motivating force for regulatory action, have not been oblivious to this implementation dilemma and have tried to circumvent the state entirely. One strategy has been to create supranational law that applies directly to people, regardless of the state. That effort has worked mainly in the area of human rights, where a set of universal rights now exists (e.g., freedom from torture), international tribunals hear cases of violations and a few people are actually convicted of violating others' human rights. That special case probably has no relevance for forests, unless trees get standing as independent entities under international law.

The other route for circumventing the state has wider application: direct consumer pressure to force firms to change behavior. Fear of boycotts and bad press has made firms much more sensitive to the conditions of workers in their factories and much more willing to adopt social agendas in countries where, previously, their interest was only in minimizing the cost of production (Vogel, 1995; Spar, 1998). Often these consumer pressures are difficult to mobilize and focus because consumers are decentralized and find it difficult to distinguish products according to the method of production. Standards and labeling can help, as it did in forcing essentially all tuna suppliers in the U.S. market to deliver "dolphin safe" products that were not caught using traditional (dolphin-ensnaring) net techniques. In forestry, certification schemes and labels are now emerging and could play a similar role. Three dozen countries have or are developing certification programs, in addition to the global Forest Stewardship Council (FSC) standards. Buyer groups for certified products—such as Britain's 95-Plus and the U.S.-based Certified Forest Products Council—are emerging and making it easier for their clients to obtain certified products. Nearly all forest products firms in nearly all advanced industrialized countries markets now view some form of certification as inevitable.

Some concerns have been raised about whether certification and labeling are compatible with the World Trade Organization (WTO), which bars countries from regulating imports according to the *process* by which they are produced. Certification is a process standard because—except for the label—certified wood is indistinguishable from non-certified wood products. However, the WTO already allows some use of process

standards and labeling schemes that are not dissimilar from certification. The 1998 “shrimp-turtle” decision (WTO, 1998) suggests that most plausible certification and labeling schemes—including FSC—will not encounter problems with WTO.¹

More important is that certification will probably have only limited impact on the *total* forest estate for three reasons. First, certification probably exerts leverage only in markets where consumers care strongly about the state of production forests—roughly, the advanced industrialized countries that are members of the OECD. At present those nations account for 59% of world consumption of industrial roundwood (FAO, 1999), and their share is expected to decline slowly and steadily (Zhu et al., 1998). Second, market pressure through labeling of certified wood products affects only production forests, which account for one-third of forests today and hopefully an even smaller share in the future. Third, certification remains a very limited enterprise. FSC (1999) reports that at the end of 1999 only 17 million hectares of forests were FSC certified, of which 11.7 million hectares were industrial forests (“plantation” or “semi-natural”). Some experts anticipate a twenty-fold increase in FSC certified areas over the next five years (*Trendlines*, vol 1., no. 1). However, consumers generally have been unwilling to pay a premium for certified wood products; nor is it clear that chain of custody tracking and labeling, which accompany many certification schemes, is worth the cost (Sedjo et al., 1998). Much if not all the benefit of certification might be achieved through the normal diffusion of industry best practices without the substantial extra cost of imposing the rigorous verification needed for chain of custody certification.

4. A Simple Framework

Figure 1 summarizes the discussion about the three major factors that influence the effectiveness of agreements and institutions—interests, ability to reach agreement, and control. Architects of international agreements and institutions are constrained by the interests of their governments, but they also face choices about the structures that they build. When their interests are known and governments are capable of implementing meaningful commitments then binding, ratified agreements often work best (upper left corner). In cases when parties are able to implement commitments but they don’t agree on objectives, side-payments (compensation, coercion) can shift interests and make agreement possible (upper-right corner). In cases where nations can agree on goals and commitments but are unable to implement them, they try to identify commitments that are easier to implement (lower-left corner). In essence, governments try to shift cooperation into the upper-left corner where they can apply the well-tested mode of international cooperation: a binding treaty.

Forests, like many environmental issues at the early stages of building international regulatory structures, are in the lower-right corner. Governments are unable to agree because they have no point of common interest and because the cost of meaningful agreements is uncertain. Even if agreement were possible it would be difficult for governments to put international commitments into practice because the

exact sources of the problem are poorly known or difficult to control. The situation is much as it was in the early 1980s in the North Sea.

The matrix helps explain why efforts to develop a binding “forest convention” have so far not been successful. The cost of systematic and concerted action to protect forests is unknown and perhaps very high; the benefits are uncertain and difficult to estimate and visualize. The cost of action could fall disproportionately—perhaps entirely—on the countries that own the forests. Only one-quarter of the world’s forests are in advanced liberal democracies—countries that are likely to be willing to pay for systemic forest protection.

Specific aspects of the forest problem might fall into other boxes, and for those the prospects for binding agreement are brighter. Examples include the carbon benefit of forests—a topic that resides in the upper-right corner. Firms, individuals and governments in industrialized countries that have an interest in protecting forests as carbon sinks can compensate forest holders to do the same. Regulating trade in illegally cut timber falls into the lower left corner—cooperation and capacity-building can help governments implement regulatory schemes that many already agree are in their interest. But the forests as a whole sit squarely in the lower right.

What can be done? Some elements of a nonbinding framework for addressing forests already exist in the UN, regional organizations, networks of public interest NGOs, and industry associations. Unlike a decade ago, there is today an active “forest dialogue.”

Much attention is focused on the UN’s Intergovernmental Forum on Forests (IFF, 1997-present) and Intergovernmental Panel on Forests (IPF, 1995-1997), which were created to follow-up the 1992 United Nations Conference on the Environment and Development (UNCED). These institutions have the strength of a multilateral intergovernmental and participatory setting. Unfortunately, they also have hobbling weaknesses. Among them is that the shadow of a possible future binding forest treaty looms over the IPF and IFF activities. Indeed, the U.N. General Assembly’s resolution creating the IFF explicitly states that IFF should “identify the possible elements of work toward consensus on international agreements and mechanisms, for example, a legally-binding instrument.” The IPF ended its work with prominent disagreement about whether to launch negotiations on a binding forest treaty. The consequence of the treaty shadow is that governments are cautious and wary—fearful of bold commitments with which they are not sure they can comply. Thus these frameworks are unable to follow the lesson from the North Sea experience and create an ambitious (but achievable) *long-term target*. Nor has the existing framework done much to build *institutions* that can assess collective goals for forest protection and scrutinize countries’ efforts to meet long-term goals.²

For the rest of this essay I explore these two critical missing elements—targets and institutions—and how they might be delivered.

2. SETTING TARGETS

The influence of international law works through decentralized political processes—in governments, regional organizations, pressure from public interest groups, and firms and industry associations that compare best practices with international norms. Simple central targets are vital to keeping the system moving, loosely, in the same direction. Pressure groups can use those targets in campaigns; governments can use them to orient policy decisions; firms can use them as benchmarks for planning. Simple and attractive visions diffuse rapidly through the system and get incorporated into the many local, regional and sector-specific activities. Complicated and contested goals, by contrast, are more difficult to diffuse.

Today there are no accepted long-term targets to orient what the forest dialogue is trying to achieve. There are some goals that apply to part of the forest estate, such as WRI's elegant proposal to ensure that there is no more clearing of "frontier forests" and the World Bank/WWF Alliance's short-term target of protecting an additional 200 million hectares by the year 2005. Our 80/20 vision suggests two types of long-term goals: (1) forested areas, and (2) yields from production forests and agriculture. Both are needed.

(1) Forested Areas

Because the fundamental goal of the 80/20 vision is protection, it tempting to think first about setting goals for protected areas—in essence, to extend the Alliance targets to a much larger area. There are two reasons why this may be very difficult.

First, nations are unlikely to accept the goal of protecting 80% of forests as an achievable goal because it is far beyond what they have already been willing to protect. Under the current system of designated protected areas (IUCN classes I to VI, summarized in table 2) there is a large gap between the area of forest lands that governments have been willing to designate as "protected" and those that are, de facto, protected. According to CIFOR and WCMC statistics shown in table 3, only 311 million hectares of open and closed forests (8% of world forest area) are formally protected (Iremonger et al., 1997). That amount is only a small fraction of the approximately 2.3 billion hectares of closed forest that is actually used for wood supply (Bull et al., 1998). It seems that governments are quite reluctant to declare forests as formally protected, even when there is no threat.

Perhaps, however, the 311 million hectares of protection is poised to expand as governments realize they can protect much more forest. Indeed, legal systems often follow and codify rather than lead trends. In a few countries, such as Chile, Indonesia and New Zealand, large fractions of the forest estate are already protected (26%, 21% and 43%, respectively). Are these countries poised to protect even more? Will other countries follow their lead?

To explore these questions, Figure 2 shows time series data for all protected areas for the 16 countries that are examined in the papers by Ausubel and Waggoner (2000) and Bull (2000). The data concern all protected lands, which are more readily available in detailed disaggregated form than are data for *forested* protected areas. The figure suggests that the concept of a “protected area” can be viewed like many other ideas and artifacts—it is a diffusion process. After creation of the first legally protected area (Yellowstone National Park in the United States 1872) the idea spread slowly. Nearby and like-minded governments followed suit more rapidly than distant and less developed nations and colonies. Canada created Banff and Glacier National Parks in 1885 and 1886, soon after America opened the era of protection. New Zealand and Sweden created their first protected areas 1888 and 1909, respectively. Others followed later: Mexico (1917), Brazil (1923) and Colombia (1948). China created its first protected area only in 1956.³

As the idea of protecting lands took hold, diffusion accelerated and nations set aside ever-larger tracts of land. Colonial Tanzania began creating the Selous game reserve in 1909 and the Serengeti National Park in 1929; both became the cores of denser and larger networks of protected ecosystems over time.

As the maximum potential for protected areas is reached, the pace of diffusion has slowed. Already the growth rate of protected areas in China, the United States and other countries has noticeably leveled. Countries with the highest degrees of protection—such as Tanzania (30%) and United States (22%)—generally show clearest signs of saturation.

Such slow-fast-slow diffusion processes, known as logistic growth, plot as S-shaped curves (Meyer et al., 1999). Figure 3 illustrates the phenomenon for just 6 of the countries; heavy lines show the actual accumulation of protected areas and the light lines show the logistic fit. Table 4 summarizes the statistical results for all 16 countries, showing the mid-point of the growth curve (the inflection point) and the time constant for growth, which is the number of years required for the total area of protection to grow from 10% to 90% of its saturation level.

As expected, the earliest creators of protected areas (United States, Canada) have the longest and slowest growth—blazing a trail is difficult and time-consuming. More recent entrants are much swifter as they can “catch up” quickly; China is the last in the 16-country sample to create a protected area, and its growth is the most rapid. A few countries demonstrate bi-logistic growth—a short pulse of activity that is embedded within the longer-term main pattern of growth. In the United States, for example, the Carter Administration doubled the size of protected areas, mainly by adding habitat and species management areas (IUCN category IV) over a brief period that ended when Ronald Reagan entered the White House. New Zealand had a short pulse of growth with three large early Class I and II protected areas—notably the Fiordland on the South Island, assembled from 1899 to 1904—and then resumed a slow and steady long-term growth. In Russia, the Bolsheviks created a limited number of protected areas from 1919 to the 1930s, and a separate pulse of growth in Russian protected areas began in the late

1950s; in the dormant period between, the government was added practically no new protected areas as it was busy with war, terror and industrial growth.

The basic insight from the logistical model is simple and sobering: after several decades of growth, the traditional strategy for protected areas is running out of steam. The results in table 4 suggest that the current patterns of growth will result in an average 40% increase in protected areas before they saturate. If the situation in forests is roughly proportional then today's 311 million hectares of protected forest might expand another 120 million hectares. In contrast, to achieve the 80/20 vision by targeting protected areas will require another 2 billion hectares. The traditional strategy for expanding protected areas is not on track to deliver the vision.

The other reason that an 80% target may not make sense is that it is completely a function of what is meant by "protected"—a debate that is already under way as people explore the practical implications of targets that already exist, such as the Alliance 200 million hectare goal and WWF's "Forests for Life" campaign goal of protecting 10% of representative forest ecosystems.

Indeed, Dudley and Phillips (2000) persuasively argue that IUCN's current definition of "protected area" must be expanded dramatically to include a wide array of new protection schemes for forests that have traditionally been excluded from legal protection, such as production forests. If we are doing that already, why stop at 80%? Rather, *the target for protection should be 100%*. At one extreme would be strictly protected areas (class I & II); at the other are intensively managed production forests, whose protection could be part of a product certification system. Politically, the 100% target would be easier to comprehend and would bring all forests into a single (albeit broad) framework. If such a broad scheme were adopted there may be a need to set sub-targets to ensure that some fraction of "protected" areas meet certain stricter standards; analysts should explore that option, but I doubt that it will be easy to develop such targets. As figure 4 shows, countries already have made very diverse use of the existing classification; adding more categories will result, probably, in even greater diversity.

It may be easier to set targets for the other side of the coin: production areas. A target of limiting production areas to 20% of forests would be useful for governments to assess whether they are collectively on track to achieve the vision.⁴ By itself, however, a production area target is not enough because production is not proportionally distributed in each nation's forests. Individual nations, firms and foresters need benchmarks to judge their own progress. We must add more targets to our system.

(2) Yields and Production Methods

What targets can leverage how foresters and farmers use the land? First I will focus on yields and then on sustainable production more generally.

The most important indicator is yields, which are a direct measure of success in the field and the single most important lever on land use. The current world average yield is 2 m³ per hectare per year. If production were concentrated to 640 million hectares (20% of today's closed forests) and demand is 2.5 billion m³ in 2050 then average yields must rise to 4 m³ per hectare per year—double the current level.⁵ Doubling over fifty years would require an easily achieved 1.4% annual improvement. Bazett (2000), Bull (2000) and Sedjo (1999) suggest that the potential for raising yields through intensively managed forests is enormous.

For agriculture it is not so easy to set simple yield targets because crops and conditions vary enormously and it is not meaningful to set an average even as a benchmark. Instead, an area target may be the most appropriate—namely, Ausubel and Waggoner (2000) suggestion that it is feasible to achieve no net encroachment onto forest lands by agriculture. If areas stay constant as mouths and incomes multiply, yields must rise.

In addition to yields, there may be a need for additional standards to govern how higher yields are achieved. Many observers have raised legitimate concerns about whether industrial forestry can deliver products without harming the environment and trampling on the rights of indigenous forest dwellers and other users of forest lands (e.g., Dudley et al., 1995; Carrere and Lohmann, 1996; Colchester, 2000). Those concerns multiply with our proposal that industrial forestry should account for a much larger fraction of world production and that management intensity should rise even higher than current levels.

Certification could be the best way to apply production standards. I have already argued that certification will have limited leverage on the forest estate as a whole, but it could play a critical role if part of a larger system of targets—outlined above—that address the other aspects of the forest estate. It is still too early to make any concrete statement about the influence of certification or whether it justifies the cost because it is unclear what standards will be adopted. However, it is plausible that FSC will emerge as the standard. If so, will FSC be compatible with the 80/20 vision?

In the main, the FSC principles are not incompatible, but there are three potential conflicts that require closer scrutiny. First, FSC standards may be applied in a way that disfavors clearcuts, which are most efficient and appropriate way to harvest even-aged forests, such as pine forests in the United States (Sedjo et al., 1998). How this works in practice is still unclear—at present, there are only three FSC-certified plantation-ready forests (certified as “plantation” or “semi-natural”) in the US, and they account for only 5131 hectares (0.3% of US FSC-certified lands). All other certified FSC lands in the U.S. are classified as “natural”. Second, FSC standards implore producers to “make every effort” to eliminate use of chemical pesticides in favor of biological control and pest prevention and eliminate fertilizers. Third, FSC also prohibits genetically modified organisms. Yet in many settings chemicals are essential to intense production, especially for species and locations where pests are a strong limiting factor on yields. To date, genetic modification has had no impact on yields, and there is much room for improving

yields without resorting to genetic modification. However, over the long term—which is relevant for our scenario—genetic modification could be very important. A norm against such techniques presumably will reduce investment in this avenue for sustainable high yield production. Genetic modification could help directly by improving qualities such as pest and drought resistance and nutrient uptake—making it easier to achieve other FSC norms. Genetic modification could also help indirectly—a genetically modified tree that reached sexual maturity at a young age could help accelerate the normal process of breeding. The first two conflicts are of immediate relevance; the third deserves closer scrutiny but it not essential to settle today.

More generally, there is a discernable discomfort with the notion of high yield forestry in the FSC principles and decision-making, evident by the addition of an extra principle (principle #10) to the core FSC principles to apply extra governance to plantation forests. Concerned, industry has created alternative certification systems, such as the U.S. industry’s Sustainable Forestry Initiative (SFI), which are more compatible with high-yield forestry but do not command the broader support of the FSC community. Most striking, however, is that industry standards and best practices are remarkably consistent with nearly all the principles that inform FSC and other certification systems. A concerted effort now—especially on the first two conflicts, which are of immediate relevance and less politically charged than genetic modification—could help ensure that certification is squarely compatible with the 80/20 vision. Indeed, the rhetoric in FSC’s principle #10 is exactly correct: “plantations...should complement the management of, reduce pressures on, and promote the restoration and conservation of natural forests.”

Table 5 summarizes the targets proposed above for areas and methods of production.

3. BUILDING INSTITUTIONS

Broad simple targets help to provide a compass for international cooperation, but by themselves they are unlikely to result in sustained efforts to ensure that targets are met. Scholars often imagine “pure” examples of international coordination in which the simple existence of a target or standard is enough to ensure that all parties change their behavior. Examples include civil aviation rules—such as the requirement that pilots use English for air traffic control communications and that aircraft approaching head-on deviate to the right—and codes for international telephone dialing. Often there are disputes over how to set the standards, but once standards are set all parties readily comply.

Forest protection, like most international environmental problems, is unlikely to have these characteristics for two reasons. First, it is hardly clear exactly which targets are most sensible nor the cost of achieving them. We are exploring the 80/20 vision as an attractive and achievable goal—a starting point. But the goal may need revision; sub-goals and milestones will be needed. Revisions and additional goals will not emerge out of thin air but must be proposed, analyzed, and debated. Moreover, that process of creating targets must occur at many levels—not only globally in setting the broadest

collective goals but also regionally, nationally and locally in setting goals that make sense for local circumstances. The “vision” is a broad, collective goal—a sketch with thick crayon, not a floorplan and wiring diagram.

Second, even if proper goals were agreed, not all parties would readily comply. Our studies suggest that the market might deliver the “vision” without any further intervention, but that outcome is hardly assured. Some producers will lose, especially those with sites that can’t compete with high-yield producers—they could work hard to scuttle the vision. Unsustainable clearing of natural forests may still supply world markets from countries where the public cares little about forests, governments are corrupt or immune to public interests, or administrators are incapable of regulating behavior in the forests. Losers may need compensation and coercion before they will change their behavior; capacity-building programs may be needed to help governments protect forests. Goals and legal instruments are needed to lock-in progress towards achieving the vision.

These two problems—the need for dialogue about goals, and the need for regulation to ensure that goals are met—are a constant tension in international law. Dialogue and norm-setting helps international law grow from the ground-up, so that eventually international norms are widely accepted and most parties tune their behavior to international standards. The more costly it is to change behavior, the longer and more uncertain the “bottom-up” process of international lawmaking becomes. Yet exactly in those situations where change is not automatic it is necessary for international law to play a tougher role—that of a regulatory system that can deliver compensation and coercion where needed.

The solution to both these problems lies in creating institutions so that international law does not consist merely of rules but also is a site for dialogue, revision, and regulation. Institutions can perform three functions: (1) to gather and assess data needed to analyze and adjust collective goals (“goal assessment”); (2) to gather and assess data on whether national governments are on track to deliver those goals (“performance assessment”); and (3) to develop and impose regulatory responses (“regulation”). In most areas of international cooperation, these institutional functions are not centralized nor are controlled completely by governments. Rather, they are performed by a wide array of public and private institutions that together form a system because people and ideas circulate.

What are the implications for forests? Table 6 summarizes the three functions and indicates activities that are already under way in each area. Much of the capacity to perform these functions is already in place, which bodes well for implementing the 80/20 vision. One factor typically found in successful international environmental regulation has been the existence of a nascent system of institutions that can be easily focused on the regulatory problem at hand. In the effort to protect the ozone layer, for example, existing scientific research capacity was quickly and easily applied to technical problems such as the development of indexes for ozone-depleting substances, identifying trends in ozone

depletion, and fingerprinting human responsibility for alarming trends such as the Antarctic ozone “hole.”

For forests, the critical missing element is a *mission* that would make this assemblage act as a *system*. Other experiences with the development of international law underscore why this is important. In the development of regulatory agreements on air pollution in Europe, a government-funded network of monitoring stations and research centers built extensive data sets on emissions, transport and deposition of pollution (the “EMEP” network). Although these activities yielded substantial analytical capacity, they had little impact on the international regulatory rules in Europe until governments had made the political decision (in the late 1980s) to base all future regulatory agreements on “critical loads.” “Critical loads” made ecological and economic sense because they are an indicator of the ability of sensitive ecosystems to withstand pollution. Using them as a guide for regulation would ensure that regulations were focused on protecting the most sensitive ecosystems rather than simply imposing across-the-board cuts in emissions, which could be both costly and ineffective. The “critical loads” concept gave the EMEP system a clear regulatory purpose that, in turn, helped to improve and focus its data collection and modeling efforts. It also helped to focus research and assessment that was formally outside the EMEP intergovernmental system. Indeed, the most influential application of the “critical loads” concept was by the modeling group at the International Institute for Applied Systems Analysis (IIASA), which used EMEP data and subroutines but was not funded or controlled in the EMEP network. The independence of the IIASA model gave it credence and directly influenced the emission targets that were adopted when the “critical loads” concept was actually applied in a regulatory treaty—the 1994 Sulfur Protocol (Hoordijk et al., 1999).

The message for forests is clear: targets are essential to focusing the work of institutions. In parallel with adopting targets, there are at least two specific tasks that institutions can be mobilized to perform initially. First, goal assessment is needed to explore the implications of early, tentative goals; the targets in the “vision” that we are proposing are incomplete. Ideally goal assessment should be decentralized because it is intended not only to examine whether the goals are plausible and attractive for forests as a whole but also to spawn a similar dialogue at the levels where forests are actually managed. Because of the large number of existing assessments—such as the World Commission on Forests and Sustainable Development, past and ongoing assessments by FAO, the World Bank’s extensive review of forest practices, and the new World Bank/UNEP Millenium Assessment as well as numerous non-governmental and national assessments—such a goal-oriented assessment should be relatively easy to initiate and build on existing data and analytical capacity. Goal assessment can help to identify needed sub-goals; for example, table 5 focuses on areas and yields, but it may also be vitally important to develop indicators for forest quality. Potential biomass may be one such indicator, and perhaps new satellites that can measure canopy height could be used, along with *in situ* data, to compile indicators of the quality of forest cover. When initiating a goal assessment, care is needed to avoid the existing models such as the Intergovernmental Panel on Climate Change and the Global Biodiversity Assessment.

Those efforts are important but are focused on different function—assessment of science and explicitly avoiding assessment of political goals.

Second, performance assessment is needed. Typically, performance assessment has been viewed mainly as a way to verify compliance; thus, most international performance assessment mechanisms have been created only after the adoption of specific regulatory targets, nearly all of which are legally binding. That perspective is inappropriate for forests. When nonbinding legal systems are created in order to promote learning and to build collective goals, performance assessment is vital in the beginning—as a vital precursor to possible later (binding) regulatory commitments. Indeed, governments will not adopt such commitments in the future unless they are confident that implementation is possible, especially if the commitments are binding. Performance assessment helps to build that confidence.

Two specific activities can help start performance assessment. One is to urge countries to undertake an “industrial ecology” analysis of their forest sectors—to quantify inputs, losses, efficiency, and outputs in both the growing of trees and the consumption of roundwood. Doing so will reveal the leverage points and the places where national practices are not consistent with best practices elsewhere. The result will be much easier learning about the practices that protect forests (and also often save resources and money) as well as specific information that will be needed to develop more meaningful goals. A model for this activity is the study by Wernick et al. (1997). Such studies are complicated and difficult to initiate; a small program in a select group of industrialized and developing countries could help lead the way. An initial group might consist of 12 countries: Australia, Bolivia, Brazil, Canada, China, India, Indonesia, Finland, Peru, Russia, Sweden and New Zealand. This group includes most of the major forested nations in major current and future markets; in most cases the industry is well-organized and could play a central role in industrial ecology analysis, which overlaps heavily with analysis that they should perform anyway as part of good firm management, and in most cases there are decent data sets that could be used initially so that new data systems would not need construction from scratch. In most of these countries, independent researchers can also contribute data and analysis.

The other performance assessment activity is to complement in-depth national studies with periodic international comparisons and review of whether countries are on track to deliver the “vision” and whether the vision is attractive and properly conceived. A useful precedent is the Trade Policy Review Mechanism (TPRM) of the World Trade Organization (Keesing, 1998). Created in 1989, the TPRM is *not* a system for evaluating compliance with WTO commitments but rather is a means to promote transparency and dialogue about how countries individually and collectively are contributing to the WTO’s goal of free trade. Reviews begin with a paper questionnaire and then a ten-day visit by WTO officials; the result is a report that is then used to structure a dialogue between the member “under review” and other WTO members. Major trading nations (Canada, European Union, Japan and United States) are reviewed every two years; others less frequently. Prior to the TPRM the only source of systematic information about trade barriers and practices worldwide was the a survey run and controlled by the U.S.

government; today, the TPRM has made useful information about trade practices, which in turn can inform the goals of the WTO, an abundant public good available to all and controlled by none. For forests, nothing so elaborate or frequent is needed now; but a review focused on policies and their impact on forests could vitally help countries set collective goals and focus activities on the areas where leverage is high and threats are greatest. The same 12 countries listed above could start the process.

The third function of institutions—creating regulatory commitments—can wait until the other functions are in place and there is better agreement on collective goals. Regulatory commitments have followed easily in all the cases where nonbinding agreements and institutions have functioned well. The most important hurdle was at the beginning—setting initial goals and seeding institutions.

CONCLUSION

I close briefly by underscoring six conclusions—three for policy and three for research.

For policy, first, it is critical to adopt some initial, plausible long-term goals. The experience with other areas of international environmental law strongly suggests that once goals are in place that other necessary instruments and institutions will follow. Moreover, clear, simple and attractive goals are critical to the process by which international law works—as a decentralized bottom-up process, rather than as a top-down regulatory system. Significant goals will imply significant changes to current practice, and governments will be wary to codify them in binding treaties; nonbinding agreements will work better.

Second, key governments, intergovernmental research organizations, and private analytical NGOs should launch a process to assess the adequacy and viability of those goals. Nearly all of the analytical capacity for goal assessment already exists, but so far it has not been marshaled for assessment of fundamental long-term goals. Because the number of institutions involved would be large, it is probably necessary for governments and key intergovernmental institutions to take the lead in this effort. If the effort is high profile and focused, other stakeholders will readily contribute.

Third, a select group of nations should initiate a process of policy assessment by studying the industrial ecology of their own forest industries and practices. The same nations that conduct such an assessment should complement their effort by volunteering for international review of the findings. The result will be a process of mutual self-assessment will increase learning about what can be achieved, which in turn can lead to more efficient best practices and international goals that can exert more leverage on governments and foresters.

For research, the first item is to develop better targets for the area and yields that are necessary for the vision. The targets discussed here—production limited to 20% of

forest area and average yields of 4 m³ per ha per year—are probably only useful at the macro level for checking general progress towards the vision. But individuals—not averages—implement forest practices. In particular, average targets may have little leverage on the most productive intensively managed forests, which can far exceed the average target and supply a large part of world demand for roundwood while occupying a small fraction of the area under production. Indeed, codifying blunt averages could do a disservice by setting standards that are much lower than can be achieved already. Perhaps the potentials outlined by Bull (2000) and Whiteman and Brown (1999) offer a starting point for more useful disaggregated targets. The more detailed aspects of this are outside the scope of this paper, but I highlight this need because it is critical to the central goals that might be adopted in a nonbinding legal instrument.

Second, more analytical and political work is needed to explore the compatibility of certification systems—as they are actually applied in the field—with high yield forestry. My impression from the standards is that there are several potential conflicts but broad compatibility. Are those conflicts severe, and what are the potentials for ironing them out before standards become more rigid?

Third, my perspective throughout this paper has been on the very long term: 2050. I have not addressed one of the chief weaknesses of international law: it is very poor at sending long-term signals because international norms depend on interests, which often change, and thus distant commitments are often discounted heavily. Further research to explore the viability of simple long-term targets should include an effort to develop shorter term interim milestones as well. For example, studies by Bull (2000) and Brown & Whiteman (1999) show how age class information can be used to estimate yields and supply from plantations. Using that approach it would be possible to develop indicators of the rates of change in plantings that would be necessary to deliver the vision by 2050. In practice, the target for 2050 might better be conceived as targets for 2025 (long rotation trees) and 2040 (short rotation). Not only would such an approach make biological sense; it would also have the political virtue of bringing targets closer to the present where they have greater political influence.

Notes

¹ The case concerned a U.S. policy that banned imports of shrimp from countries whose boats don't use devices that keep turtles from becoming entangled in shrimp nets. The WTO ruled against the U.S. policy. However, the ruling suggested that the U.S. law would have been acceptable if it had followed an earlier multilateral attempt to reduce threats to the turtle population multilaterally (WTO, 1999). That ruling suggests that certification and labeling should be part of a multilateral system and must be connected to bona fide environmental concerns; both of those standards are probably easy to meet and are already achieved by most existing certification systems. Purely national systems might encounter some problems, but if they are designed in the context of a multilateral effort—for example, as part of mutual recognition under FSC—then they should not encounter problems.

² I am mindful that there are some implementation efforts, such as the German-led six country initiative to put the IPF proposals for forest protection into practice at the national level. These are important but still limited activities. They are also examples of how compensation and capacity-building can play important roles—the initiative is heavily funded by Germany (GTZ), involves several developing countries, and has included an effort to build forest-related capacity for national action.

³ Dates are for the creation of protected areas that exist today; in some cases existing protected areas were consolidated from earlier areas and thus the actual date of “creation” is earlier.

⁴ The same logic would suggest that targets might be set for agriculture areas. That is technically feasible although perhaps not politically wise because the conventional wisdom that agriculture production (food for hungry people) is closely linked to agriculture areas is so strong that setting the goal of minimizing agriculture areas could undermine the political acceptability of the entire vision.

⁵ Slightly lower yield figures derive if “forest area” includes non-closed forests. Data in tables 1 & 2 use the broader definition of “forest.” Throughout this paper, where the narrower definition is used (which is more appropriate for discussion of industrial forests), I have used the term “closed forests”. Because of the difficulty of getting data on protected forest areas, I have used CIFOR & WCMC aggregated data in table 2. Those data suggest that total forest area was 4 billion hectares in 1996. FAO data for 1994, which are shown in table 1 and also employ a broad definition of forests, suggest a global forest area of 4.2 billion hectares.

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Captions for Figures and Tables

Table 1: The Forest Top 20. Forest area is from FAO (1999a), Land Use (Land cover) data series from the FAO *Production Yearbook*, series 141 (“Forests and Woodland”), which ends in 1995 due to problems defining areas. Income data are from World Bank (1999), series “GDP per capita, PPP (current international \$).” [must change data set to constant dollars]. “Political rights” are one indicator of liberalism of a country. Liberalism, which is difficult to measure, is the extent to which people have freedom of association and discussion, can pressure their governments to reflect their interests, and the extent to which rule of law (independent non-corrupt judiciary, constitutional protections, transparent laws) prevails. Data from Freedom House (1999), series “political rights.”

Table 2: The Present IUCN Classification System for Protected Areas. Source: <http://www.wcmc.org.uk/forest/data/cdrom2/parkmeta/annex1.htm>. (See also, Dudley and Phillips, 2000).

Table 3: Land Protection in 16 Countries. The countries are the super-set of those analyzed in the studies by Ausubel & Waggoner (2000) and Bull (2000). *Data on land protected areas* are aggregated from data on individual protected areas (date of creation, location, size, name & links to websites with descriptive detail) extracted from the impressive online database managed by the World Conservation Monitoring Centre and the IUCN World Commission on Protected Areas; see WCMC/WCPA (1999). Sea areas are excluded. Some data points for land areas have missing dates; I exclude those and assume that errors introduced from that are distributed randomly; however, that may lead to some under-statement in category V and VI areas, which are systematically affected by this problem. Nearly all U.S. category VI forests are missing dates; all Russian category III forests are without dates. Overall, the database provides very high (>90% of total protected area) plot-by-plot coverage for all countries, except for Congo (80%), Indonesia (89%), Russia (88%) and United States (62%). The full data set, cleaned and sorted with charts and tables for all 16 countries, is available in Excel format from the author. This data set is also used to generate table 4 and figures 2-4. *Data on forest protected areas* is aggregated and reported by Iremonger et al. (1997) using CIFOR and WCMC data sets. Their definition of “forests” is broad and includes sparse woodlands.

Table 4: Results from a logistic regression of data on the creation and size of protected areas. The regression is from “loglet lab” software reported in Meyer et al. (1999) and reported in detail at: <http://phe.rockefeller.edu/>.

Table 5: A system of targets for achieving the 80/20 vision.

Table 6: Functions for a system of institutions. Table summarizes three needs (see text) and illustrates current capacity.

Figure 1: Styles and Types of Effective International Cooperation.

Figure 2: The Accumulation of Protected Areas in 16 Countries. Data are for all protected areas; countries and data are the same as in table 3. Areas are normalized (1997 protected area=100%).

Figure 3: Logistic Growth in Protected Areas, 6 selected countries. Actual data (heavy lines) are from same data sources as table 3. Logistic fits (thin lines) are reported in table 4 using the Loglet Lab software (see caption to table 4).

Figure 4: Protected Area Designations, 6 selected countries. Chart shows that countries have made different use of protected areas. Some (e.g., Brazil, Indonesia) make extensive application of multiple use designations (Category V and VI). Others (e.g., China, Russia) focus nearly all protection in the most restrictive forms (Category I and II).

Table 1: Top 20 Forested Countries (78% of world total)

Country	Forest Area (K ha) (FAO, 1994)	GDP per capita (PPP)			Political Rights (Freedom House)		
		(1975)	(1997)	% change	(1975)	(1997/1998)	change
<i>lower income & less democratic:</i>							
Russia	765,912	..	4,280	NA	NA	4	NA
Brazil	555,000	2,080	6,350	305%	4	3	better (1)
Congo, Dem R	166,000	550	1,620	295%	5	7	worse (2)
China	130,496	240	3,130	1304%	7	7	same
Indonesia	111,774	480	3,490	727%	5	6	worse (1)
Peru	84,800	1,970	4,680	238%	6	5	better (1)
India	68,500	350	1,670	477%	2	2	same
Bolivia	58,000	..	2,880	NA	6	1	much better (5)
Colombia	53,000	1,810	6,810	376%	2	3	worse (1)
Argentina	50,900	3,710	10,300	278%	2	3	worse (1)
Mexico	48,700	2,680	8,370	312%	4	3	better (1)
Central African Republic	46,700	720	1,330	185%	7	3	much better (4)
Venezuela	44,500	4,200	8,860	211%	2	2	same
Papua N Guinea	42,000	NA	3	2	better (1)
Sudan	42,000	540	1,560	289%	6	7	worse (1)
Cameroon	35,900	690	1,890	274%	6	7	worse (1)
Tanzania	32,700	..	580	NA	6	5	better (1)
<i>highest income & most democratic:</i>							
Canada	453,300	6,600	22,480	341%	1	1	same
United States of America	295,990	8,020	29,010	362%	1	1	same
Australia	145,000	5,700	20,210	355%	1	1	same

Table 2: Today's System of Protected Areas

Category	IUCN Definition (and management objective)
Ia	Strict Nature Reserve (scientific research)
Ib	Wilderness Area (wilderness protection)
II	National Park (ecosystem protection and recreation)
III	Natural Monument (conservation of specific natural features)
IV	Habitat/Species Management Area (conservation through management intervention)
V	Protected Landscape/Seascape (area of distinct character, produced through interaction of people and nature, conserved for its unique characteristics and to allow recreational uses)
VI	Managed Resource Protected Area (protection combined with sustainable flow of natural products and services to meet community needs)

Table 3: Land Protection in 16 Countries

	All Lands (WCPA data set)			Forested Lands (IUCN data set and analysis)		
	Land area (mill ha)	1997 protected area (categories I - VI, mill ha)	% protected	1996 Forest area (mill ha)	1996 protected area (categories I - VI, mill ha)	% protected
Brazil	846	53	6%	441	23	5%
Cameroon	47	2	4%	29	2	6%
Canada	922	93	10%	548	40	7%
Chile	75	14	19%	15	4	26%
China	933	68	7%	110	4	4%
Colombia	104	9	9%	54	6	11%
Congo (Dem. R)	227	15	6%	144	9	6%
Finland	30	3	9%	25	2	6%
India	297	14	5%	57	5	9%
Indonesia	181	35	19%	91	19	21%
Mexico	191	18	10%	67	3	4%
New Zealand	27	6	23%	4	2	43%
Russia	1689	53	3%	826	15	2%
Sweden	41	4	9%	29	1	2%
Tanzania	88	26	30%	15	2	15%
United States	916	199	22%	298	30	10%
TOTAL (this data set):	6614	612	9%	2753	166	6%
WORLD (excl. Antarctica):	11100			3989	311	8%

Table 4: Logistic Growth of Protected Areas, 16 Countries

	First Protected Area (date)	Type of logistic (single/double)	Mid-point(s) (date)	Growth time(s) (years)	Saturation level (percent of 1997 level)
Brazil	1923	single	1989	51	161%
Cameroon	1932	single	1963	61	112%
Canada	1876	single	1995	105	202%
Chile	1907	single	1966	25	99%
China	1956	single	1988	11	108%
Colombia	1948	single	1989	42	156%
Congo (Dem. R)	1925	single	1970	72	123%
Finland	1938	double	1955, 1992	2, 15	138%
India	1925	single	1980	22	107%
Indonesia	1910	single	1997	93	176%
Mexico	1917	double	1934, 1994	19, 17	135%
New Zealand	1888	double	1905, 1990	7, 67	144%
Russia	1916	double	1931, 1991	10, 28	143%
Sweden	1909	double	1908, 1986	0.3, 37	130%
Tanzania	1922	single	1976	73	144%
United States	1872	double	1974, 1979	154, 2	118%
				weighted saturation level:	140%

Table 5: A System of Targets for the 80/20 vision

Target type	Today's value	Target for 2050	Purpose	Advantages	Disadvantages	Key political & technical hurdles to clear
“Protected” Forests	311 million hectares closed forest (8%)	3.2 billion hectares closed forest (100%); or, 4 billion hectares forest (100%)	Benchmark for governments	Simple	Broad; difficult for individual foresters and farmers to measure their progress; unachievable unless “protection” concept expanded	Broader definitions of “protected” areas needed
Production forests		640 million hectares closed forest (20%)	Benchmark for governments	Simple; focused on the objective: shrinking disturbed production areas	Broad; difficult for individual foresters to measure their progress	Must accommodate low-yield production from small landowners?
Agriculture lands	1500 million hectares	no net change	Benchmark for governments	simple; focused on a major possible threat to forests	Broad; perhaps politically difficult to adopt due to fears about food security	Is such a target meaningful in light of the wide variety of crops (food and non-food)?

Yields in production forests	2 m ³ per ha per year	4 m ³ per ha per year (double)	Benchmark for foresters and governments	simple; focused on the key leverage point	broad; may not exert much leverage on most industrial activities, which will (and should) far exceed the 4 m ³ per ha per year already.	Possible need to set separate targets for industrial and non-industrial production forests.
Production methods	Scattered; none	Certification?	Benchmark for foresters and consumers	Possible to apply detailed standards	Unclear whether formal application of standards is worth the cost, especially if linked to labeling and chain of custody; could be difficult to apply if markets do not demand it.	Ensuring compatibility between standards (e.g., FSC) and practices necessary for high yield forestry.

Table 6: Institutions for Forests: Functions and Needs

	Function		
	Goal Assessment	Performance Assessment	Proposal/development of Regulation
Activities under way	No long-term goals; therefore no goal assessment. However, tools and data sets developed for assessment of forests and markets could be readily applied to assessing the plausibility and adequacy of future goals, e.g.: Sedjo & Lyon (1995); IIED (1996); World Commission on Forests; FAO's SOFO and FRA reports.	At present, no assessment of specific global long-term goals because none exist. However, substantial capacity exists to analyze national policies and practices. Examples include in-country firms and policy assessments; private assessments done at the request of governments (e.g., Sizer, 1996); assessments by multilateral institutions as part of lending activities (e.g., World Bank); and other international assessments (e.g., FAO).	Numerous sites where this could occur (UN General Assembly; UN CSD; IFF; FAO); many committed national governments and NGOs that could propose and shepherd regulatory proposals.

Figure 1: Styles and Types of Effective International Cooperation

		<i>Can Governments Agree on Commitments?</i>	
		Yes	No
Do Governments have Control over Offending Behavior?	Yes	<p><i>Style of cooperation:</i> contract-making</p> <p><i>Type of Agreement:</i> Legally binding (treaty, convention)</p> <p><i>Type of Institutions:</i> monitoring & verification</p> <p><i>Example of Effective Agreement & Institutions:</i> General Agreement on Tariffs and Trade</p>	<p><i>Style of cooperation:</i> contract-making with side-payments and coercion</p> <p><i>Type of Agreement:</i> No agreement (if side payments and coercion fail) or Legally binding agreement</p> <p><i>Type of Institutions:</i> compensation, monitoring & verification</p> <p><i>Example of Effective Agreement & Institutions:</i> Montreal Protocol on Substances that Deplete the Ozone Layer</p>
	No	<p><i>Style of cooperation:</i> contract-making by identifying “choke points” and capacity-building activities</p> <p><i>Type of Agreement:</i> Legally binding agreement focused on “choke points” and funding for capacity-building</p> <p><i>Type of Institutions:</i> capacity-building programs, monitoring & verification</p> <p><i>Example of Effective Agreement & Institutions:</i> Convention on International Trade in Endangered Species (CITES)</p>	<p><i>Style of cooperation:</i> exploration, learning, confidence-building</p> <p><i>Type of Agreement:</i> Non-binding, focused on diverse actions and intensive review of experience</p> <p><i>Type of Institutions:</i> Research; assessment of policy impacts; monitoring; generation of detailed regulatory commitments as confidence increases</p> <p><i>Example of Effective Agreement & Institutions:</i> North Sea Ministerial Conference system</p>

Figure 2: The Accumulation of Protected Areas in 16 Countries

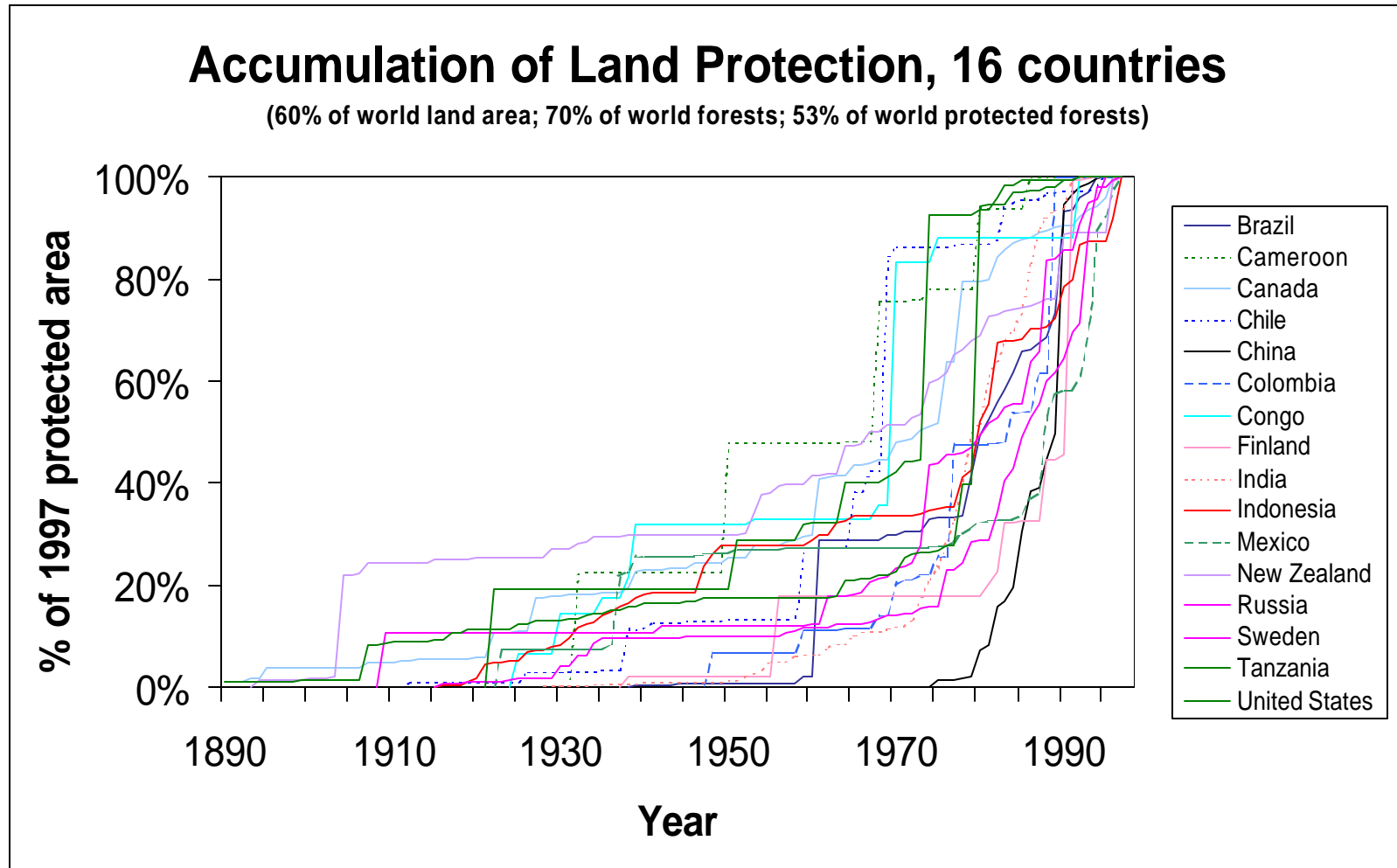


Figure 3: Logistic Growth in Protected Areas, 6 selected countries

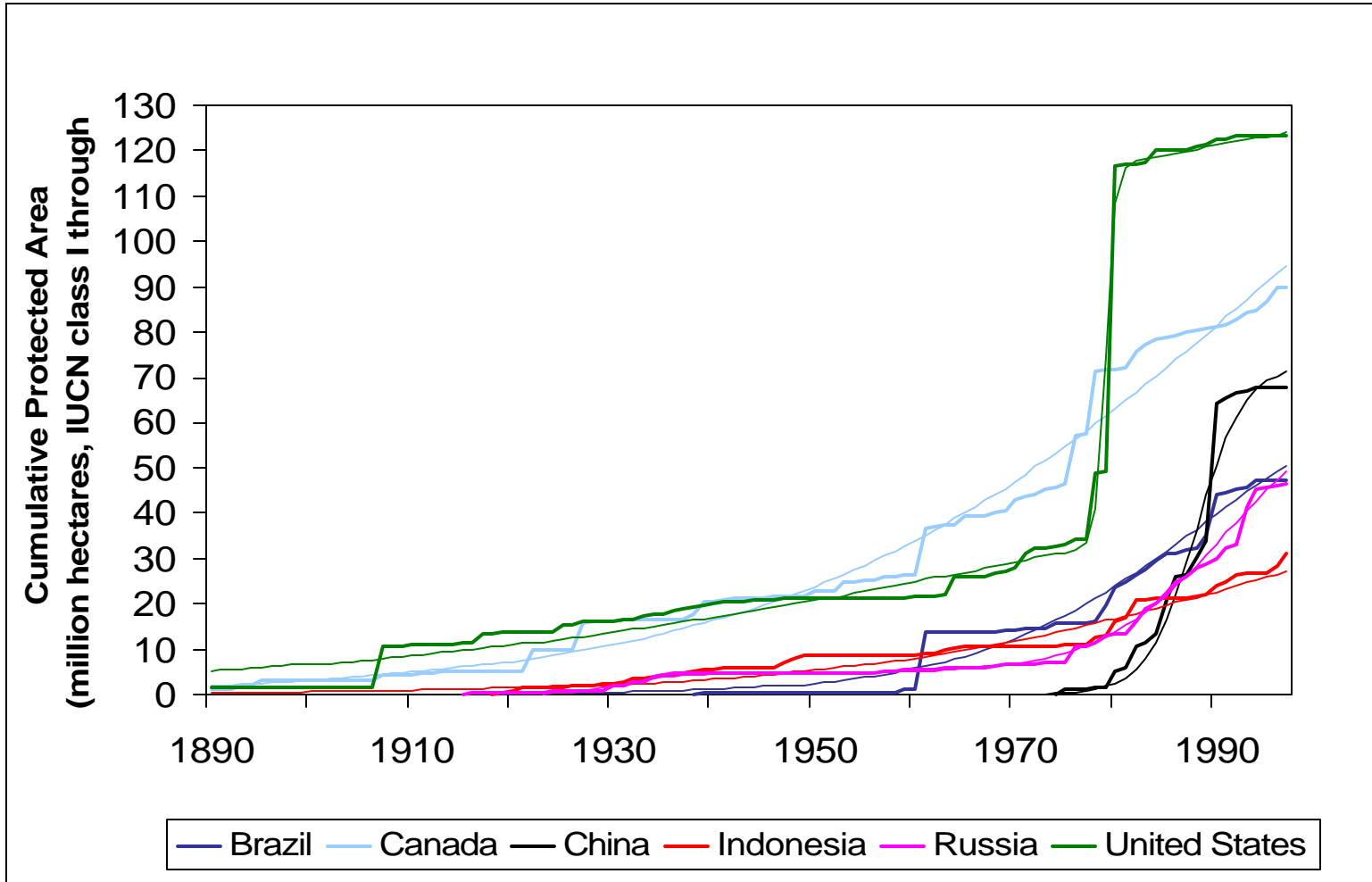


Figure 4: Protected Area Designations, 6 countries

