"WHOSE WOODS THESE ARE I THINK I KNOW": HOW KYOTO MAY CHANGE WHO CONTROLS BIODIVERSITY

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INTRODUCTION

Whose woods these are I think I know.
—Robert Frost, *Stopping by Woods on a Snowy Evening*[1]

Identifying exactly who controls a forest is not always a straightforward matter. But if Robert Frost had written his poem in the modern age of multilateral environmental agreements, he and his little horse might have been even more perplexed about exactly whose woods they were stopping by on that snowy evening. By one count, over three hundred multilateral agreements aim to protect the environment: almost one hundred specifically address biodiversity, with several directly regulating forests.[2] Add to the mix myriad domestic legal systems, contested boundaries, and complicated ownership arrangements, and it quickly becomes difficult to tell who is in control.[3] Despite such potential confusion, the principle of national sovereignty over natural resources has survived more or less intact through the ever-expanding gauntlet of supranational regulations.

But one multilateral agreement that, at first glance, has little to do with forests could end up interfering to an unexpected and unprecedented degree with nations' traditional control over their own forests. As the names suggest, the United Nations Framework Convention on Climate Change and its Kyoto Protocol target climate change, not forests. Though deforestation certainly is closely linked to climate change,[4] these international agreements were not principally designed to impose a new global regulatory system on forests. Nevertheless, the potential for trees to soak up and sequester carbon dioxide is recognized by the Kyoto

[1] Robert Frost, *Stopping by Woods on a Snowy Evening* (1923), *reprinted in* CHIEF MODERN POETS OF BRITAIN AND AMERICA, VOLUME II: POETS OF AMERICA 81 (Gerald DeWitt Sanders et al. eds., 1970).

[2] Desiree M. McGraw, *The Story of the Biodiversity Convention: From Negotiation to Implementation*, *in* GOVERNING GLOBAL BIODIVERSITY: THE EVOLUTION AND IMPLEMENTATION OF THE CONVENTION ON BIOLOGICAL DIVERSITY 7, 9 (Philippe G. Le Prestre ed., 2002).

[3] For more on the ever-changing licensing requirements, contractual arrangements, privatization, and decentralization efforts in forest regulation, see FAO LEGAL OFFICE, LEGISLATIVE STUDY 73, LAW AND SUSTAINABLE DEVELOPMENT SINCE RIO: LEGAL TRENDS IN AGRICULTURE AND NATURAL RESOURCE MANAGEMENT 288–97 (2002).

[4] *See* MICHAEL GRUBB ET AL., THE KYOTO PROTOCOL: A GUIDE AND ASSESSMENT 27 (1999).

Protocol's Clean Development Mechanism ("CDM"), which allows developed and developing countries to work together on reforestation projects that will act as carbon sinks.[5] The decision whether and how to allow reforestation projects under the CDM generated fierce conflict; in particular, one debate raged over whether genetically modified ("GM") plant species should be allowed in such projects.[6] After months of actively contemplating a total ban on GM trees, the Kyoto Protocol's Subsidiary Body for Scientific and Technological Advice ("SBSTA") suddenly changed its mind in December 2003, allowing GM trees to be used upon approval from the country that will host the CDM project.[7]

This outcome seemed to reaffirm the traditional principle of sovereignty: if it is contained in our country, it is our decision alone. Yet upon examining what will happen in practice to a CDM project involving GM trees, it will become apparent that the project approval requirements established under the CDM potentially place unprecedented restrictions on how a country deals internally with risks to biological resources. While this fact does not even remotely spell the end of national sovereignty over natural resources, it is one of the strongest signals to date that the international community may assert a powerful interest and demand a tangible role in a country's choices about its own internal biodiversity.

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[5] Technically both reforestation and afforestation projects are permitted to some degree. The difference between the two turns on if, when, and how the land was last covered with forests. U.N. Framework Convention on Climate Change, Oct. 29–Nov. 10, 2001, *1 Report of the Conference of the Parties on Its Seventh Session, Held at Marrakesh: Addendum, Part Two: Action Taken by the Conference of the Parties*, 11/CP.7, Annex, ¶ 1, U.N. Doc. FCCC/CP/2001/13/Add.1 (Jan. 21, 2002), *available at* http://unfccc.int/resource/docs/cop7/13a01.pdf. The distinction will not matter for this analysis, and so the more familiar term "reforestation" will be used.

[6] The debate also involved whether invasive species (also known as alien, exotic, or non-indigenous species) should be allowed. Much of the analysis in this article would apply equally to invasive species.

[7] U.N. Framework Convention on Climate Change, Dec. 1–12, 2003, *Report of the Conference of the Parties on Its Ninth Session, Held at Milan: Addendum, Part Two: Action Taken by the Conference of the Parties*, Decision 19/CP.9, U.N. Doc. FCCC/CP/2003/6/Add.2 (Mar. 30, 2004), *available at* http://unfccc.int/resource/docs/cop9/06a02.pdf [hereinafter *Milan Addendum, Part Two*].

I. THE CDM AND ITS UNIQUE ROLE IN THE KYOTO CONTEXT

Greenhouse gases, such as carbon dioxide, have been implicated as the driving force in climate change. The burning of fossil fuels and deforestation generate most of the offending carbon dioxide, and the international community began to realize in the late 1980s that global emissions must be cut to prevent a potentially disastrous jolt to weather patterns.[8] In 1992, the U.N. Framework Convention on Climate Change ("UNFCCC") first articulated the goal of an international agreement to stabilize the atmosphere, but it did not establish any binding emissions commitments itself; rather, it paved the way for future agreements, like the Kyoto Protocol.[9]

The Kyoto Protocol commits Annex I countries (developed countries and economies-in-transition, like Russia) to certain assigned emission levels over a period of time. They can achieve these levels by reducing their actual emissions, by sequestering carbon (in specified and limited ways), or by participating in flexibility mechanisms.[10] Flexibility mechanisms are designed to reduce global emissions of greenhouse gases even while lowering the compliance costs for individual countries: the CDM is one of three such mechanisms.[11]

The first flexibility mechanism, emissions trading, essentially allows Annex I nations to buy and sell emissions allowances among themselves.[12] The second mechanism, joint implementation, enables Annex I nations to invest in projects in other

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[8] GRUBB ET AL., *supra* note 4, at 27.

[9] *Id.* at 36–37, 43.

[10] *Kyoto Protocol to the United Nations Framework Convention on Climate Change*, Dec. 10, 1997, art. 3, FCCC/CP/1997/L.7/Add.1, 37 I.L.M. 22 [hereinafter *Kyoto Protocol*]. In a few cases, all that is required is stabilization or even a slight increase in emissions. *See* GRUBB ET AL., *supra* note 4, at 115–22. For more on the limited role of land use, land-use change, and forestry (i.e., various carbon sequestration methods) to meet general emissions reduction requirements, see, for example, *id*. at 120–22. The debate over Annex I countries' ability to use their own forests to meet emissions reductions in many ways paralleled the debate over whether Annex I countries could use forests in developing countries through the CDM. *See infra* Section IV (highlighting some such parallels). But more generally, the larger debate over carbon sinks in the Kyoto Protocol will not be addressed in detail in this article.

[11] *See* Peter Duncanson Cameron, *The Kyoto Process: Past, Present and Future*, *in* KYOTO: FROM PRINCIPLES TO PRACTICE 3, 10 (Peter D. Cameron & Donald Zillman eds., 2001).

[12] *Kyoto Protocol*, *supra* note 10, art. 17.

Annex I nations that will reduce emissions (like clean energy generators or carbon sinks).[13] These first two flexibility mechanisms let countries take advantage of the most cost-efficient emissions reduction opportunities, even if those opportunities lie beyond a country's own borders. But as the third flexibility mechanism, the CDM is unique in pushing beyond the boundaries of Annex I and permitting nations to obtain emission credits by investing in *non*-Annex I nations: that is, in developing countries under no current obligations to reduce emission.[14] Indeed, the CDM is so unique that is has been dubbed "the Kyoto surprise."[15]

How the CDM will work is discussed in greater detail below.[16] But as a rough summary, under the CDM, an Annex I country (or a private entity within that country) provides finances, technology, or other support to a willing developing country. That developing country then hosts a project—such as a clean power plant or a reforestation effort—which will reduce the amount of greenhouse gases that the developing country would otherwise produce. Since the Annex I country is in some sense responsible for the resulting net emissions reduction, it is awarded credits called Certified Emissions Reductions ("CER"), so long as the CDM project meets various design requirements, goes through public comment, and is approved by the CDM Executive Board. The Annex I country can use those credits to offset its own emissions, helping it more easily meet its net capped allowance.[17]

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[13] *Kyoto Protocol*, *supra* note 10, art. 6. GRUBB ET AL., *supra* note 4, at 131–32.

[14] The terms "developed" and "developing" nations are, admittedly, loaded and often controversial. They are used here primarily as shorthand for Annex I and non-Annex I nations, respectively. The UNFCCC website explains that Annex I nations include "the industrialized countries that were members of the OECD (Organisation for Economic Co-operation and Development) in 1992, plus countries with economies in transition (the EIT Parties), including the Russian Federation, the Baltic States, and several Central and Eastern European States"; non-Annex I nations are "mostly developing countries." UNFCCC, Parties & Observers, http://unfccc.int/parties_and_observers/items/2704.php (last visited Feb. 24, 2006).

[15] GRUBB ET AL., *supra* note 4, at 226. The CDM was surprising not only in substance, but in its very creation: it emerged from extremely last minute negotiations. Cameron, *supra* note 11, at 10.

[16] *See infra* Section V.

[17] *See* U.N. Framework Convention on Climate Change, Oct. 29–Nov. 10, 2001, *2 Report of the Conference of the Parties on Its Seventh Session, Held at Marrakesh: Addendum, Part Two: Action Taken by the Conference of the Parties*, 17/CP.7, U.N. Doc. FCCC/CP/2001/13/Add.2, 23–34 (Jan. 21, 2002)

Compared to emissions trading and joint implementation, the CDM greatly enhances the benefits of geographic flexibility and cost efficiency, since developing countries have tremendous untapped potential for cheap emissions reductions.[18] It also promises to improve the health, environment, economy, and technological capabilities of developing countries.[19] But the CDM is not without critics. Many fear that the CDM will destroy industrialized countries' motivation to reduce their own greenhouse gas emissions.[20] Perhaps even more worrisome is the potential problem of additionality. Namely, if the developing nation would have undertaken the same emissions reduction projects even in the absence of Annex I investment, the world could have enjoyed the same emissions reductions without the CDM and without giving Annex I countries credits that let them emit more. For example, if China already plans on switching some of its fossil fuel energy plants over to hydroelectricity, an investment from France does not add to the global emissions reductions, and so France should not be rewarded with credits. The designers of the CDM tried to build in safeguards to prevent these dangers.[21]

The CDM is obviously not the only flexibility mechanism, and it is certainly not the only means by which a country can comply with its Kyoto commitments. So why single out the CDM for analysis, especially in an article focused on sovereignty issues? To start, the CDM generated "a creative but untested mix of relationships," among a host of actors.[22] To be precise, the CDM implicates developing countries with a deep interest in controlling their biological resources but often with little capacity to do so effectively; developed nations bringing the promise of resources and technology, but asking for something in return; private actors holding the purse strings and wielding corresponding influence;

available at http://unfccc.int/resource/docs/cop7/13a02.pdf [hereinafter *Marrakesh Addendum*].

[18] *See* Ernestine Meijer & Jacob Werksman, *Keeping It Clean: Safeguarding the Environmental Integrity of the Clean Development Mechanism*, *in* LEGAL ASPECTS OF IMPLEMENTING THE KYOTO PROTOCOL 191, 192 (David Freestone & Charlotte Streck eds., 2005).

[19] *Id*.

[20] For a more detailed discussion of the potential environmental downside of the CDM, see *id*.

[21] See *infra* Section V for a discussion of some of these safeguards.

[22] Meijer & Werksman, *supra* note 18, at 194–96.

local stakeholders and public entities with much to gain or lose from a project's success or failures but with perhaps little voice to express their concerns; and international institutions trying to build legitimacy and governance out of thin air. If ever there were a recipe for a decision-making conflict, the CDM is it. On top of these potential conflicts, "[t]he combined lures of foreign investment and cheap emissions reduction credits have created political pressures for rapid development of rules for the CDM that are potentially dangerous."[23] The CDM has been called "a leap into *terra incognita*:"[24] analysis is needed in order to predict where we will land.

Why single out reforestation projects, specifically GM tree projects? As this analysis will show, sovereignty over natural resources has resisted attempt after attempt at stronger global governance of biodiversity and biotechnology. If the CDM changes how at least some decisions are made about a country's own forests, although it may not spell the end of sovereignty, and it may not even be the first discernable erosion of sovereignty, it is certainly significant. Perhaps just as important, this is where the debate occurred. The various nations involved in deciding the fate of the CDM thought GM trees deserved special consideration, and so they will receive special consideration here. And after reviewing the science and economics of GM trees, the history of biotech regulation, and the debate over GM trees in the CDM, it will become apparent that the parties to the CDM negotiations were right: CDM projects involving GM trees are indeed special.

II. BACKGROUND ON GM TREES

The debate over whether GM trees should be allowed in CDM projects begs the question: does anyone want to use GM trees in CDM projects? Discussing how GM reforestation projects would be regulated might remain an intellectually interesting exercise even if no GM reforestation projects existed, but the question only takes on a practical significance after demonstrating that GM trees are desirable and feasible for CDM projects. A look at the

[23] GRUBB ET AL., *supra* note 4, at xxxix. In fact, the CDM was allowed to begin functioning even before the Kyoto Protocol took effect, and any CERs generated from the year 2000 until the beginning of the first commitment period could be put toward achieving compliance in the first commitment period. *Id*. at 135.

[24] *Id*. at xxxix.

scientific status and environmental risks of GM trees will also prove invaluable to subsequent discussion on where, in what form, and under what control GM tree projects may actually sprout up.

A. *The Promise of Biotechnology for Silviculture*

The genomes of most plants cultivated by humans have been shaped by countless centuries of domestication. Corn, for instance, experienced its first dramatic change in genetic composition around six thousand years ago, when Mesoamericans began selectively choosing the best seeds from the best plants.[25] Indeed, the very practice of agriculture has been defined as "the human creation of new botanical species whose genetic structures are distinct from those of their wild ancestors."[26]

But silviculture (the cultivation of trees) almost singularly does not fit this model. Humans have long relied on trees for fuel, building material, food (fruit and nuts), and medicine; the list of modern forestry products ranges from paper to rayon to Christmas trees.[27] Yet despite this long history of use, trees remain essentially wild and undomesticated compared to most agricultural crops.[28] Few attempted to use traditional breeding methods on trees until the past half century, and even then the work was slow going.[29] Most tree species are self-incompatible, meaning that foresters cannot produce the inbred lines that proved so crucial in the selective breeding of many crops; instead, foresters must try to cross two separate parents, resulting in an unpredictable assortment of offspring.[30] Tree growth cycles are also frustratingly long compared to crops: a breeder may have to wait years for trees

[25] *See* D.R. Piperno & K.V. Flannery, *The Earliest Archaeological Maize (Zea mays L.) from Highland Mexico: New Accelerator Mass Spectrometry Dates and Their Implications*, 98 PROC. NAT'L ACAD. SCI. U.S. 2101–03 (2001).

[26] SUE HUBBELL, SHRINKING THE CAT: GENETIC ENGINEERING BEFORE WE KNEW ABOUT GENES 10 (2001).

[27] *See* Alan A. Lucier et al., *Biotechnology and the Forest Products Industry*, *in* THE BIOENGINEERED FOREST: CHALLENGES FOR SCIENCE AND SOCIETY 12, 12–13 (Steven H. Strauss & H.D. Toby Bradshaw eds., 2004).

[28] *Id.*

[29] *Id.*

[30] *Id.* at 15. The mating of most trees is hard to control and results in high heterozygosity, meaning few offspring will demonstrate the entire set of characteristics that the breeder intended. Kees van Frankenhuyzen & Tannis Beardmore, *Current Status and Environmental Impact of Transgenic Forest Trees*, 34 CAN. J. FOREST RES. 1163, 1164 (2004).

to reach maturity before she can select the best candidates to try to breed again.[31] Developing an improved trait through such methods is rarely cost-effective.

Only in recent years has biotechnology begun to give foresters hope for faster and more profitable genetic improvements for trees. In particular, biotechnology may help tree breeders by allowing them to: (1) identify desirable traits through genetic analysis; (2) achieve more precise combinations of superior traits at the genetic level; and (3) insert novel traits (either redesigned tree genes or characteristics from wholly unrelated species) into the tree genome.[32] The latter two techniques are often referred to collectively as genetic engineering or genetic modification.[33] Through biotechnology, breeders hope to—or already can—engineer trees that: sequester greater amounts of carbon in their roots; grow faster or yield better wood; produce their own pesticides or fungicides, improving the trees' defense systems against pest attacks; are herbicide- or pesticide-tolerant, allowing foresters to spray more chemicals without harming the saplings; are resistant to exotic diseases, assisting the restoration of devastated species like the chestnut and the elm; grow in harsh conditions, helping to reverse desertification and allowing the bioremediation of soil with high salinity, low water content, or high concentrations of toxins (most notably, mercury); contain less lignin, making the paper production process cheaper and possibly more environmentally friendly (for example, less chlorine and alkali are necessary); are sterile, ensuring that GM trees cannot reproduce on their own or cross-breed with wild relatives; produce commercially-viable chemicals; or produce better fruits and nuts.[34]

For CDM reforestation projects, the most obviously desirable traits include: the ability to store more carbon, directly increasing the number of emissions reduction credits that a project could earn; the ability to grow in harsh conditions, expanding the geographic

[31] *See* Lucier et al., *supra* note 27, at 15; Van Frankenhuyzen & Beardmore, *supra* note 30, at 1164.

[32] *See* Lucier et al., *supra* note 27, at 15–16; Van Frankenhuyzen & Beardmore, *supra* note 30, at 1164.

[33] "Transgenic" is sometimes used interchangeably with these terms, and any distinction is immaterial to this analysis.

[34] *See* Lucier et al., *supra* note 27, at 16; Hillary Rosner, *Turning Genetically Engineered Trees into Toxic Avengers*, N.Y. TIMES, Aug. 3, 2004, at F2; Paul Elias, *Genetically Engineered Trees Quietly Sprout: Genetic Tinkering Meets Growing Opposition*, OAKLAND TRIB., Aug. 10, 2003, at 1.

regions in which reforestation projects could be located; and the ability to ensure more rapid establishment of saplings (including faster growth and improved defense capabilities, such as disease-resistance), increasing the number of trees that survive to generate credits. Also, non-susceptibility to pests (and possibly, in future application, to fire) could reduce concerns about the forests being destroyed and hence "leaking" supposedly sequestered carbon back into the atmosphere. Environmentalists estimate it takes two non-GM trees to offset the carbon dioxide produced per passenger on a single trans-Atlantic flight;[35] genetic changes could dramatically improve that ratio, making biotechnology quite a boon to reforestation projects.

Of course, not every potential genetic improvement is currently available and ready for commercial release. The technology is very young. Genetic modification of trees only began in 1987,[36] forest researchers and industries did not begin seriously contemplating biotechnology until the 1990s.[37] Granted, enthusiasm has grown remarkably since then. In the past decade, at least 138 field test applications have been filed in the United States, with almost half coming in a two-year period.[38] These permits represent 73.5 percent of worldwide field trials; other developed nations (Belgium, Canada, France, Finland, New Zealand, Norway, Portugal, Spain, and Sweden) claim 23 percent, with the final 3.5 percent scattered around the world (Brazil, Chile, China, South Africa, and Uruguay).[39]

Recent enthusiasm notwithstanding, only two commercial releases of GM trees have occurred to date—papaya in Hawaii and poplars in China.[40] And compared to herbicide and insecticide

[35] Alister Doyle, *U.N. Talks Permit GMO Forests Under Kyoto*, REUTERS, Dec. 9, 2003, http://www.climateark.org/articles/reader.asp?linkid=27635.

[36] 1987 saw herbicide-tolerance genes inserted into a hybrid poplar; the first genetically modified conifer was reported in 1993. Van Frankenhuyzen & Beardmore, *supra* note 30, at 1165.

[37] Roger A. Sedjo, *Biotechnology and the Global Wood Supply*, *in* THE BIOENGINEERED FOREST: CHALLENGES FOR SCIENCE AND SOCIETY, *supra* note 27, at 23. Academic and government research dominated the GM applications for the first decade, but recently were replaced by increasing interest from industry. Van Frankenhuyzen & Beardmore, *supra* note 30, at 1169.

[38] Don S. Doering, *Will the Marketplace See the Sustainable Forest for the Transgenic Trees?*, *in* THE BIOENGINEERED FOREST: CHALLENGES FOR SCIENCE AND SOCIETY, *supra* note 27, at 112, 113.

[39] Van Frankenhuyzen & Beardmore, *supra* note 30, at 1169.

[40] *See* Sedjo, *supra* note 37, at 23; Zhao Zhizhen, *A Second Postcard from*

transformations, which have proven their potential for commercial success in over a decade of field trials, most other modifications are in their "infancy."[41] Modifications to tolerate salt and water stresses have had some field success, as have the mercury-bioremediating trees; modifications to withstand harsh temperatures have not fared as well.[42] Increased carbon absorption field trials began in a 1993 project funded by Toyota, with some initial success.[43] More recently, the U.S. Department of Energy began collaborating with the Oak Ridge National Laboratory to change the cellular structure of trees, with hopes of increasing the roots' capacity for carbon storage.[44] But again, these studies represent only early results, not success.

Even if a GM tree succeeds in field trials, it may not instantly become viable in the forestry industry or for CDM projects. To make modifications cost-effective, a breeder must first develop the right gene in the right tree variety. While poplar is perhaps the most commonly chosen tree for GM experiments, few of the poplar varieties transformed so far are ever grown commercially, and tissue cultures are not available for most of the commercially important varieties of trees.[45] Indeed, the forest industry mostly relies on the pine and the eucalyptus for modern plantations, not the poplar.[46]

China: China Boosts Biotech—But Under Strict Controls, THE SCIENTIST, June 26, 2000, *available at* http://www.biomedcentral.com/news/20000626/01. Also see *infra* text accompanying notes 49–51, note 82 and accompanying text, and text accompanying notes 272–274.

[41] Van Frankenhuyzen & Beardmore, *supra* note 30, at 1167; Kenneth F. Raffa, *Transgenic Resistance in Short-Rotation Plantation Trees: Benefits, Risks, Integration with Multiple Tactics, and the Need to Balance the Scales*, *in* THE BIOENGINEERED FOREST: CHALLENGES FOR SCIENCE AND SOCIETY, *supra* note 27, at 208, 208 (the first GM poplars for use against caterpillars and gypsy moths were developed over a decade ago and field tested shortly thereafter).

[42] Van Frankenhuyzen & Beardmore, *supra* note 30, at 1167–68.

[43] Chris Lang, *Climate Change: Hot Air, Fake Science, and Genetically Modified Trees*, WRM BULL. (World Rainforest Movement, Montevideo, Uru.), Mar. 2003, at 24, *available at* http://www.wrm.org.uy/bulletin/80/index.rtf.

[44] Rosner, *supra* note 34. The branches and upper trunks of such trees would then be harvested approximately every ten years and used to produce ethanol to offset petroleum and petroleum-emissions. *See id.*

[45] Rick Meilan et al., *Accomplishments and Challenges in Genetic Engineering of Forest Trees*, *in* THE BIOENGINEERED FOREST: CHALLENGES FOR SCIENCE AND SOCIETY, *supra* note 27, at 36, 36–37.

[46] Both pine and eucalyptus varieties have been modified (along with apple, papaya, citrus, persimmon, pear, plum, sweetgum, spruce, poplar, and walnut), but presumably the few varieties that have undergone testing are not the most

Assuming the right variety can be modified, the necessary mechanisms must be in place to take financial advantage of the genetic advantage. For example, the benefits of herbicide-tolerance can be captured quickly: from the moment seeds are planted, foresters can begin to spray the target herbicide. By reducing the cost of establishing saplings, herbicide-tolerance could produce an economic benefit of one billion dollars annually, and do so practically from year one.[47] In contrast, for lignin modification the foresters must wait years until maturation (i.e., until the trees are ready to harvest) to capture any benefits, and even then can only do so if paper mills have been reconfigured to use the chemicals appropriate for low-lignin trees.[48] If a certain type of modification cannot become cost-effective in the immediate future, it has less hope of attracting financial support for planting, let alone for the necessary research and development.

Not even cost-effectiveness will guarantee that GM trees can enjoy public acceptance and hence financial gains. The success of the GM papaya—the only GM tree approved for commercial release in the United States—may serve as a cautionary tale, since in many ways the papaya's transformation was unique.[49] When the papaya was decimated by a virus, so was the local papaya industry. Disease-resistance through biotechnology created an immediate and significant local benefit; by contrast, the benefits of slightly cheaper paper products through herbicide-resistance will be spread much more thinly. The effort to save the papaya was a fully transparent collaboration; by contrast, industry may want to keep future GM techniques proprietary, and secretiveness may undermine public trust. Finally, the papaya tree has no important wild relatives, and no chemicals were sprayed, reducing environmental concerns; herbicide-tolerant trees may not so easily

commercially important. *See* Rowland D. Burdon & Christian Walter, *Exotic Pines and Eucalypts: Perspectives on Risks of Transgenic Plantations*, *in* THE BIOENGINEERED FOREST: CHALLENGES FOR SCIENCE AND SOCIETY, *supra* note 27, at 52, 52; James F. Hancock & Karen Hokanson, *Invasiveness of Transgenic Versus Exotic Plant Species: How Useful is the Analogy?*, *in* THE BIOENGINEERED FOREST: CHALLENGES FOR SCIENCE AND SOCIETY, *supra* note 27, at 181, 184.

[47] *See* Sedjo, *supra* note 37, at 28–29, 33.

[48] *See id*. at 28–29.

[49] *See* Doering, *supra* note 38, at 119–20. Similarly, restoration of the American chestnut is among the least controversial GM tree proposal, partly because humans contributed to the decline of this beloved tree. Rosner, *supra* note 34.

avoid scrutiny from the environmental movement.[50] Barring circumstances as unique as these, and especially after years of often negative press on GM crops, the forestry industry may have to be cautious until the public accepts products from GM trees.[51]

On the other hand, a GM plantation could be cost-effective without producing any consumable wood, fruit, or fibers for the public. Governments in particular may desire large stands of trees to remediate contaminated land, to conserve soil and prevent desertification, to provide shade or windbreaks, to act as flood controls, or simply to reforest areas. In fact, the largest release of GM trees to date was by the Chinese government as an anti-desertification measure.[52] But compared to the potential for profit in international trade of forestry goods, the need and incentives for such non-commercial stands are minimal.

On the whole, the promise of biotechnology may be theoretically great, but the immediately realizable benefits are probably much more tenuous. Nevertheless, if there were no downside to using GM trees, even tenuous benefits could be worth the investment. Of course the very fact that GM trees are controversial suggests there may be a rather significant downside.

B. *The Risks of Biotechnology for Silviculture*

To begin, there are a few purely economic risks unique to GM trees. If gene expression fails or fades over time, the trees will not express the desired advantages that foresters hoped and paid for. Even worse, unstable genes could cause unpredictable pleiotropic effects, damaging the trees' viability in unforeseeable ways.[53] If the risk of failure is great enough, GM trees will not be worth the

[50] See *infra* text accompanying notes 61–74 for an examination of the risks of invasiveness that may result from herbicide tolerance.

[51] *See* Doering, *supra* note 38, at 114. But note that, despite years of bad public relations, GM crops have largely been successful, boasting near market dominance in the US for crops such as soybeans. For a report on the global success of GM crops, see Clive James, *Global Review of Commercialized Transgenic Crops: 2001* (ISAAA Brief No. 24-2001, 2001), *available at* http://www.isaaa.org/kc/Publications/pdfs/isaaabriefs/Briefs%2023.pdf. See *infra* text accompanying notes 75–80 for an examination of the public reaction to GM trees to date.

[52] *See infra* text accompanying notes 82–85.

[53] Van Frankenhuyzen & Beardmore, *supra* note 30, at 1170. Pleiotropism occurs when a single gene determines two or more apparently unrelated characteristics. For example, a gene designed to bestow herbicide-tolerance could accidentally interfere with a trait as fundamental as root development.

additional costs of developing and planting them.[54] Also, if GM tree plantations are more likely than other plantations to be monocultures, they may be more susceptible to devastation by a single exotic, unexpected disease or pest.[55] Such risks are worth considering when making decisions about particular investments in GM trees,[56] but alone seem insufficient to indicate that nobody would ever want to invest in GM trees for CDM projects.

More relevant for this discussion are the potential environmental and health risks.[57] A principle concern for GM crops—the human health risk—does not seem as strong for GM trees, provided the fruit, nuts, and bark of GM trees are not ingested by humans.[58] However, the special case of bioremediating GM trees may raise a different type of health

[54] However, preliminary evidence suggests that gene expression is relatively stable. *See* Meilan et al., *supra* note 45, at 39.

[55] Monoculture occurs when an entire planting is genetically identical. When seeds are engineered to contain a predetermined set of characteristics, unless precautions are taken, genetic variability is lost. Genetic diversity helps a population resist threats of disease or pests, since a diverse population contains more chances that at least one organism will have a genetic trait that will improve defenses. Thus, monocultures are more susceptible to devastating attacks.

[56] Particular trees may also carry unique economic risks: low-lignin trees, for example, may be less able to withstand gusts of wind and hence more susceptible to strong weather events. *See* Rosner, *supra* note 34.

[57] GM crops may also pose risks of social and cultural harms. GM corn, for example, could threaten the traditional farming system of Mexico, destroying the livelihoods of farmers, and could even undermine the religious beliefs surrounding corn in the Mesoamerican world. *See* Jason A Schwartz, Aftermaths of Aftermath: Risk Cultures and the Mexican Maize Scandal (Mar. 20, 2003) (unpublished A.B. thesis, Harvard University) (on file with the Harvard University Library and with author). Analogous risks could occur with the planting of GM trees, but identifying such risks would require both a detailed analysis of the forestry industry worldwide and a global look at how humans interact with forests on an economic, cultural, and spiritual level: such a study may be worthwhile, but is beyond the scope of this article and would not substantially advance the present discussion. For an introduction to socio-cultural concerns for reforestation projects in general (though not for GM trees in particular), see, for example, U.N. Framework Convention on Climate Change, Subsidiary Body for Scientific and Technological Advice, *Methodological Issues: Land Use, Land-Use Change and Forestry: Definitions and Modalities for Including Afforestation and Reforestation Activities Under Article 12 of the Kyoto Protocol*, 269, U.N. Doc. FCCC/SBSTA/2003/MISC.5 (Apr. 9, 2003) (Tuvalu's submission on socio-economic effects), *available at* http://unfccc.int/resource/docs/2003/sbsta/misc05.pdf.

[58] Yet note that no potential health risk has prevented the success of the GM papaya.

concern. These trees are engineered to leach toxic substances out of contaminated soil. In some cases, the tree may be able to convert the chemical into a less harmful form or store it permanently. But for the bioremediation of mercury, all the trees can do is dissipate the toxin into the atmosphere, diluting the concentrations. Critics say this is nothing more than a "shell game," cleaning up one small area by dumping the toxins into the air.[59] Still, proponents hope to use the trees to eliminate mercury and arsenic from drinking water in developing countries like Bangladesh and India.[60] Thus, these GM trees could fast become a popular choice for CDM projects, since they could kill two birds with one stone (to use an environmentally-ironic saying). The health pros and cons of such projects will have to be weighed on a case-by-case basis but cannot be ignored.

Another environmental concern is the risk of creating invasive species. This threat could manifest itself in several ways. First, if the modification confers such a powerful advantage to the trees' fitness, the GM trees may be able to reproduce and create offspring capable of colonizing a wide range of habitats and geographic locations. If such offspring successfully invade new areas, they may squeeze out local species of plants, as well as the other organisms that depend on those species, resulting in a rapid loss of biodiversity. Second, if GM trees are able to interbreed with wild relatives and if the transferred traits confer a fitness advantage, the resulting hybrid could become similarly invasive.[61] Finally, herbicide-tolerance and insecticide-tolerance may lead to increased use of chemicals; the resulting increased pressure on weeds and insects could act as a selective force for the evolution of so-called "superweeds," resistant to chemical controls.[62]

The risk of invasion arguably exists for all GM crops, but the

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[59] *See, e.g.*, Rosner, *supra* note 34.

[60] *See id*.

[61] *See* Richard N. Mack et al., *Biotic Invasions: Causes, Epidemiology, Global Consequences, and Control*, 10 ECOLOGICAL APPLICATIONS 689, 692 (2000).

[62] Van Frankenhuyzen & Beardmore, *supra* note 30, at 1172. There is one additional, though very unlikely, scenario for invasion: the modified genes could persist in the leaves, branches, and bark dropped by the tree, seep into the soil during decomposition, and then be incorporated by microorganisms in the soil. *See* Irene Hay et al., *Assessing the Persistence of DNA in Decomposing Leaves of Genetically Modified Poplar Trees*, 32 CAN. J. FOREST RES. 977, 977–82 (2002); Burdon & Walter, *supra* note 46, at 60–61.

problems are exacerbated by the long lifespan of trees and the long range of windborne pollen for common plantation tree species like pine.[63] Given these characteristics, GM trees have more chances to reproduce over a wider and harder-to-control area, reducing the effectiveness of buffer zones, which are the traditional defense against invasions. Additionally, compared to most agricultural crops, plantation trees are less dependent on humans for survival and more related to their wild relatives; theoretically, GM trees are equipped to thrive in the wild and breed with relatives.[64]

Skeptics of a "GM invasion" make reasonable counter-arguments. Plantation pines have very poor inter-fertility with native species; and while the eucalyptus—the other dominant plantation crop—has greater inter-fertility, there are few wild eucalyptuses outside of Australia.[65] In fact, all twelve tree species currently under modification experiments in the United States rate low for invasiveness.[66] Even still, the biggest skeptics of invasion acknowledge that without reproduction suppression, it is possible that certain GM traits like herbicide-tolerance may increase invasiveness and could spread to natural stands.[67]

The best protection against invasiveness is sterility: if the trees cannot breed, they cannot become invasive. However, experts acknowledge that "[w]ith the tools that are currently available, absolute sterility in plants is unlikely to be technically achievable in the foreseeable future."[68] But even assuming that sufficient sterility can be achieved to minimize the risks of invasion, new environmental problems are raised by this protective measure. An entire forest of sterile GM trees would interrupt normal forest ecology. Sterility means no fruit, no nuts, no seeds, no pollen, and the complete disruption of the feeding habits for countless insects, birds, and animals.[69] For this reason, some

[63] *See* Burdon & Walter, *supra* note 46, at 55. Pollen has been found to drift over 180 miles. Sean Poulter, *GM Trees Created to Resist Elm Disease*, DAILY MAIL (London), Aug. 28, 2001, at 14.

[64] *See* Hancock & Hokanson, *supra* note 46, at 186.

[65] *See* Burdon & Walter, *supra* note 46, at 55–58. Eucalypts also insect-pollinate, reducing the risk of long-distance breeding. *Id.*

[66] Hancock & Hokanson, *supra* note 46, at 182–84. *See also supra* note 46.

[67] *See, e.g.*, Burdon & Walter, *supra* note 46, at 57.

[68] Meilan et al., *supra* note 45, at 43; *accord* Burdon & Walter, *supra* note 46, at 56 (no reproduction suppression strategy "can guarantee zero reproduction when used alone").

[69] *See* Burdon & Walter, *supra* note 46, at 56; Rosner, *supra* note 34.

recommend developing nonviable pollen so as not to disturb the food chain.[70] But since nonviable pollen is not a guaranteed method of prophylaxis, this option leads back to concerns about gene flow and invasion.

The cost of invasion could be catastrophic. A single invasive species can decimate multiple native species and destroy entire ecosystems.[71] Such a loss of biodiversity could interfere with ecosystem benefits like air and water purification, drought and flood control, and a host of other natural cycles that make the world livable for humans.[72] More obviously, invasive species can devastate agricultural economies, and the techniques to control an invasion are often extremely expensive. All told, the direct costs may spiral into the billions of dollars per invasion.[73] Most of these costs, however, will not fall on the forester who planted the offending trees. And while there are examples of private actors assuming responsibility for their environmental impacts, in general private actors seldom internalize external costs unless forced to by government or the public.[74]

Industry might avoid certain GM trees purely for fear of negative public relations.[75] But public apprehension about GM trees has been relatively mild. GM trees escaped the attention of potential opponents almost entirely through much of the 1990s, as

[70] *See* Burdon & Walter, *supra* note 46, at 56.

[71] Wendy M. Jastremski, *A Proposed International Framework Convention on Bioinvasive Species*, *in* TRANSBOUNDARY ENVIRONMENTAL NEGOTIATION: NEW APPROACHES TO GLOBAL COOPERATION 361, 361 (Larry Susskind et al. eds., 2002).

[72] JAMES GUSTAVE SPETH, RED SKY AT MORNING: AMERICA AND THE CRISIS OF THE GLOBAL ENVIRONMENT 28 (2004).

[73] *See* Jastremski, *supra* note 71, at 361.

[74] In fact, climate change is one area where several industries have acted seemingly on their own. DuPont, BP Amoco, and GE have voluntarily pledged aggressive emissions reductions. Often companies make such changes because of independent economic reasons (i.e., low-energy solutions tend to be low-cost solutions as well) or out of fear of eventual regulation. But even these decisions are never isolated from motivations based on public opinion. *See* Heike Mainhardt, *Capacity-Building Strategies in Support of Multilateral Environmental Agreements*, *in* TRANSBOUNDARY ENVIRONMENTAL NEGOTIATION: NEW APPROACHES TO GLOBAL COOPERATION, *supra* note 71, at 252, 269–71.

[75] *See* Doering, *supra* note 38, at 121. For example, industry may limit itself to public-minded projects—like restoration of disease-ridden favorites, such as the elm—until the public's fears are put to rest. If industry took this approach, it remains unclear whether carbon sequestration would be viewed as sufficiently socially-aware to quell opposition.

most environmental activists focused on the more immediate threat of GM crops, which were already in commercial release and which presented a more obvious human health risk.[76] The anti-GM tree movement did start to pick up in 1999, as the media began to report on the science's status and risks, and as protesters began to picket biotechnology conferences and destroy GM trees in field trials.[77] More substantial actors soon entered the fray, with the World Wildlife Fund and Greenpeace publicly opposing GM trees (both in general and in the context of the CDM).[78] Petitions to exclude GM trees from the CDM eventually collected hundreds of signatures internationally.[79] Still, judging from the amount of media coverage and the intensity of the opposition, the anti-GM tree movement appears minuscule compared with the anti-GM crop movement, and a trip to the supermarket proves that even the stronger crop opposition never succeeded in shaming industry into giving up GM foods.[80] Thus, it seems unlikely that public opposition alone could prevent the use of GM trees either generally or in the specific context of the CDM. Any restrictions on the use of GM trees in the CDM must have the weight of a regulatory structure behind them to have even the hope of effectiveness.

[76] Other potential reasons for the slow start of the anti-GM tree movement include a greater trust of government to protect natural resources than to ensure food safety, as well as the inability of the movement to harness potent symbols and sympathetic victims: the anti-GM crop movement had monarch butterflies and small-scale farmers as victims, but the equivalent small-scale loggers are much more rare. *See* Doering, *supra* note 38, at 116.

[77] *See* Mark Henderson, *GM Trees Produce Their First Paper*, THE TIMES (London), June 10, 2002, at 4.

[78] *See* Van Frankenhuyzen & Beardmore, *supra* note 30, at 1169; *see generally* GREENPEACE, SINKS IN THE CDM: AFTER THE CLIMATE, BIODIVERSITY GOES DOWN THE DRAIN (2003), *available at* http://www.greenpeace.org/raw/content/international/press/reports/sinks-in-the-cdm-after-the-cl-2.pdf.

[79] The People's Biosafety Association, the Union of Ecoforestry, the People's Forest Forum, and Friend of the Earth (Finland) launched these petitions. *See* Lang, *supra* note 43.

[80] *See supra* note 51.

C. *Biotechnology in Developing Countries: Receptiveness and Risks*

In addition to profitability, another prerequisite for using GM trees in CDM projects is receptiveness in developing countries.[81] Developing nations are increasingly receptive to biotechnology. China has already allegedly planted over a million GM poplars in a massive reforestation effort aimed at combating desertification and flash floods.[82] Brazil, Chile, South Africa, and Uruguay also have ongoing GM tree research efforts,[83] and many developing countries—even countries long resistant to agricultural technologies, like Mexico—have recently proved receptive to GM crops.[84] Indeed, Argentina and China together account for a quarter of worldwide plantings of GM crops.[85] A growing number of developing nations are willing to let some level of biotechnology flourish within their borders, and those looking to expand their biotechnology capabilities may even actively seek out CDM projects. The costs of research, of the actual seeds, of the accompanying technology (for example, herbicides), of managing the plantations, of containing risks, and of waiting for non-immediate benefits (like with lignin modification) may make certain GM efforts prohibitively expensive in developing nations.[86]

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[81] For a more detailed analysis of the capacity of developing countries to oversee CDM projects, see *infra* Section V.

[82] Fred Pearce, *Altered Trees Hide Out With the Local Poplars*, NEW SCIENTIST (London), Sep. 18, 2004, at 7; Press Release, Sam Burcher, Inst. of Sci. in Soc'y, GM Trees Lost in China's Forests (Jan. 03, 2005), *available at* http://www.i-sis.org.uk/GMTGL.php. Of course, to the extent China or other countries can undertake such projects on their own, involvement of the CDM would raise questions of additionality, but the example still proves the receptiveness of developing countries to GM trees. See *infra* note 86 for more on additionality for GM tree projects.

[83] *See* Van Frankenhuyzen & Beardmore, *supra* note 30, at 1169.

[84] In the late 1990s, during negotiations for the Cartagena Protocol on Biosafety, most developing states remained skeptical of the desirability of GMOs, but note that Argentina, Uruguay, and Chile were not part of this group, and instead supported the interests of trade in GMOs. Peter-Tobias Stoll, *Controlling the Risks of Genetically Modified Organisms: The Cartagena Protocol on Biosafety and the SPS Agreement*, 10 Y.B. OF INT'L ENVTL. L. 82, 86–87 (2000). Attitudes have changed considerably since then. For example, Mexico had a moratorium on GM corn for years, but lifted the ban in 2003, in part due to pressure from NAFTA and the regulatory influence of the United States. Schwartz, *supra* note 57.

[85] Ruth Mackenzie et al., An Explanatory Guide to the Cartagena Protocol on Biosafety 7 (IUCN Environmental Policy and Law Paper No. 46, 2003).

[86] One of the central concerns about the CDM is additionality. While

Those countries that want to gain the experience and know-how to expand their biotechnology industries may first look for financial support, which is precisely what the CDM provides.

On the other hand, the risk calculus may also change in developing nations. As a rule of thumb, developing nations possess most of the world's biodiversity, and so the magnitude of harm from an invasion increases in developing nations: an invasion that might be a mere annoyance in some developed countries could be ecologically devastating in developing countries. Moreover, developing countries in general have less sophisticated legal and institutional frameworks,[87] which could increase the difficulty of controlling risks. But ultimately, even an increased risk will not scare away all investors, and only a regulatory system can police the use of GM trees. Thus the debate over GM trees that played out under the Kyoto Protocol will matter, unless an alternate regulatory system exists. And it just might—in the Cartagena Biosafety Protocol.

III. GMOS, BIODIVERSITY, AND SOVEREIGNTY BEFORE KYOTO

Through most of history, states have been free to exploit as they saw fit whatever natural resources they happened to find within their borders, without international regulation or constraint.[88] This right flowed from the greater principle of national sovereignty, namely that states cannot intervene in the internal affairs of other states.[89] But as awareness grew of the

additionality remains a problem for all CDM projects, it is not especially a problem for reforestation projects and may actually be less of a concern for GM reforestation projects in particular, because at least some developing countries will not have the capacity to undertake such plantings on their own. Of course, if they could have planted *non*-GM trees, then the CDM project hinges on a difficult baseline calculation, comparing the carbon uptake of the GM tree project with some hypothetical non-GM tree project. And some countries—as demonstrated by China—may have the resources for massive GM plantings. To reiterate, additionality concerns do not disappear for GM reforestation projects, but they are perhaps alleviated.

[87] *See* Cameron, *supra* note 11, at 13.

[88] *See* Michael Bowman, *The Nature, Development and Philosophical Foundations of the Biodiversity Concept in International Law*, *in* INTERNATIONAL LAW AND THE CONSERVATION OF BIOLOGICAL DIVERSITY 5, 6–7 (Michael Bowman & Catherine Redgwell eds., 1996).

[89] More precisely, this principle is Westphalian or Vattelian sovereignty, as opposed to either international legal sovereignty (any territory acknowledged as a state can enter into any agreement it chooses) or domestic sovereignty (the

migratory patterns of fauna and the limited supply of some shared resources like fisheries, the international community began to realize that the internal exploitation of resources could interfere with other states. For example, many fish stocks travel the globe, and so overfishing by one country directly limits the access of every other nation to those resources. Yet even as treaties on migratory species, shared resources, sensitive regions, and endangered species multiplied in number, such international agreements continued to "leave untouched resources located wholly within a State's own national boundaries."[90] U.N. General Assembly resolutions, for instance, repeatedly affirmed the principle of "permanent sovereignty" over natural resources.[91]

In the late 1970s and 1980s, the international community began to contemplate protecting natural resources and biodiversity on a more comprehensive level. The idea that nature has no political borders and is the "common heritage of mankind" started appearing in political rhetoric.[92] The general trend moved states toward "voluntarily accepting restrictions upon their sovereignty" for the sake of international obligations.[93] It looked as if the principle of sovereignty was collapsing in the face of globalization, modern scientific understanding, and moral arguments about the environment. But do any of these agreements really interfere with national sovereignty, specifically over biodiversity, forests, and the

particular institutions under which a state is governed). Westphalian sovereignty is basically a principle of non-intervention. This principle is routinely violated in international affairs, and some notion of shared sovereignty over natural resources may even be desirable for developing nations to help maximize utility; but so far, Westphalian sovereignty with respect to natural resources remains more or less inviolate. *See* Stephen D. Krasner, *The Hole in the Whole: Sovereignty, Shared Sovereignty, and International Law*, 25 MICH J. INT'L L. 1075, 1077, 1097 (2004).

[90] Alan E. Boyle, *The Rio Convention on Biological Diversity*, *in* INTERNATIONAL LAW AND THE CONSERVATION OF BIOLOGICAL DIVERSITY, *supra* note 88, at 33, 33.

[91] *Id*. at 39 (citing Permanent Sovereignty Over Natural Resources, G.A. Res. 1803 (XVII), U.N. Doc. A/5217 (Dec. 14, 1962), Declaration on the Establishment of a New International Economic Order, G.A. Res. 3201 (S-VI) U.N. Doc. A/9559 (May 1, 1974), Charter of Economic Rights and Duties of States, G.A. Res. 3281 (XXIX) U.N. Doc. A/9631 (Dec. 12 1974)).

[92] Bowman, *supra* note 88, at 7–13.

[93] BHARAT H. DESAI, INSTITUTIONALIZING INTERNATIONAL ENVIRONMENTAL LAW 20–22 (2004). Of course, some of these voluntary sacrifices were made in such a way that benefited the individual nations politically or economically and may have therefore indirectly enhanced sovereignty.

regulation of genetically modified organisms ("GMOs")?

A. *Background Agreements on Biotechnology*

Besides the Convention on Biological Diversity ("CBD"), only two multilateral regimes on biotechnology really exist at the present.[94] The European Union ("EU") first adopted directives on GMOs in 1990,[95] and through this structure imposes often onerous restrictions on the release of GMOs within any member state.[96] The EU regulations go beyond mere concern for transboundary impacts and truly seem to override some of the individual nations' decision-making abilities. Thus, the EU regulatory regime would represent a significant infringement of national sovereignty over natural resources if the EU were not such a unique entity in international law. One expert on sovereignty has said: "The European Union is an example of an institutional arrangement that has transgressed conventional sovereignty rules so successfully that it is hardly seen as being a transgression at all."[97] In other words, for certain purposes—like the regulation of biotechnology—the EU has so thoroughly subordinated its members that it really acts like a single sovereign entity, and the regulations do not weaken the collective sovereignty of the EU. Moreover, the EU is almost entirely comprised of Annex I countries under the Kyoto Protocol, which are not eligible to host CDM projects, and the non-Annex I countries—Cyprus and Malta—are not the most likely targets for massive reforestation efforts under the CDM, due to their inherent geographic limitations. Though the directives may obliquely influence various

[94] Agenda 21 calls for the "environmentally sound management [and] sustainable applications of biotechnology." U.N. Conference on Environment and Development, Rio de Janeiro, Braz., June 3–14, 1992, *Resolutions Adopted by the Conference*, ch. 16, U.N.Doc A/CONF.151/26/Rev.1 (Vol. I) (1993). As a non-binding document, Agenda 21 really adds nothing not already covered by the CBD and the Biosafety Protocol. On the other hand, there are a few countries that have signed Agenda 21 but have not ratified or signed the Biosafety Protocol, such as Argentina and Costa Rica. However, since Agenda 21 is so weak and of such limited application, it will not be considered in this analysis.

[95] Council Directive 90/219, 1990 O.J. (L 117) (EC); Council Directive 90/220, 1990 O.J. (L 117) (EC), *replaced by* Council Directive 2001/18, art. 6, 2003 O.J. (L 106) 21 (EC).

[96] PHILIPPE SANDS, PRINCIPLES OF INTERNATIONAL ENVIRONMENTAL LAW 658–62 (2d ed. 2003).

[97] Krasner, *supra* note 89, at 1085.

European countries' willingness to sponsor GM tree projects under the CDM, the directives do not apply to any release outside the EU,[98] and so technically will not constrain any states' choice to sponsor or receive a CDM project involving GM trees.

International trade regimes—most specifically the World Trade Organization and its supplementary agreement on Sanitary and Phytosanitary Measures—are also worth noting briefly. Trade regulation may reduce a country's ability to restrict the international exchange of GMOs and in doing so will constrain that country's sovereignty to make its own decisions about accepting GMOs into its borders. However, this simply is not the scenario raised by CDM projects. A CDM project must be located in a country that gives voluntary consent to the project; if a country were forced to accept GM trees under international trade law, the consent would not be voluntary, and the CDM project could not go forward.[99] Trade laws describe when an individual country can and cannot regulate the international exchange of goods; this article asks when the international community can regulate natural resources even when an individual country does not wish to do so. Trade law simply does not inform this analysis.[100]

[98] *See, e.g.*, Council Directive 2001/18, art. 6, 2003 O.J. (L 106) 21 (EC) ("[A]ny person must, before undertaking a deliberate release of a GMO . . ., submit a notification to the competent authority *of the [EU] Member State* within whose territory the release is to take place.") (emphasis added).

[99] Moreover, CDM projects involving GM trees oftentimes might not involve the transboundary movement or trade of GMOs. For more on these points, see *infra* notes 129–40 and accompanying text.

[100] However, the debate over GMOs in the context of international trade does demonstrate the historical conflict between the United States and the EU on the issue of biotechnology, a conflict that continues to play out in the CDM debates. *See generally* Sheila Jasanoff, *Citizens At Risk: Cultures of Modernity in the US and EU*, 11 SCI. AS CULTURE 363, 366 (2002) (stating that the US is the leading producer of genetically modified crops while many European countries are opposed to genetically modified foods, showing how technologies can evolve at different rates even among modern nations); Robert L. Paarlberg, *The Contested Governance of GM Foods: Implications for U.S.-EU Trade and the Developing World* 3 (Weatherhead Ctr. for Int'l Affairs Paper No. 02-04, 2002), *available at* http://www.wcfia.harvard.edu/papers/558__PaarlbergWP02-04.pdf (arguing that developing countries are trying to stay "GM-free" so that they can continue to export food to Europe and Japan, while the US contemplates challenging EU regulations and trade conflict looms).

B. *Background Agreements on Forests and Biodiversity*

Nearly half of the world's forests are located in tropical and subtropical areas, predominately in developing countries.[101] As a source of cultural, environmental, and potentially vast economic benefits, forests are prized possessions, and developing countries have resisted international forest instruments precisely out of the fear of losing sovereignty over these valuable commodities.[102] For this reason, forests—tropical or otherwise—have never been defined as the "common heritage of mankind" and were not even defined as a "common concern to mankind" in the Forest Principles, a non-binding agreement adopted at the 1992 U.N. Conference on Environment and Development.[103] The Forest Principles affirm national sovereignty over resources and are otherwise weak and "of limited legal authority and content."[104] Currently no world treaty on forests exists, and since the 1992 Conference, global interest in forests seems to have declined even further.[105]

The International Tropical Timber Agreement ("ITTA")[106] will not apply to CDM projects. The ITTA aims to ensure that all tropical timber products traded internationally originate in

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[101] FAO LEGAL OFFICE, *supra* note 3, at 271.

[102] *See* Hugo M. Schally, *Forests: Toward an International Legal Regime?*, *in* 4 YEARBOOK OF INTERNATIONAL ENVIRONMENTAL LAW 30, 37, 41 (Günther Handl ed., 1994).

[103] SANDS, *supra* note 96, at 547. *See* Conference on Environment and Development, Rio de Janeiro, Braz., June 2–14, 1992, *Non-Legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation and Sustainable Development of all Types of Forests*, U.N. Doc. A/CONF.151/26 (Aug. 14, 1992). The "common heritage" versus "common concern" distinction was first used by a U.N. General Assembly Resolution in the context of the global climate. Boyle, *supra* note 90, at 40. Unlike "common heritage," "common concern" does not internationalize ownership of resources: instead, it only acknowledges that states should manage their own resources with an eye toward the good of the international community at large. *Id*.

[104] SANDS, *supra* note 96, at 548–49.

[105] Schally, *supra* note 102, at 31. *See* SANDS, *supra* note 96, at 547 ("Agenda 21 does not suggest that new international legal developments [on forests] are imminent."). Though not analyzed here, regional agreements on forests and biodiversity—to the extent they exist—probably do little to impact national sovereignty: in a pact between several developing countries, all of which want to maintain exclusive rights to their valuable forests, it is hard to imagine any extreme infringements of national sovereignty.

[106] International Tropical Timber Agreement, Jan. 26, 1994, 1955 U.N.T.S. 143.

sustainably managed forests.[107] But since most potential GM plantations will be of non-tropical trees (pine and poplars), any applications will be indirect and limited at most. Also, CDM projects involving GM trees do not necessarily have to produce commercial lumber or paper goods in order to achieve cost-effectiveness.[108] For similar reasons, other potentially applicable agreements—like the Convention on International Trade in Endangered Species of Wild Fauna and Flora ("CITES")[109] or the FAO Tropical Forestry Action Plan[110]—will most likely never apply to GM tree reforestation projects.

C. *The Convention on Biological Diversity and the Cartagena Biosafety Protocol*

The CBD is in some sense a sister treaty to the UNFCCC, both owing their existence to the 1992 U.N. Conference on Environment and Development.[111] And as with many siblings, the CBD quickly found herself in the shadow of her big sister. The UNFCCC monopolized much of the attention of media, industry, and environmental organizations, and drew away most nations' "A-Team" negotiators.[112] More importantly, many developing countries felt "colonized" by the climate change negotiations and, especially early on, worried that their interests had received short shrift under the UNFCCC.[113] Developing countries saw the CBD as an opportunity to restore balance and reassert their hitherto-slighted interests.[114] Specifically, developing countries wanted to secure their rights to use their own natural resources as they wished and to exclude others from using their resources. Since developing countries physically control fourth-fifths of the world's biodiversity,[115] there could not be a CBD without their willing

[107] SANDS, *supra* note 96, at 547–48. The ITTA also seeks to create uniform policy on reforestation. *Id.*

[108] *See supra* text accompanying note 52.

[109] Convention on International Trade in Endangered Species of Wild Fauna and Flora, Mar. 23, 1973, 992 U.N.T.S. 243.

[110] Tropical Forest Action Plan, U.N. Food and Agriculture Commission on Forest Development, 4th Sess., Agenda Item 56, at 1–19, U.N. Doc. TFAP E.42 XVI. 14 (1985).

[111] McGraw, *supra* note 2, at 7.

[112] *Id*. at 13, 16.

[113] *Id*. at 13.

[114] *See id*.

[115] *See id*. at 7.

participation; and since developed nations and other interested actors had not invested the negotiating resources to mount a successful resistance, the developing countries got what they wanted. Thus, though the CBD was originally conceptualized by some as a chance to recognize the world's shared interest in conserving biodiversity at all costs, the CBD instead retains the principle of national sovereignty and even encourages use of natural resources, so long as it is sustainable use.[116] Indeed, developing countries rejected language that would have called genetic resources the "common heritage of mankind," opting for the more diluted term "common concern."[117]

Perhaps as a result of this negotiating history, the CBD's regulatory regime appears weak or even ineffective.[118] The CBD still aspires to ensure "the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources."[119] States are required to plan for the conservation and sustainable use of biodiversity, monitor the status of biodiversity, and carry out a host of other general duties.[120] Article 8(g) calls for special regulation of "the use and release of living modified organisms resulting from biotechnology which are likely to have adverse environmental impacts."[121] Article 14 requires

[116] *See id.* at 7–8; Boyle, *supra* note 90, at 35–36. The CBD might even extend notions of sovereignty beyond traditional application by implicitly acknowledging that individual genetic resources—not just whole organisms—can be owned and are controlled by states. Sam Johnston, *Sustainability, Biodiversity and International Law*, *in* INTERNATIONAL LAW AND THE CONSERVATION OF BIOLOGICAL DIVERSITY, *supra* note 88, at 51, 63. For a debate over whether the CBD recognizes sovereignty over biological diversity, improved genetic resources, or intellectual property, see *id.* at 65.

[117] McGraw, *supra* note 2, at 12. See Boyle, *supra* note 90 for a clarification of the "common heritage" versus "common concern" distinction.

[118] *See* Philippe G. Le Prestre, *Introduction: The Emergence of Biodiversity Governance*, *in* GOVERNING GLOBAL BIODIVERSITY: THE EVOLUTION AND IMPLEMENTATION OF THE CONVENTION ON BIOLOGICAL DIVERSITY, *supra* note 2, at 1.

[119] Convention on Biological Diversity, art. 1, June 5, 1992, 31 I.L.M. 818, 1760 U.N.T.S. 79 [hereinafter CBD]. Biological diversity includes diversity between species and diversity of ecosystems, as well as genetic diversity within species. *See id.* art. 2. The provisions of the CBD on access to genetic resources, technology transfer, and financial support all relate to biotechnology generally, but do not concern the topic of this article.

[120] *Id.* arts. 6–11, 14.

[121] *Id.* art. 8(g). Note that Article 8(h) calls for the outright prevention, control, and eradication of threatening exotic species. But it is doubtful that

environmental impact statements[122] and the mitigation of actual damage to biodiversity, especially when those impacts seep across borders and into other nations.[123] But all of these tasks are only required "as far as possible and as appropriate,"[124] and the CBD staunchly reaffirms the principle that nations have "the sovereign right to exploit their own resources."[125] Indeed, these provisions were left weak precisely to avoid substantial intrusions on national sovereignty.[126] In general, the greater the affirmation of sovereignty in a multilateral environmental agreement, the less legitimacy and authority the international regime has when it comes time to enforce the stated environmental goals.[127] Ultimately, the chances a country takes with respect to its own internal biodiversity remain, under the CBD, mostly its own business and nobody else's.

One of the few strong and unqualified provisions in the CBD calls for a subsequent protocol on biotechnology. Article 19(3) reads: "The Parties shall consider the need for and modalities of a protocol setting out appropriate procedures . . . in the field of the safe transfer, handling and use of any living modified organism resulting from biotechnology that may have adverse effect on the

language could be applied directly to GMOs, even if GMOs become invasive.

[122] Environmental impact statements require a country to look closely at the environmental costs of its actions, most often in comparison either to taking no action or to alternative forms of action.

[123] *Id.* art. 14. It is noteworthy that this principle—that a State should not cause damage beyond its borders—was placed in the body of an international treaty, rather than in the preamble, for the first time. Boyle, *supra* note 90, at 39 n.29. Nevertheless, overall the CBD's treatment of transboundary issues is "perfunctory" and barely even reflects the customary requirements in international law. *Id.* at 41–42, 48.

[124] CBD, *supra* note 119, art. 6–11, 14; Boyle, *supra* note 90, at 40–41 ("[T]he qualifying words 'as far as possible and as appropriate' in Article 14 may enable parties to avoid an EIA altogether where they find it inconvenient to conduct one.").

[125] CBD, *supra* note 119, art. 3. *See also* CBD, *supra* note 119, pmbl.; Boyle, *supra* note 90, at 39 ("None of this suggests any redefinition of the legal status of biological resources. The Convention's treatment of these resources remains fully within the existing rules of international law, and is consistent with the principle of permanent sovereignty.").

[126] *See* Boyle, *supra* note 90, at 40.

[127] David W. Bowker & Michael Castellano, *Enforcing International Environmental Treaties in Domestic Legal Systems*, *in* TRANSBOUNDARY ENVIRONMENTAL NEGOTIATION: NEW APPROACHES TO GLOBAL COOPERATION, *supra* note 71, at 230, 232.

conservation and sustainable use of biological diversity."[128] After years of negotiations, that provision gave birth to the Cartagena Protocol on Biosafety.

For an agreement that covers the transboundary movement, transit, handling, and use of GMOs,[129] much of the Biosafety Protocol is surprisingly irrelevant to the present discussion. The Protocol was largely designed to give countries the information and rights needed to exclude or condition the importation of GMOs.[130] But if the CDM works as planned, CDM projects involving GM trees will only find homes in countries receptive to or even seeking out biotechnology projects. A host nation can always turn down a CDM project: indeed, for the project to be approved, the host country must confirm that its participation is voluntary.[131] The question raised by CDM projects is not whether host nations can exclude or condition GM projects, but whether they must sometimes do so against their will. To the extent the Biosafety Protocol reinforces the pathways for sharing information and building institutional capacity, it may increase the sophistication with which countries can make decisions about GM projects under the CDM. But such impacts alone will not change the *rights* of countries to make those decisions, and this analysis will remain focused on the issue of sovereignty over natural resources in the face of potential risks to biodiversity. Advance informed agreements, debates over GM food, and possible conflicts with international trade—all favorite topics when commenting on the Biosafety Protocol—need not be discussed; only the Biosafety Protocol's bearing on sovereignty will be explored.

The Biosafety Protocol's objective is "to contribute to ensuring an *adequate level of protection* in the field of the safe transfer, handling and use of living modified organisms resulting from modern biotechnology that *may have adverse effects* on the conservation and sustainable use of biological diversity . . . specifically focusing on transboundary movements."[132] Some commentators interpret this objective as

[128] CBD, *supra* note 119, art. 19(3).

[129] Cartagena Protocol on Biosafety to the Convention on Biological Diversity, Jan. 29, 2000, 39 I.L.M. 1027 [hereinafter Biosafety Protocol].

[130] *See generally* Mackenzie et al., *supra* note 85, at 20.

[131] *Marrakesh Addendum*, *supra* note 17, at 17/CP.7, Annex ¶ 40(a).

[132] Biosafety Protocol, *supra* note 129, art. 1 (emphasis added).

having the substantive force to preclude activities "that would result in unacceptable risks to biological diversity, for example to permit uncontrolled release of [GMOs] in an ecologically sensitive area."[133] Admittedly, the objective seems very aggressive: using the phrase "may have adverse effects" instead of "is likely to have adverse effects" demonstrates the Protocol's insistence on exercising precaution.[134] On the other hand, the phrase "adequate level of protection" significantly weakens the objective, since "adequate" is a vague and relatively benign term.[135] Likewise, the protocol only seeks to "contribute" to an adequate level; it does not demand it.[136] As long as some minimal control mechanism exists, effectiveness seems irrelevant to satisfying this objective.

The Biosafety Protocol's general provisions are a bit broader in scope and stronger in language: "Parties *shall* ensure that the development, handling, transport, use, transfer and release of any living modified organisms are undertaken in a manner that *prevents or reduces* the risks to biological diversity . . . ."[137] Yet the disjunctive "or" seems to indicate that any control is sufficient even if it only reduces risks by an unspecified (and perhaps nominal) degree. Such a minimal requirement hardly compromises a country's sovereignty to determine its own acceptable level of risk to biodiversity.

The Biosafety Protocol's dramatic provisions on risk assessment and risk management have the greatest potential to disturb sovereignty, but ultimately will not substantially impact CDM projects. The Protocol calls for three different types of risk assessment:[138] (1) in advance of decisions about importation, (2) in

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[133] Mackenzie et al., *supra* note 85, at 31.

[134] The precautionary principle is also enshrined in Annex III(4), Article 10(6) and Article 11(8). *Id*. at 13, 31.

[135] *See* Amanda Wolf, *The Emergence and Implementation of the Advance Informed Agreement Procedure*, *in* GOVERNING GLOBAL BIODIVERSITY: THE EVOLUTION AND IMPLEMENTATION OF THE CONVENTION ON BIOLOGICAL DIVERSITY, *supra* note 88, at 127, 134 (The Protocol "provides [GMO] trade initiators with incentives to aim for 'adequate' safety, not to develop maximally safe products.").

[136] *See* Mackenzie et al., *supra* note 85, at 32.

[137] Biosafety Protocol, *supra* note 129, art. 2 (emphasis added).

[138] *Id.* arts. 16–17. The text is not entirely clear on when and for what purposes risk assessments are required, and even the CBD's website does not provide much clarification. *See* Convention on Biological Diversity, Cartagena Protocol on Biosafety: About the Protocol, http://www.biodiv.org/biosafety/about (last visited Feb. 5, 2006).

anticipation of unintentional transboundary movement, (3) in the form of general observation for all GMOs.

The first type of assessment might never apply to CDM projects. As discussed above, CDM projects will not involve a host country that wants to restrict the importation of GMOs. The Biosafety Protocol was largely designed to give importing countries rights to refuse or condition importation, and to this extent, the provisions do not apply to CDM-related decisions. However, the Protocol's risk assessment structure creates affirmative duties when countries decide to import; even risk assessments that approve importation of GMOs theoretically must comply with these requirements. But a CDM project involving GM trees need never involve the intentional transboundary movement of GMOs. Many developing nations boast fledgling or even well-established GM research programs;[139] such countries either will have the GM seeds necessary for the CDM project, or else could produce the seeds if given sufficient funding and scientific know-how. Even if the seeds could be produced more cheaply in Annex I nations, the CDM participants may still opt to produce them entirely within the borders of the eventual host country. The spirit of the CDM is to improve the technological capabilities of host countries, not simply to export the products of technology;[140] by producing GMOs within the host country, the CDM project will avoid the Annex I nation's domestic regulations on the production of GMOs, which may be stricter and almost certainly will be more complex (i.e., more expensive and time-consuming) than those in the developing countries. In short, CDM projects need never involve the shipping of GM seeds, only of money and knowledge.

The Biosafety Protocol dictates that, in response to risk assessments, countries should adopt "appropriate" risk management measures "to the extent necessary."[141] While the risk management provisions do not explicitly apply only to cases of

[139] China, Brazil, Chile, South Africa, and Uruguay in particular have conducted field trials of GM trees. *See supra* note 39 and accompanying text. Additionally, many other developing countries have commercial or scientific experience with GM crops. *See generally* Paarlberg, *supra* note 100.

[140] *E.g.*, *Marrakesh Addendum*, *supra* note 17, at 17/CP.7 ("Further emphasizing that clean development mechanism project activities should lead to the transfer of environmentally safe and sound technology and know-how. . . .").

[141] Biosafety Protocol, *supra* note 129, arts. 16(1)–(2).

importation, most commentators read the provisions as being so restricted.[142] Even the CBD website says that risk assessments are for importation and does not mention general release.[143] The risk management provisions should not apply to CDM projects; and if they do, "to the extent necessary" is hardly an exacting standard.

Only if the GM trees or seeds are for some reason shipped internationally could the first type of risk assessment and management provisions likely apply. But despite the technical obligations, countries realistically could carry out such risk assessments and managements to whatever extent they want. The emphasis of the Protocol was to describe when and how a country can restrict importation, thus, there is no strong mechanism for the public or the international community to challenge a decision to *allow* an importation. The compliance and liability measures of the Protocol are still largely nonexistent (though they are under discussion and development).[144] Similarly, public input into the risk analysis and decision-making is encouraged, but only "in accordance with [the Party's] laws and regulations."[145] Ultimately, nobody is looking over the shoulder of countries that decide to allow GMOs into their borders. Thus, import-related provisions will not seriously interfere with a country's decision to let a CDM project involving GM trees go forward.

The Biosafety Protocol next calls for risk assessments in anticipation of unintentional transboundary movements. As discussed above, GM trees can easily transform into invasive species, capable of spreading in unanticipated and far-reaching ways.[146] The Protocol requires each party to:

> notify affected or *potentially affected* States . . . when it *knows* of an *occurrence* under its jurisdiction resulting in

[142] *See, e.g.*, Mackenzie et al., *supra* note 85, at 217 ("[T]he risk assessment is to be used by Parties in order to make informed decisions as to whether or not to approve an import . . . ."). Also noteworthy, the Biosafety Protocol's overall objective says it is "specifically focusing on transboundary movements," meaning import/export; strictly domestic decisions about use and release are not excluded from the Protocol, but nor are they the main focus. Biosafety Protocol, *supra* note 129, art. 1.

[143] *See* Convention on Biological Diversity, Cartegena Protocol on Biosafety: Risk Assessment and Risk Management, http://www.biodiv.org/biosafety/issues/risk.aspx (last visited Feb. 13, 2005).

[144] Biosafety Protocol, *supra* note 129, arts. 27, 34.

[145] *Id.* art. 23.

[146] *See supra* notes 65–74 and accompanying text.

> a release that leads, or *may lead*, to an unintentional transboundary movement of a living modified organism that is *likely to have significant* adverse effects on the conservation and sustainable use of biological diversity, taking also into account risks to human health in such States.[147]

The terms of this provision must be dissected one by one. Experts on the Biosafety Protocol have interpreted the word "occurrence" to include an accidental release or a breakdown in risk management measures, but *not* an intentional introduction of a GMO into the environment, unless that release has been specifically identified as presenting a risk of unintentional transboundary movements.[148] In other words, for an intentional introduction of a GMO to be considered an "occurrence," the country must "know" that the release may cause unintentional transboundary movements. To this end, Article 16(3) specifically suggests carrying out a risk assessment prior to the first release of a GMO in order to minimize unintentional transboundary movements.[149] However, as the Protocol states, such an obligation only arises when "significant" effects are "likely." In developing countries—often centers of genetic diversity, which the CBD takes special care to protect—the threshold for what qualifies as "significant" may be lower.[150] The words "may" and "potentially affected" also seem to indicate a precautionary approach. However, these terms are all subject to interpretation, and it will still largely be up to the individual countries to decide when such a risk assessment is necessary or appropriate.[151]

To the extent developing countries will take it upon themselves to conduct risk assessments for unintentional transboundary movements, the standard remains one mostly of

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[147] Biosafety Protocol, *supra* note 129, art.17(1) (emphasis added).

[148] *See, e.g.*, Mackenzie et al., *supra* note 85, at 118.

[149] Biosafety Protocol, *supra* note 129, art. 16(3).

[150] Mackenzie et al., *supra* note 85, at 119.

[151] Given the fact that most developing countries have limited capacity to monitor environmental risks, the question next becomes whether the provision should be applied more leniently toward them. *See id.* at 118. Note that while the host country can get the exporter to carry out (and pay for) risk assessments relating to importation, risk assessments on unintentional transboundary movements are put squarely on the shoulders of the host country. Though the Protocol sets up some financial assistance mechanisms, the burden remains mostly on the individual countries.

notification. This is nothing new or surprising vis-à-vis sovereignty: under customary international law, states are already obligated to notify other countries of significant transboundary harms and to prevent or minimize such risks.[152] Liability for transboundary harms may someday affect sovereignty, but currently the issue of liability has not been resolved and remains inexistent.[153] Until the Protocol adopts strong provisions on liability, risk assessments in anticipation of unintentional transboundary movements will not change the traditional notions of sovereignty.

If a GMO is not imported and is not likely to have transboundary effects, the Protocol only requires one thing: "each Party shall *endeavour* to ensure that any living modified organism, *whether imported or locally developed*, has undergone an appropriate period of observation that is commensurate with its life-cycle or generation time before it is put to its intended use."[154] Depending on what "commensurate" means, this obligation could be quiet severe for GM trees, which have very long life-cycles and generation times. But the word "endeavour" is so soft and flexible as to nearly obliterate any affirmative requirement. Once again, the Protocol falls far short of affecting sovereignty over natural resources in any meaningful way.

Finally, it is crucial to remember that the Cartagena Protocol is only a multilateral agreement, not a universal agreement; the same goes for the Kyoto Protocol. As of April 2005, twenty-four nations that had ratified the Kyoto Protocol had not signed or ratified the Biosafety Protocol, and an additional seventeen nations party to Kyoto had only signed but not ratified the Biosafety Protocol. These include high-target developing nations for potential CDM projects, such as Argentina, Chile, China, Costa Rica, Honduras, Thailand, and Uruguay.[155] For these countries,

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[152] *Id*. at 115–16.

[153] *Id*. at 19.

[154] Biosafety Protocol, *supra* note 129, art. 16(4) (emphasis added).

[155] *Compare* U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE, KYOTO PROTOCOL STATUS OF RATIFICATION (2006), http://unfccc.int/files/essential_background/kyoto_protocol/application/pdf/kpstats.pdf, *with* Convention on Biological Diversity, Cartagena Protocol on Biosafety: Status of Ratification and Entry into Force, http://www.biodiv.org/biosafety/signinglist.asp (last visited Feb. 13, 2006). Under the Vienna Convention on the Law of Treaties, states that sign but do not ratify a treaty are still obligated to adhere to the treaty's general objective. Convention on the Law of Treaties, art. 18, May 23, 1969, 1155

even the limited or potential impacts on sovereignty under the Biosafety Protocol will not apply. But the provisions governing the CDM will apply to these countries, and to every other nation that signed and ratified the Kyoto Protocol. Thus, if the Kyoto Protocol does indeed change the international community's role in decisions about biodiversity, the change will be one of wide applicability.

IV. THE NEGOTIATIONS ON REFORESTATION

The story of the debates over the potential ban on GM trees is relevant for three reasons. First, it gives direct insight into how receptive individual countries might be to projects involving GM trees. Second, it demonstrates how involved private actors, non-governmental organizations, and the public are willing to get in supporting or protesting CDM projects that use GM trees. Third, it provides a background against which the CDM's Executive Board might interpret its responsibilities in approving or rejecting projects.

A. *Before the Debate: Nukes and Sinks*

The fate of reforestation projects under the CDM was to some degree always linked with the debate over nuclear energy. In general, the issue of what project types should be eligible for inclusion in the CDM proved so divisive that it was pushed aside for months out of fear that the controversy might destroy the entire negotiation process.[156] Some countries felt that only specified project types should be approved, or at least certain projects—like nuclear power or reforestation—should be excluded; other countries wanted to leave the decisions entirely up to whatever nation would host the CDM project in question.[157] At last, after

U.N.T.S. 331; Mackenzie et al., *supra* note 85, at 31. But recall that the Protocol's general objective was fairly weak and limited.

[156] Indeed, it nearly did, with talks collapsing in the Hague in 2000 over the broader issue of the role of carbon sinks throughout the Kyoto Protocol. Cameron, *supra* note 11, at 15.

[157] On nuclear power, the split roughly pitted the EU, small island states, and oil producing countries (arguing for exclusion) against China, India, a handful of other developing nations, and the rest of the developed world. The split was slightly different on reforestation projects. Lavanya Rajamani, *Re-Negotiation Kyoto: A Review of the Sixth Conference of Parties to the Framework Convention on Climate Change*, 2000 COLO. J. INT'L ENVTL. L. & POL'Y 201, 218–19 (2000).

months of debate, on July 25, 2001, the parties to the Kyoto Protocol set the precedent for making project-specific determinations, adopting restrictions on nuclear energy: "The Conference of the Parties agrees:. . .To recognize that Parties included in Annex I are to refrain from using certified emission reductions generated from nuclear facilities to meet their commitments [to reduce emissions]."[158] This language effectively destroys the incentives for Annex I parties to invest in nuclear energy projects in developing nations, essentially making an end-run around those countries' ability to choose for themselves whether to accept nuclear CDM projects. Precisely why this final decision to exclude nuclear energy from the CDM was reached may remain unknowable, barring an interview with each negotiator from each member state.[159] But even speculation can afford some insight and provide a useful point of comparison for the GM tree debates.[160]

Numerous powerful criticisms on environmental grounds have been raised against nuclear power The disposal of nuclear waste and the risk of radioactive contamination are commonly known problems. More specific to climate change, the preparation of uranium often involves fossil fuels and thus generates carbon dioxide. Some also believe that reprocessing spent fuel is often too expensive and technology-demanding for developing countries, and that nuclear projects ultimately divert funds from other climate change resources, like wind-based energy.[161]

However, critics of the nuclear ban have pointed out that not all projects with environmental risks and efficiency concerns were

[158] U.N. Framework Convention on Climate Change, July 16–27, 2001, *Report of the Conference of the Parties on the Second Part of Its Sixth Session, Held at Bonn*, 5/CP.6, U.N. Doc. FCCC/CP/2001/5 (Sept. 25, 2001), *available at* http://unfccc.int/resource/docs/cop6secpart/05.pdf [hereinafter *Bonn Report*]. The same language was repeated to apply to joint implementation.

[159] *See* Bowman, *supra* note 88, at 14 ("It is, admittedly, notoriously difficult to isolate with precision the political motivations underlying the adoption by governments of international legal measures in any context . . . . Where protection of the environment is concerned, it may be particularly unwise to expect these factors to be clear, consistent or uniform.").

[160] *See id*. ("[I]t should [still] be possible to identify particular instincts and attitudes which have played their part in spurring governments to action . . . .").

[161] Timothy J.V. Walsh, Note, *Turning Our Backs: Kyoto's Mistaken Nuclear Exclusion*, 16 GEO. INT'L ENVTL. L. REV. 147, 160–62 (2003). *See also*, Richard L. Ottinger & Rebecca Williams, *Renewable Energy Sources for Development*, 32 ENVTL. L. 331, 334 (2002).

banned from the CDM.[162] Wind turbines pose potentially serious environmental problems, including bird strikes, noise pollution, and eyesores.[163] Plus wind power often is not economically efficient.[164] But wind power was not excluded from CDM-eligible projects. This discrepancy suggests that something beyond the naked risk of environmental harm was perhaps at work behind the nuclear ban.[165]

Of course, nuclear power presents a much greater magnitude risk of environmental harm than wind energy, and maybe the difference is just one of degrees. But nuclear power also carries three risks that wind power does not: risks to human health, risks to international security, and risks of generating negative public opinion. The memories of Hiroshima and Chernobyl continue to make the potential health risks very tangible for the public, and it is difficult for policymakers to resist that kind of strong public influence.[166] Indeed, one of the EU's original reasons for excluding nuclear power from the CDM was to garner greater public support.[167] Even pro-nuclear countries like the United States have powerful interests in non-proliferation of nuclear weapons,[168] and the danger of countries deriving plutonium from a nuclear plant's spent fuel is not so easily dismissed.

Quite possibly though, negotiators never consciously made such distinctions as to the risks of nuclear energy. From a legal realism perspective, the nuclear ban can be explained purely as the result of a bargaining trade-off. Countries like the United States, Canada, Japan, and Australia (which, along with a few others, formed the so-called Umbrella Group) desperately wanted to count forests—both their own and the ones they hoped to plant in developing countries—toward their emissions reductions.[169] The

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[162] *See, e.g.*, Walsh, *supra* note 161, at 167.

[163] *See generally* Avi Brisman, *The Aesthetics of Wind Energy Systems*, 13 N.Y.U. ENVTL. L.J. 1 (2005) (examining objections to wind farms on visual grounds).

[164] *See* Walsh, *supra* note 161, at 168

[165] *See id.* at 167–68.

[166] Marcus Dubois King, *Harder Than Physics: Negotiating an International Regime to Limit Transboundary Consequences of Nuclear Waste Disposal*, *in* TRANSBOUNDARY ENVIRONMENTAL NEGOTIATION: NEW APPROACHES TO GLOBAL COOPERATION, *supra* note 73, at 376, 378.

[167] Rajamani, *supra* note 157, at 218.

[168] *See* King, *supra* note 166, at 385.

[169] *Summary of the Resumed Sixth Session of the Conference of the Parties to*

EU opposed this proposal, fearing such an allowance would give some of the world's largest carbon emitters an excuse to avoid making real emission cuts.[170] A deal was struck, and the Umbrella Group gave the EU their nuclear ban in exchange for some flexibility on carbon sinks. In fact, Negotiations Chair Ambassador Raul Estrada-Oyuela—a respected and effective deal-broker—was specially brought in to help shape such a compromise.[171] Debate over both nuclear power and carbon sinks was deadlocked, and some compromise was necessary to keep negotiations alive; perhaps just as easily nuclear power could have been allowed and carbon sinks banned.

This analysis of the nuclear ban debates leads to three important conclusions. First, the parties were willing to interfere with national sovereignty under the CDM in certain circumstances. Banning nuclear power robbed developing nations of their ability to decide for themselves whether to accept the risks of nuclear plants. Of course, every nation remains free to build a nuclear plant on its own if it so chooses. But with the ban, the international community definitively said that it cares deeply about the risks individual countries take on, and that so long as it's footing part of the bill, it gets to make part of the decisions. Second, this interference with sovereignty might have been justified because of strong negative public opinion, a potentially large magnitude risk to health, and international security concerns. Third, and most importantly, if the EU won its nuclear ban by trading some flexibility on the issue of carbon sinks, the EU was perhaps honor bound, even against its will, to remain flexible on future debates over reforestation, such as the debate over whether GM trees should be allowed.

B. *From Ban to Permission*

The Kyoto Protocol's Subsidiary Body for Scientific and Technology Advice was assigned the task of preparing definitions and modalities for reforestation projects under the CDM. Nations party to the Protocol were asked by SBSTA in February 2002 to submit their initial opinions on this matter, and most parties

the U.N. Framework Convention on Climate Change: 16–27 July 2001, EARTH NEGOTIATIONS BULL. (Int'l Inst. for Sustainable Dev., Winnipeg, Man.), Jul. 30, 2001, at 13.

[170] *Id.*

[171] *Id.* at 13–14.

responded with vague recommendations for how future discussions should proceed, offering few details for how the actual modalities should be structured.[172] Uruguay stood alone during this submission period by indicating a preference for use of native species;[173] no party made native-only a requirement, and GM trees were not mentioned at all. Clearly GMOs were not a priority or a contentious issue at the very start of negotiations.

By the December 2002 session of SBSTA, more parties began to address the possible environmental impacts of reforestation projects. Numerous submissions emphasized the need to protect biodiversity and adhere to the ideals of sustainable development.[174] Switzerland became the first to note that the issue of GM and alien species should be addressed, but did not specifically call for their exclusion.[175] A few other parties alluded either to a preference for

[172] *See generally* The Secretary-General, *Views from Parties on the Organization of a Workshop, Terms of Reference and an Agenda for Work Relating to Afforestation and Reforestation Activities Under the Clean Development Mechanism (CDM), delivered to U.N. Framework Convention on Climate Change, Subsidiary Body for Scientific and Technological Advice*, U.N. Doc. FCCC/SBSTA/2002/Misc.1 (Feb. 27, 2002), *available at* http://unfccc.int/resource/docs/2002/sbsta/misc01.pdf [hereinafter *Views from Parties on the Organization*].

[173] The Secretary-General, *Views from the Parties on the Organization of a Workshop, Terms of Reference, and an Agenda for Work Relating to Afforestation and Reforestation Activities Under the Clean Development Mechanism (CDM), Addendum*, ¶ 5, *delivered to U.N. Framework Convention on Climate Change, Subsidiary Body for Scientific and Technological Advice*, U.N. Doc. FCCC/SBSTA/2022/Misc.1/Add.1 (May 14, 2002), *available at* http://unfccc.int/resource/docs/2002/sbsta/misc01a01.pdf ("CDM shall give importance [sic] to projects that fulfill one or more of the following conditions: . . . (iii) use of native species . . . ."). Chile did make a reference to alien species, but in a surprising way: it implied that certain exotic species were acceptable for reforestation projects, so long as they were already long established in the project area, were not themselves pests, and did not present the risk of introducing pests. *Views from Parties on the Organization*, *supra* note 172, at 18.

[174] The strongest language came from Norway, calling biodiversity "absolutely essential" and stating that "definitions and modalities *must* ensure . . . that biodiversity is not threatened." U.N. Framework Convention on Climate Change, Subsidiary Body for Scientific and Technological Advice, Oct. 23–29, 2002, *Views from Parties on Issues Related to Modalities for the Inclusion of Afforestation and Reforestation Project Activities Under the Clean Development Mechanism in the First Commitment Period, Addendum*, 5, U.N. Doc. FCCC/SBSTA/2002/Misc.22/Add.1 (Sept. 27, 2002), *available at* http://unfccc.int/resource/docs/2002/sbsta/misc22a01.pdf [hereinafter *Views from Parties on Issues Related to Modalities, Addendum*].

[175] U.N. Framework Convention on Climate Change, Subsidiary Body for

native species or the need to mitigate potential pests, but went no further.[176] Non-parties were also invited to make submissions at this time, and the Climate Action Network called to "exclude the use of genetically modified trees or other organisms and the introduction or use of exotic species."[177] All these submissions were incorporated into an "Options Paper on Modalities for Addressing Socio-Economic and Environmental Impacts."[178] The

Scientific and Technological Advice, Oct. 23–29, 2002, *Views from Parties on Issues Related to Modalities for the Inclusion of Afforestation and Reforestation Project Activities Under the Clean Development Mechanism in the First Commitment Period, Addendum Three: Switzerland*, 13, U.N. Doc. FCCC/SBSTA/2002/Misc.22/Add.3 (Dec. 24, 2002), *available at* http://unfccc.int/resource/docs/2002/sbsta/misc22a03.pdf.

[176] Bolivia advocated prioritization of "activities that don't include deforestation or substitution of native forests." U.N. Framework Convention on Climate Change, Subsidiary Body for Scientific and Technological Advice, Oct. 23–29, 2002, *Views from Parties on Issues Related to Modalities for the Inclusion of Afforestation and Reforestation Project Activities Under the Clean Development Mechanism in the First Commitment Period*, 9, U.N. Doc. FCCC/SBSTA/2002/Misc.22 (Sept. 6, 2002), *available at* http://unfccc.int/resource/docs/2002/sbsta/misc22.pdf [hereinafter *Views from Parties on Issues Related to Modalities*]. Denmark, on behalf of the European Community, mentioned the need for tools to mitigate pests. *Id*. at 45. Uruguay wanted to give priority to projects that use native species. Malaysia expressed the need for projects to manage pests. *Views from Parties on Issues Related to Modalities, Addendum*, *supra* note 174, at 4. And Samoa, on behalf of the alliance of small island states, recommended "using a mix of indigenous species" and cited the introduction of alien species as a potential negative impact. U.N. Framework Convention on Climate Change, Subsidiary Body for Scientific and Technological Advice, Oct. 23–29, 2002, *Views from Parties on Issues Related to Modalities for the Inclusion of Afforestation and Reforestation Project Activities Under the Clean Development Mechanism in the First Commitment Period: Samoa on Behalf of the Alliance of Small Island States*, 5, U.N. Doc. FCCC/SBSTA/2002/Misc.22/Add2 (Oct. 26, 2002), *available at* http://unfccc.int/resource/docs/2002/sbsta/misc22a02.pdf.

[177] The Secretary-General, *Views from Organizations on Issues Related to modalities for the Inclusion of Afforestation and Reforestation Project Activities Under the Clean Development Mechanism in the First Commitment Period*, 1, 22–23, *delivered to U.N. Framework Convention on Climate Change, Subsidiary Body for Scientific and Technological Advice*, U.N. Doc. FCCC/WEB/2002/12 (Sept. 4, 2002), *available at* http://unfccc.int/resource/webdocs/2002/12.pdf. CAN is a global network of environmental NGOs, including the World Wildlife Fund, Greenpeace, and Friends of the Earth. *See* Climate Action Network Int'l, What Does CAN Hope to Achieve?, http://www.climatenetwork.org/pages/AboutCANInt.html (last visited Feb. 13, 2006).

[178] The Secretary-General, *Options Paper on Modalities for Addressing Socio-Economic and Environmental Impacts, Including Impacts on Biodiversity and Natural Ecosystems*, ¶ 3, *delivered to the United Nations Framework Convention on Climate Change, Subsidiary Body for Scientific and Technological Advice*, U.N. Doc. FCCC/SBSTA/2003/7 (Dec. 24, 2002),

Options Paper includes the introduction of alien species as a possible environmental impact, but does not mention GM trees despite the submissions of Switzerland and the Climate Action Network.[179] General awareness of the GM issue may have been growing, but it still was not getting much traction.

The parties met again in February 2003,[180] and by April had once more made written submissions. Now, for the first time, Norway strongly stepped forward, proposing "to exclude the use of alien species and genetically modified organisms."[181] Switzerland just repeated its previous statement of the need to address the issues of GM trees and alien species,[182] but purportedly Switzerland's off-the-record comments were much more strongly in favor of banning GMOs.[183] Still, no other parties formally and clearly joined the anti-GM call,[184] and indeed Bolivia and Uruguay dropped their language suggesting a preference for native species.[185] Perhaps the most important step at this stage in negotiations was the increased appearance of language on the host country's rights and prerogative to determine whether a project supports sustainable development.[186] This sentiment would develop more quickly and strongly than the anti-GM leanings and

available at http://unfccc.int/resource/docs/2003/sbsta/07.pdf.

[179] *Id*. ¶ 12.

[180] Chair of the U.N. Framework Convention on Climate Change, Subsidiary Body for Scientific and Technological Advice, *Workshop on Definitions and Modalities for Including Afforestation and Reforestation Project Activities Under Article 12 of the Kyoto Protocol in the First Commitment Period*, ¶¶ 6–7, U.N. Doc. FCCC/SBSTA/2003/8 (Mar. 13, 2003), *available at* http://unfccc.int/resource/docs/2003/sbsta/08.pdf.

[181] U.N. Framework Convention on Climate Change, Subsidiary Body for Scientific and Technological Advice, June 4–13, 2003, *Methodological Issues: Land Use, Land-Use Change and Forestry: Definitions and Modalities for Including Afforestation and Reforestation Activities Under Article 12 of the Kyoto Protocol: Draft Text for Modalities: Submissions from Parties*, 208, 210, U.N. Doc. FCCC/SBSTA/2003/Misc.5 (Apr. 9, 2003), *available at* http://unfccc.int/resource/docs/2003/sbsta/misc05.pdf [hereinafter *Methodological Issues*]. On the other hand, Norway also stresses a country's prerogative to determine if projects comport with sustainable development.

[182] *Id*. at 254.

[183] *See* Lang, *supra* note 43.

[184] Two parties made vague allusions: Tuvalu objected to the influx of persistent weeds and potential for "genetic erosion," *Methodological Issues*, *supra* note 181, at 268, and the EU, represented by Greece, again alluded to pest mitigation. *Id*. at 146.

[185] *Id*. at 4, 14, 273.

[186] *See, e.g.*, *id.* at 60, 98 (submissions of Chile and Columbia).

would ultimately be reflected in the final language on how GM trees would be handled.

In spite of everything, by the end of the June 2003 meeting of SBSTA, Norway and Switzerland had won enough support to include a proposed ban as a bracketed provision in the draft of the definitions and modalities.[187] It was reported that Norway had fully won at least the EU's support in opposition to GMOs.[188] Nevertheless, despite the promise of a bracketed provision, the parties remained deadlocked over this issue going into the December negotiations.[189] Suddenly, during the pre-session to the December 2003 meeting, Norway gave up the fight and dropped its proposed GM ban and more permissive language entered the text:

> [The Parties recognize that] host Parties evaluate, in accordance with their national laws, potential risks associated with the use of genetically modified organisms by afforestation and reforestation project activities and that Parties included in Annex I evaluate, in accordance with their national laws, the use of temporary certified emission reductions and/or long-term certified emission reductions generated from afforestation and reforestation project activities that make use of genetically modified organisms . . . .[190]

Without interviewing every negotiator, it may be impossible to explain precisely why the GM ban failed; but even speculative explanations can reveal how various players may react to the language adopted in its place. First, who opposed the GM ban? One report implied that United States and Argentina might have been responsible for killing the ban.[191] Additionally, China and

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[187] U.N. Framework Convention on Climate Change, June 4–13, 2003, *Report of the Subsidiary Body for Scientific and Technological Advice on its Eighteenth Session, Held at Bonn, Addendum, Part Three*, ¶ 16(e), U.N. Doc. FCCC/SBSTA/2003/10/Add.3 (July 31, 2003), *available at* http://unfccc.int/resource/docs/2003/sbsta/10a03.pdf. A bracketed provision implies that, while no consensus has yet been reached, the proposed text is a leading option for the final document.

[188] Doyle, *supra* note 35; Press Release, European Commission, Commission Confirms Quality of European GMO Legislative Framework, U.N. Doc. IP/05/355 (Mar. 22, 2005), *available at* http://europa.eu.int/rapid/pressReleasesAction.do?reference=IP/05/355&format=HTML&aged=0&language=EN&guiLanguage=en.

[189] Doyle, *supra* note 35.

[190] *Milan Addendum, Part Two*, *supra* note 7, at 19/CP.9.

[191] *See* Doyle, *supra* note 35 (juxtaposing the EU's support for a ban with the

Brazil were especially worried about any possible sovereignty infringements, and Canada feared overly complex regulations.[192] The Climate Action Network awarded "Fossil of the Day" prizes—given to countries judged to have made the worst input to the negotiations from an environmental perspective—to New Zealand, Japan, China, and Canada, for failing to speak out against GMOs in the CDM.[193] The EU was also uncharacteristically quiet, given their vocal opposition to GM crops in other contexts.[194] In short, there were many Annex I countries at least on the fence about GM trees, and possibly many that supported their use. Recall that Belgium, Canada, France, Finland, New Zealand, Norway, Portugal, Spain, Sweden, England, and Japan have all approved field tests of GM trees within their own borders.[195] At least some of these countries presumably would have been open to CDM emission credits generated from GM tree projects. Thus, GM tree projects had the necessary support from Annex I nations to become a real possibility under the CDM.

Next, why were states opposed to the GM ban? The United States and Australia disapproved of any decision that would reduce maximum flexibility under the CDM. For countries that viewed the Kyoto Protocol's flexibility mechanisms as a principle route toward achieving emissions reductions, banning any entire type of project would severely interfere with plans.[196] Moreover, the United States is deeply committed to biotechnology and would not have been eager to perpetuate what it essentially sees as Luddism.[197] A ban on GMOs not only would continue to shelter developing countries from a technology that the United States in

United States' and Australia's fondness of GMOs).

[192] *Id*.

[193] Climate Action Network, Fossil of the Day Awards, http://www.fossil-of-the-day.org/go/ (last visited Feb. 13, 2006). The United States and Australia received more than their fair share of Fossils as well. *See id.*

[194] As discussed above, the EU's submissions mostly focused on pest mitigation rather than addressing the issue of GMOs head on. *See supra* notes 176, 184.

[195] *See supra* notes 38–39 and accompanying text. The United States and Australia have also approved field tests of GM trees, but they have not ratified the Kyoto Protocol, and so cannot participate in CDM projects. *U.S. Seeks to Ease Supervision of Gene-Splicing Tests on Plants*, N.Y. TIMES, Aug. 27, 1995, at F2; Australian Office of the Gene Tech. Regulator, GMO Record, *available at* http://www.ogtr.gov.au/gmorec/ir.htm (last visited Feb. 05, 2006).

[196] Cameron, *supra* note 11, at 17, 19–20.

[197] *See* Jasanoff, *supra* note 100, at 365.

particular hopes to profit from, but also could reinvigorate the debate about banning GMOs under other international regimes, such as the WTO. Even though the United States had not ratified the Kyoto Protocol at the time of negotiations,[198] parties hoping for a United States-ratification would not want to slam the door on the very tool the United States would need in order to comply with the Protocol. If the United States and Australia played the pivotal role in reversing the ban, they probably did so not because they cared in the least about developing countries' sovereignty over their biological resources, but rather because they wanted to safeguard their unfettered use of biotechnology on the international scene.

By sharp contrast, the remaining opposition to the GM ban cared deeply about possible intrusions on state sovereignty over natural resources.[199] The bulk of this group was composed of Latin American countries, perhaps led by Brazil. Of course, sovereignty is often invoked as a disguise for other state interests, particularly economics.[200] Developing countries may not have been keen to sacrifice the influx of financial resources and technological expertise that would accompany the pricey and science-driven GM tree projects. In fact, the principle interest of developing countries at environmental conferences has traditionally been development, not sovereignty.[201] But the pure sovereignty concerns cannot be written off entirely. At the 1992 U.N. Conference on Environment and Development, developing countries earnestly expresses the fear "that [their] sovereignty over [their] forests would diminish to save the world's climate."[202] If

[198] Neither the United States nor Australia have ratified the Kyoto Protocol at this time. *See* U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE, *supra* note 155.

[199] It is unclear if Japan, New Zealand, and Canada were in the US's camp or had their own reasons for opposing the ban. If the latter is true, those reasons remain, unfortunately, largely unknown.

[200] DESAI, *supra* note 93, at 19, n.12 ("behind the screen of sovereignty we may perceive the shadowy silhouette of interests") (quoting Mohammed Bedjaoui, *On the Efficacy of International Organizations: Some Variations on an Inexhaustible Theme . . . , in* 1 TOWARDS MORE EFFECTIVE SUPERVISION BY INTERNATIONAL ORGANIZATIONS: ESSAYS IN HONOUR OF HENRY G. SCHERMERS, 7, 11 (Niels Blokker & Sam Muller eds., 1994)).

[201] *See* Adil Najam, *International Environmental Negotiation: A Strategy for the South, in* TRANSBOUNDARY ENVIRONMENTAL NEGOTIATION: NEW APPROACHES TO GLOBAL COOPERATION, *supra* note 71, at 41, 48.

[202] *Id.* at 45 (quoting Indian environmentalist Anil Agarwal); *see also id.* at 43 (quoting Ambassador Edward Kufour of Ghana as saying, "[w]e have not come here to negotiate away our permanent sovereignty over our natural resources").

these countries steered the negotiations away from the ban, the text perhaps should be read more explicitly as a pro-sovereignty stand.

Perhaps, however, Norway simply dropped the language on its own, without much prodding from either of those opposing groups. There was an urgency to reach an agreement—any agreement—on the CDM so governments and industry could begin planning for the first commitment period. "The combined lures of foreign investment and cheap emissions reduction credits ha[d] created political pressures for rapid development of rules for the CDM," and in fact the CDM began operating on an interim basis even before the Kyoto Protocol went into force.[203] SBSTA's negotiations on the CDM were driven by a "forward-moving spirit,"[204] and countries expressed concern that the proceedings moved too quickly.[205] When the reforestation modalities were finally accepted, numerous delegates alluded to how the text was pushed through despite a lack of consensus.[206]

Norway in particular may have been sensitive to that urgency.

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[203] GRUBB ET AL., *supra* note 4, at xxxix. Any CERs generated from the year 2000 until the beginning of the first commitment period could be put toward achieving compliance in the first commitment period. *Id*. at 135.

[204] Webcast: 9th Conference of the Parties, SBSTA 19, 2nd Meeting, Dec. 2, 2003 (UNFCCC Webcast), *available at* http://maindb.unfccc.int/webcast/episode.pl?id_episode=1285&time_index=00:00:00&language=English (statement by Karsten Sach, co-chair of the negotiating group on reforestation).

[205] For example, a final draft of the reforestation modalities was not even distributed for review until fifteen minutes after the December 2, 2003, SBSTA meeting (in which the modalities were debated) already began. *See id.* In a different context, the Russian Federation said: "We have said on numerous occasions in the informals that, Mr. Chairman, you have been proceeding very quickly, and sometimes we simply don't have the time to keep up." Webcast: 9th Conference of the Parties, SBSTA 19, 6th Meeting, Dec. 9, 2003, *available at* http://maindb.unfccc.int/webcast/episode.pl?id_episode=1335&time_index=00:00:00&language=English.

[206] For example, New Zealand said:

> This has been a very challenging process, and the chairs have worked extremely hard to build mutual understanding and work toward consensus. However [when it was clear] that despite their best efforts, broad consensus would not be possible on many issues, the chairs took on the responsibility to propose a way through with courage and resolve.

Webcast: 9th Conference of the Parties, SBSTA 19, 2nd Meeting, *supra* note 205. Thelam Krug, co-chair of the reforestation contact group, spoke of the great difficulties and delays that were overcome, and she looked visibly relieved when the gavel closed the final debate on the modalities. *See id.* Similarly, the SBSTA's chair called the modalities a "significant harvest" and announced that "we have a lot to celebrate tonight." *Id*.

Ever since Norway's former Prime Minister Brundtland chaired the World Commission on Environment and Development, Norway has pursued the role of a high profile international environmental negotiator, especially on issues like sustainable development and climate change.[207] This perhaps explains why Norway was the first to take a clear stand against GMOs. On the other hand, Norway faces a unique emissions problem: Norway is a large exporter of oil, even though its own energy grid relies largely on hydropower. As a result, Norway's carbon dioxide emissions come mostly from the production of petroleum, not from the production of electricity.[208] The country cannot simply reduce its carbon emissions by adopting more clean energy at home (Norway has already maximized its most efficient sources of hydroelectricity), and it cannot reduce its carbon dioxide by cutting petroleum production without devastating its economy.[209] The best option for Norway to cut emissions is to utilize the flexibility mechanisms, like the CDM. Indeed, financing climate measures in developing countries was a "key element in the Norwegian negotiating strategy."[210] Norway needed agreement on the CDM as much as any other party to the Kyoto Protocol.[211] A deadlocked negotiation was unacceptable, and the delegates surely remembered when negotiations collapsed in November 2000, largely because the United States and the EU would not compromise on carbon sinks.[212] Norway might have dropped the language preemptively, out of fear of controversy and irresolvable deadlock, simply as an effort to save the reforestation modalities (and perhaps, by implication, the CDM's overall legitimacy and workability). If the final text of the modalities was merely a product of urgency and fear, perhaps it should not be taken at face

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[207] *See* Hans Chr. Bugge, *The Kyoto Protocol and the International Energy Industry: The Norwegian Perspective*, *in* KYOTO: FROM PRINCIPLES TO PRACTICE, *supra* note 11, at 39, 39; Anne Kristin Sydnes, *Norwegian Climate Policy: Environmental Idealism and Economic Realism*, *in* POLITICS OF CLIMATE CHANGE: A EUROPEAN PERSPECTIVE 268, 268 (Tim O'Riordan & Jill Jäger eds., 1996).

[208] *See* Bugge, *supra* note 207, at 39–40.

[209] *See id*.; Sydnes, *supra* note 207, at 268.

[210] Sydnes, *supra* note 207, at 279.

[211] Norway's CDM plans surely include reforestation: Norway began financing experimental climate projects in developing countries as early as 1993, including reforestation efforts in Costa Rica. Bugge, *supra* note 207, at 47.

[212] Cameron, *supra* note 11, at 15.

value.

C. *Aftermath: NGO and Party Responses*

The anti-GM tree movement—asleep or nonexistent throughout most of the CDM negotiations—finally woke up when it was too late to do anything. The Climate Action Network handed out a score of "Fossil of the Day" awards in connection with the failed ban, but its criticisms mostly came after the text was already finalized.[213] The environmental media derided the Kyoto Conference of Parties for not banning GMOs,[214] and networks of activists sprang to life, collecting hundreds of signatures on petitions calling for an immediate rejection of GM trees from the CDM.[215] Of course, the anti-GM tree movement has not succeeded in any of its demands, and it still remains small and low profile compared to the anti-GM crop movement. But the brief flurry of activity—particularly from the Climate Action Network, which includes large NGOs like Greenpeace—indicates that environmental groups and the public at large will likely continue to take an active interest in the use of GM trees in CDM projects, even if a total ban is a lost cause.

NGOs were not the only ones who decided to speak up after debate was officially over. At its December 9, 2003 meeting, SBSTA determined to send the definitions and modalities for reforestation projects on to the Conference of the Parties for a final vote. But after that decision was made and the modalities' fate was in some sense already sealed, several parties rose to speak their minds one last time. Predictably, Norway "stress[ed] that we would have preferred stronger text, with the exclusion of alien, invasive species and GMOs in the CDM," and expressed "regret that it was not possible to get sufficient support for that."[216] But even after repeating that it is "absolutely essential to avoid negative environmental impacts on such project activities, in

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[213] *See* Climate Action Network, *supra* note 193.

[214] *See, e.g.*, Doyle, *supra* note 35; Lang, *supra* note 43.

[215] *See, e.g.*, People's Forest Forum, Global Ban on GM Trees: List of Signatories, http://elonmerkki.net/dyn/appeal/list (last visited Feb. 13, 2006). The petitions also alleged that the decision to allow GM trees in the CDM would violate the CBD. People's Forest Forum, Global Ban on GM Trees, http://elonmerkki.net/dyn/appeal (last visited Feb. 13, 2006).

[216] Webcast: 9th Conference of the Parties, SBSTA 19, 6th Meeting, *supra* note 205.

particular on biodiversity," Norway conceded that the document, on the whole, was "a good basis to start work on environmentally-sound afforestation and reforestation project activities under the CDM."[217] Norway's conflicted stance confirms the above speculation that Norway backed down not because it abandoned its commitment to excluding GMOs, but because it could not allow negotiations to collapse. Yet a new twist on this story lies in the subtext of what other parties said.

The Australian delegate expressed absolute disgust that GMOs were singled out at all, even in this seemingly permissive context:

> It is important to ensure that CDM sinks projects are environmentally effective . . . . However, we need to be careful that overly prescriptive and complex rules do not make CDM sinks projects difficult to implement. We remain puzzled as to why certain issues were singled out for specific attention, and we want to register our concern in relation to this. In our view, it is not appropriate to single out alien, invasive species and GMOs in the decision text; these issues are the subject of continuing consideration in other international fora. It is the right of host parties to determine how best to use CDM projects to achieve their own sustainable development objectives, taking into account their national circumstances, and consistent with their international rights and obligations. . . . While we didn't wish to block consensus on this issue, we do wish to register our concern.[218]

The United State's testimony echoed Australia's:[219] "We would highlight, like Australia, the provisions relating to genetically modified organisms and alien, invasive species, as inappropriately highlighted in our view. We also want to note . . . that nothing in this decision affects the applicability of

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[217] *Id*.

[218] *Id*.

[219] As to why the United States and Australia should care about the CDM, given they had not ratified Kyoto, the United States delegate said:

> I think we have seen this as a Kyoto decision, even though it is something approved by the [Conference of the Parties]. And after careful thought, we decided that though there are issues that in our mind remain unresolved and inadequately addressed, that because this is a Kyoto related issue, we would allow the decision to go forward.

Id.

other international obligations, including trade obligations . . . ."[220] If the text truly allowed countries to make whatever decisions they wanted about GM trees, these comments would seem very strange—why would these countries make such a fuss if they got their way? Perhaps Australia and the United States feared that the text may not be as permissive as it appears. Indeed, the final statements of two other parties suggest there might be some wiggle room in the text.

Canada began by emphasizing "that the provisions on GMOs in this decision must be implemented by each party in a manner consistent with all of its international obligations."[221] Of course, they might have just been referring to trade obligations, like the United States had. But Canada might have also been alluding to other multilateral environmental agreements, such as the CBD and the Biosafety Protocol. As discussed above, analysis of those agreements predicts they would in fact have little practical effect for GM tree projects.[222] Nevertheless, Canada's statement suggests that, even though the reforestation modalities affirm that individual countries make their own decisions on GMOs, some parties might be willing to read an international role into these decisions. Indeed, Canada specifically recalled that the conservation of biological diversity was an overarching goal of the CDM.[223] Canada continued its testimony by saying:

> While Canada has concerns about some of the definitions and modalities, we hope that the private sector will invest in CDM carbon sinks projects, and that the experience gained will help improve these modalities. We look forward to prompt implementation. Only through learning by doing can we build confidence in the positive contribution of carbon sinks in addressing climate change. . . . Canada notes that the Conference of the Parties can review and assess any time prior to 2011, how well the rules set out in this decision are working.[224]

In other words, Canada viewed the CDM as a learning process and saw the modalities as flexible and malleable over time. The

[220] *Id.*

[221] *Id.*

[222] *See supra* notes 111–55 and accompanying text.

[223] Webcast: 9th Conference of the Parties, SBSTA 19, 6th Meeting, *supra* note 205.

[224] *Id.*

modalities are not set in stone; they can be rewritten in the future and possibly even reinterpreted during present implementation.

Italy, speaking on behalf of the EU, made very similar comments:

> This is an important example of the significance of the United Nation process today, to having many countries converging, accepting compromises, and putting forward a concrete piece of text . . . it was really a compromise in seeking the respect of different ideas, of different parties, and so we hope that these results are considered. Again I want to stress the fact that this is a very balanced text, it's a very balanced text, it really put the middle line on many of the issues that we are discussing these days.[225]

Saying that the negotiations were difficult and filled with compromises certainly is not surprising. What is surprising is that the EU almost seems to say that the text should be interpreted in light of that complex negotiating history. In the EU's view, the negotiations were not a series of contests with alternating winners and losers, but instead were a series of true compromises incorporating multiple viewpoints, and those multifaceted results must be "respected" and "considered." Furthermore, Italy concluded by expressing how much the EU "appreciate[s] Canada in saying that this is a process of learning by doing, exactly the case where we want to see in practice how it works."[226] The implication is that the modalities do not dictate precisely how the CDM will operate; rather, the CDM will evolve in practice. That evolution is explored in the following section.

V. WHAT WILL HAPPEN TO GM PROPOSALS UNDER THE CDM

To recap, this analysis so far predicts the following: GM trees can make reforestation projects more cost-efficient, and so they are an attractive option under the CDM; there are Annex I countries that will sponsor (or will allow private entities under their jurisdiction to sponsor) such projects; there are non-Annex I countries that will be receptive to (and possibly seek out) such projects; no international agreement on biodiversity, biotechnology, forests, or trade will prevent countries from making those decisions; and furthermore the literal text of the CDM

[225] *Id.*
[226] *Id.*

reforestation modalities will not explicitly prevent countries from making those decisions. But the backstory to the CDM negotiations suggests that perhaps the text should not be read quite so literally, or at least not in a vacuum. Some parties wanted to ban GMOs. All parties at least paid lip service to protecting biodiversity and environmental integrity. So what will actually happen to a GM project submitted for approval under the CDM? Reviewing the entire history and details of the CDM would be beyond the scope of this analysis. Instead, this analysis will focus only on those most relevant aspects, and in doing so hopes to demonstrate how the international climate change regime might start to creep into national decisions about biological resources.

A. *How the CDM Modalities Are Supposed to Work*

A CDM project begins with the project developer, which may be an Annex I nation or a private actor within that nation—anyone looking to emit more than their allotment. The participation of the host nation must be voluntary, so the developing country will also be involved from early on.[227] During the design phase, if the project poses significant environmental problems, an environmental impact assessment must be completed in accordance with whatever procedures are specified by the host country.[228] The impact assessment may be conducted by either the project developer or the host country, and the host country will usually foot the bill.[229] However, the CDM modalities do not provide any procedures for impact assessments in the event that the host country has no specified requirements pertaining to impact assessments.[230] Moreover, a developing country may have an incentive to weaken requirements, making itself a cheaper and more attractive location for CDM projects.[231] Similarly, local stakeholders theoretically must be consulted during the project design,[232] and the project developer must explain how local

[227] *See supra* note 131 and accompanying text.

[228] *See Marrakesh Addendum*, *supra* note 17, at 16/CP.7, Annex ¶ 33(d).

[229] *See id.*

[230] Meijer & Werksman, *supra* note 18, at 201.

[231] *Id*. at 210.

[232] "'Stakeholders' means the public, including individuals, groups or communities affected, or likely to be affected, by the proposed clean development mechanism project activity." *Marrakesh Addendum*, *supra* note 17, at 16/CP.7, Annex ¶ 1(e).

comments were taken into consideration. But the CDM modalities do not indicate how stakeholders are to find out about the existence of a CDM proposal, let alone its possible environmental implications. Assessing environmental impacts can be an expensive process, and the local communities in developing countries will seldom have the funding or capacity to conduct such research.

The project design next must meet the approval of the designated operation entity ("DOE"). DOEs are any domestic or international organization chosen by the project participants to monitor the various stages of the project.[233] The DOEs review that the project has met all requirements, such as the requirements to solicit public comment and complete whatever environmental impact assessments the host country requires.[234] Before a DOE can validate a project and send it on to the next stage in the approval process, it must receive "confirmation by the host Party that the project activity assists it in achieving sustainable development."[235] However, a DOE's capacity to review such a confirmation is extremely limited, since the CDM modalities' preamble affirms "that it is the host Party's prerogative to confirm whether a clean development mechanism project activity assists it in achieving sustainable development."[236] The DOE also makes the project design documents available for public review and comment by all parties to the Kyoto Protocol, as well as general stakeholders and UNFCCC-accredited NGOs.[237] After the comment period expires, the DOE then must "make a determination as to whether, on the basis of the information provided and taking into account the comments received, the project activity should be validated." [238]

The DOEs' potential behavior is difficult to predict. DOEs must be certified by the CDM's Executive Board, and they must demonstrate sufficient expertise not only in general environmental

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[233] Right now, no DOEs are licensed by the CDM Executive Board to review reforestation projects. *See* UNFCCC Clean Development Mechanism, List of DOEs, http://cdm.unfccc.int/DOE/list (last visited Feb. 05, 2006) (current projects list shows that there are no current licenses for sectoral scope 14, afforestation and reforestation).

[234] *Marrakesh Addendum*, *supra* note 17, at 17/CP.7, Annex ¶ 37.

[235] *Id*. at 17/CP.7.

[236] *Id*. at 17/CP.7, Annex ¶ 40(a).

[237] *Id.* at 17/CP.7, Annex ¶ 40(b)-(d).

[238] *Id*.

and technical issues relating to the project type, but also region-specific concerns.[239] The DOEs are thus beholden to the Executive Board, and if the Board feels the DOE has committed fraud, malfeasance, or incompetence in its work, it can impose financial penalties on the DOE and can essentially strip the DOE of its status.[240] But DOEs only get work when chosen by project participants, and overly strict DOEs may find themselves as unemployed as overly lax DOEs. Ultimately, those worried about protecting biodiversity from invasive CDM projects probably should not rely too heavily on DOEs to reject risky projects.

When the DOE does validate a project, the project is sent on to the Executive Board for registration.[241] If three or more members of the Board request a review of the proposed CDM project, the fulfillment of requirements is re-analyzed, including the various requirements on environmental integrity.[242] If the outcome of such a review is negative, the Board may reject the project.[243] Such Board decisions should theoretically remain objective and politically-neutral. The CDM modalities go to extreme length to sever any potentially influential political or economic ties between the Executive Board and the Kyoto Protocol's member nations. Executive Board members are required to possess appropriate expertise, to act in their personal capacity, and to take an oath declaring they have no financial interest in any CDM projects or in any DOEs. All Board meetings are open to accredited NGO observers and are broadcast over the internet, to ensure full transparency.[244]

Reforestation projects add a few wrinkles to this general CDM project cycle.[245] The permissive language on GMOs

[239] *Id.* at 17/CP.7, Annex ¶ 20 and 17/CP.7, Annex, app. A ¶ 1(f).

[240] *Id*. at 17/CP.7 Annex ¶ 65; Meijer & Werksman, *supra* note 18, at 202–03. The Kyoto Protocol's Conference of the Parties is officially responsible for their final designation, but DOEs are accredited and recommended to the Conference of the Parties by the Executive Board. *See id.*

[241] *Marrakesh Addendum*, *supra* note 17, at 17/CP.7 Annex ¶ 41.

[242] *Id.*

[243] *Id.*

[244] Meijer & Werksman, *supra* note 18, at 206.

[245] Note that the total number of usable CERs from reforestation projects per Annex I country is limited. *Marrakesh Addendum*, *supra* note 17, at 19/CP.7, Annex ¶ 31. This limitation may reduce the chances GM reforestation proposals are ever submitted for approval. However, if science can deliver commercially successful GM trees on schedule, the limited number of reforestation projects allowed may soon be filled with GM trees.

appeared in the preamble to the reforestation modalities. But that same preamble also promised that the parties would "[take] into account the issues of non-permanence, additionality, leakage, uncertainties and socio-economic and environmental impacts, *including impacts on biodiversity* and natural ecosystems."[246] Similarly, the preamble to the general provisions on the CDM "emphasiz[ed] that clean development mechanism project activities should lead to the transfer of *environmentally safe and sound technology* and know-how."[247] These provisions deserve equal weight as the GMO language. Thus, the Executive Board must take into account impacts on biodiversity even while respecting the right of host nations to determine their own risks levels and plans for sustainable development. And the Board must balance the risks of GMOs against the command to promote "safe and sound technology." How the Executive Board might in practice strike these balances is the subject of the next section.[248]

B. *How the CDM Modalities Might Actually Work*

The CDM requires that developing countries voluntarily approve the projects within their borders, certify that the projects are consistent with sustainable development, and assess any significant risks according to their own domestic laws. If developing countries have sophisticated mechanisms for making such certifications and assessments, the Executive Board may feel uncomfortable intervening in any way, since these issues are supposed to be left up to the host country's prerogative. This supposed deference is all the more explicit for decisions about GMOs.[249] But, in fact, many developing countries will have inadequate procedures for making these types of determinations.

Before a CDM project can be appropriately managed, a country needs the ability to maintain stable investment conditions, to collect massive amounts of scientific information, to set and

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[246] *Marrakesh Addendum*, *supra* note 17, at 19/CP.7 (emphasis added).

[247] *Id.*

[248] If a project is approved and takes effect, the developer must continue to monitor the environmental impacts, and the DOE verifies this monitoring. If everything goes as planned, the Executive Board will issue credits ("CERs") to a successful CDM project. There are some chances for public and international roles at these stages of the project cycle, *see* Meijer & Werksman, *supra* note 18, at 198, but this analysis will concentrate on the steps leading up to registration.

[249] *Marrakesh Addendum*, *supra* note 17, 17/CP.7, 40(a), 19/CP.9 pmble.

enforce national priorities, to process and act on complex data with efficiency, and to monitor private actors and bring them into compliance.[250] To generalize, the domestic environmental regimes of developing countries suffer from a lack of capacity, resources, and motivation, and will be unable to meet most of these goals. Many developing nations "are still struggling with core issues such as adequate and coherent law and policy formulation, elimination of overlap and coordination amongst administrative bodies, and insufficient monitoring and control capabilities due to scarce economic and human resources."[251] Environmental issues often fail to generate enough political or scientific interest, losing out to development priorities. When the environment does attract attention, funding is in short supply and administrative resources are thinly spread.[252]

To analyze specific countries, Argentina, for example, does not even have a framework environmental statute and, as a result, environmental regulation—to the extent it exists—is mainly sectoral.[253] Some environmental impact assessment regulations exist for the energy industry, but "emphasis falls on the 'enlightened self-interest' of private sector operators and market competition as the best means for achieving . . . emissions' abatement."[254] Much of Argentina operates in a regulatory vacuum: agencies rarely follow up on enforcement efforts, assuming the agency even knows it is responsible for enforcement.[255] The Argentina Office of Joint Implementation, which will oversee CDM projects, is only beginning to build some transparency into project certification,[256] and the country has not finished collecting basic data on its overall level of carbon

[250] Lila Katz Barrera-Hernández, *Implementation of the Kyoto Protocol and the International Energy Industry: Legal Implications. Latin American Region—Part I*, *in* KYOTO: FROM PRINCIPLES TO PRACTICE, *supra* note 11, at 225, 227.

[251] *Id*. at 251 (discussing the implications of Kyoto for Latin American countries).

[252] *See* Laurent Renevier & Mark Henderson, *Science and Scientists in International Environmental Negotiations*, *in* TRANSBOUNDARY ENVIRONMENTAL NEGOTIATION: NEW APPROACHES TO GLOBAL COOPERATION, *supra* note 71, at 107, 114.

[253] Barrera-Hernández, *supra* note 250, at 229–30.

[254] *Id.*

[255] *See id.* at 232–33.

[256] *See id*. at 231.

emissions.[257] Argentina's Forest Ecosystem Report for the CBD has assigned a "low" priority to biodiversity.[258] Argentina has "limited" resources available to pursue a program increasing forest biodiversity, has not attempted to integrate policy on a national level, has not incorporated the interest of indigenous peoples, and has taken only "minimal" activity to control such threats as invasive species.[259]

Even seemingly better-prepared countries may have trouble. Brazil has "a highly developed set of environmental laws," including specific environmental impact assessment requirements for most activities that may degrade the environment.[260] Brazil has also denounced the "systematic harassment" experienced by its forestry industry "at the hands of 'external interests' interested in the possibility of proving resources for the execution of [Kyoto] projects."[261] The nation also boasts an established commission on sustainable development and another on climate change, which will control CDM projects in Brazil.[262] However, Brazil's information gathering efforts contain severe gaps,[263] its environmental agencies are often restructuring and in a state of flux, and enforcement authority is not always clearly provided in law.[264] Thus, even the best-prepared developing countries may not be able to offer sophisticated analysis of the risks of CDM projects.

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[257] *See id*. at 231–32.

[258] MINISTERIO DE DESARROLLO SOCIAL Y MEDIO AMBIENTE, INFORME TEMATICO SOBRE ECOSISTEMAS FORESTALES 3 (2001), *available at* http://www.biodiv.org/doc/world/ar/ar-nr-fe-es.pdf.

[259] *See id.* at 3–6. On their Forest Ecosystem Reports, China and Mexico do a bit better, having taken "limited" and "significant" action respectively, as opposed to "minimal" action; but most developing nations have not even filed a report. *See* INT'L COOPERATION DEPT., STATE ENVTL. PROT. ADMIN., THEMATIC REPORT ON FOREST ECOSYSTEMS 6 (2001), *available at* http://www.biodiv.org/doc/world/cn/cn-nr-fe-en.pdf (China); SECRETARÍA DE MEDIO AMBIENTE Y RECURSOS NATURALES, UNIDAD COORDINADORA DE ASUNTOS INTERNACIONALES, THEMATIC REPORT ON FOREST ECOSYSTEMS 8 (2001), *available at* http://biodiv.org/doc/world/mx/mx-nr-fe-es.pdf (Mexico). To review the Forest Ecosystem Reports for other countries, see Convention on Biological Diversity, National Reports: Thematic Report on Forest Ecosystems, http://www.biodiv.org/reports/list.aspx?type=for (last visited Feb. 14, 2006).

[260] Barrera-Hernández, *supra* note 250, at 236–37.

[261] *Id*. at 234 n.43.

[262] *See id*. at 239–40.

[263] *See id*. at 240.

[264] *See id*. at 241.

Most of the developing world will face similar problems. Mexico does not possess the information-gathering resources necessary for proper implementation of the CDM.[265] Bolivian environmental laws set unrealistic goals,[266] especially given a lack of agency coordination and lack of sufficient resources and trained personnel for implementation.[267] Venezuela's environmental laws are mostly outdated.[268] Despite recent efforts to reverse the trends, Indonesia and Thailand's environmental agencies for decades stood by and witnessed massive illegal deforestation.[269]

Perhaps the most disturbing case is China. As mentioned above, China allegedly planted millions of GM poplars in a colossal anti-desertification effort.[270] The exact number of poplars released is not known because China lost track of both the exact count and exact location of the poplars.[271] In short, China does not know where its GM trees are or whether they are reproducing and spreading in the wild, possibly headed beyond its own borders.[272] This hardly instills confidence in developing countries' ability to manage GM reforestation projects.

The environmental community took notice of China's poor recordkeeping,[273] and the incident is sure to add fuel to the anti-GM movement that has been growing ever since SBSTA dropped

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[265] *See id*. at 248–49 (stating that "only fifty cities in Mexico have at least one air quality monitoring station").

[266] *See* Carolina González de Armas, *Implementation of the Kyoto Protocol and the International Energy Industry: Legal Implications. Latin American Region—Part II*, *in* KYOTO: FROM PRINCIPLES TO PRACTICE, *supra* note 11, at 253, 254.

[267] *See id*. at 255–56.

[268] *See id*. at 261.

[269] *See* Gillian Triggs, *The Kyoto Protocol and the Energy Industry: Australia and the Asia-Pacific*, *in* KYOTO: FROM PRINCIPLES TO PRACTICE, *supra* note 11, at 299, 322–23; *see generally* ENVTL. INVESTIGATION AGENCY, TIMBER TRAFFICKING: ILLEGAL LOGGING IN INDONESIA, SOUTH EAST ASIA AND INTERNATIONAL CONSUMPTION OF ILLEGALLY SOURCED TIMBER (2001), *available at* http://www.salvonet.com/eia/old-reports/Forests/Reports/timber/timber.pdf; CHRIS BROWN ET AL., ASIA-PACIFIC FORESTRY COMM'N, FAO REGIONAL OFFICE FOR ASIA AND THE PACIFIC, FORESTS OUT OF BOUNDS: IMPACTS AND EFFECTIVENESS OF LOGGING BANS IN NATURAL FORESTS IN ASIA-PACIFIC: EXECUTIVE SUMMARY (2001), *available at* http://www.fao.org/docrep/003/x6964e/X6964e00.htm#TOC.

[270] *See supra* note 82 and accompanying text.

[271] *See* Press Release, Sam Burcher, Inst. of Sci. in Soc'y, *supra* note 82.

[272] *See id.*

[273] *See id*.

the ban on GMOs. International environmental NGOs that have long demonstrated an active opposition to GM trees have the funding and energy to monitor CDM projects that are up for validation and to comment on these proposals. They may also support or alert local stakeholders, giving them the knowledge and resources to comment during the project design phase. Even in international treaties that do not give NGOs a formal role for comment, such groups are often capable of mobilizing public opinion and forcing some level of compliance by serving as general watchdogs;[274] in a regime that explicitly gives NGOs several opportunities for formal comment—like the CDM does—this role will be further strengthened. Fierce opposition to GM reforestation proposals (especially the first such proposal) should be anticipated.

Thus when the Executive Board reviews a GM reforestation proposal, it will see harsh criticisms from NGOs, which will probably detail the various risks to biodiversity in the host country. It will also be fully aware of the various deficiencies in the host country's domestic legal regime for monitoring and responding to such risks if they arise. The Executive Board will know that reforestation modalities prescribe a general respect for and protection of biological resources. Of course the Board cannot ignore the modalities' call to respect a host country's sovereignty. But since many members of the Executive Board were involved in the negotiations of the CDM modalities,[275] they will also be intimately familiar with the details of the negotiations. They will know the compromises behind the language and the potential for reinterpretation. Although host countries get to evaluate their own risk, the language never says the decision stops there. The decision stops at the Executive Board, which must also consider whether the project has sufficiently taken into account impacts on biological diversity. The Executive Board will know that the CDM modalities have not hesitated to interfere with national decisions about risk before (as with nuclear power), and so they may not hesitate to do it again when necessary. Indeed, the Executive Board has refused to act as a mere rubberstamp; the Board and its expert advisors have already taken a critical eye to reforestation proposals, applying strict standards to review the way

[274] *See* Bowker & Castellano, *supra* note 127, at 233.

[275] *See* Meijer & Werksman, *supra* note 18, at 205.

a proposal deals with issues like additionality and leakage.[276]

Assuming the Executive Board will so interpret their responsibilities, what specific actions could it take on GM reforestation proposals? It is unclear whether the Board could base a rejection purely on a project's failure to meet the Board's own interpretation of the preamble's call to protect against impacts on biodiversity. But the Board explicitly can reject a project for failure to meet the requirements for validation and registration, which include identifying environmental impacts, describing measures to prevent or mitigate significant impacts, and taking due account of public comments. If any three members of the Board (not even a majority is necessary) believe that the project failed on any one of these counts, the project may be reviewed and rejected.[277] Consider for example the discretion the Board has in interpreting the last criterion: "due account" has not been defined,[278] and the Board could determine that any project using GM trees in a way that will impact biodiversity has not taken due account of public comments objecting to the use of GM trees. Of course, whether the Board will take such actions depends on who is on the Board and their own opinions on GM trees and on their power as Board members. But the mere fact that the Board theoretically has the power to reject projects for such reasons is remarkable, even if it never wields that power.

The Board does not have to reject all projects using GM trees to promote the interests of biodiversity. Proposals that specifically build in biodiversity protections may meet approval. For example, reforestation projects using GM trees with herbicide resistance could provide for the preservation of herbicide-free "glades" or

[276] *See, e.g.*, UNFCCC, CDM: PROPOSED NEW A/R METHODOLOGY, A/R WORKING GROUP RECOMMENDATION TO THE EXECUTIVE BOARD, F-CDM-AR-NMAR ver 01 (2004), *available at* http://cdm.unfccc.int/Panels/ar/ARWG02_repan2.pdf (demonstrating the level of detail and precision the Board requires before approving an applicant's methodology for measuring emissions).

[277] *Marrakesh Addendum*, *supra* note 17, at 17/CP.7, Annex ¶ 41. The Board has ten members and ten alternates. UNFCCC, CDM: Board Members, http://cdm.unfccc.int/EB/Members (last visited Feb. 24, 2006).

[278] Note that the guidelines specifically drafted by the Executive Board for complying with the requirements for reforestation projects do not offer any elaboration. *See* UNFCC, CDM EXEC. BOARD, GUIDELINES FOR COMPLETING CDM-PDD, CDM-NMB AND CDM-NMM, VERSION 4 (2005), *available at* http://cdm.unfccc.int/Reference/Documents/Guidel_Pdd/English/Guidelines_CDMPDD_NMB_NMM.pdf.

"reservoirs" in which weeds and other native species could flourish.[279] Instead of monocultures, GM forests could include multiple species, which not only would directly increase biodiversity, but also would provide a greater range of tree architecture and food resources for other animals and plants.[280] The existence of such options may make the Board all the more likely to reject GM projects that do not make the effort to protect biodiversity.

Of course, even if the Board does reject GM reforestation proposals, developing countries can still release GM trees—and any other GMO for that matter—whenever they want; they just will not get funding for such projects under the CDM. Nevertheless, the CDM modalities are revolutionary. Through them, the international community can say that even if the risk to biodiversity is contained wholly within a country's own borders, sometimes national sovereignty is not the final word—sometimes, the international legal regimes and the international public will have a voice as well. Sometimes the international community's interest in protecting biodiversity can trump a nation's independent decisions about risk. National sovereignty over natural resources will live on, largely intact. But through the CDM's Executive Board, the international community can—perhaps for the first time—exert real control over some of those precious resources.

CONCLUSION

The woods are lovely, dark and deep,
But I have promises to keep,
And miles to go before I sleep,
And miles to go before I sleep.
—Robert Frost, *Stopping by Woods on a Snowy Evening*[281]

[279] *See* Brian Johnson & Keith Kirby, *Potential Impacts of Genetically Modified Trees on Biodiversity of Forestry Plantations: A Global Perspective*, *in* THE BIOENGINEERED FOREST: CHALLENGES FOR SCIENCE AND SOCIETY, *supra* note 27, at 190, 191.

[280] *See id*. at 191.

[281] Frost, *supra* note 1, at 82.

The debate over GM trees in the CDM has come a long way already, but the journey is not yet complete. The parties to the Kyoto Protocol have bound themselves to a promise: "the treatment of land use, land-use change and forestry project activities under the clean development mechanism in future commitment periods shall be decided as part of the negotiations on the second commitment period."[282] In short, everything analyzed above—the negotiations, the debates, the reinterpretations—may be repeated again in the not-so-distant future, in preparation for the second commitment period beginning in 2012. What should be done in this second round of negotiations?

This analysis suggests that GM trees could be a remarkable weapon in the fight against climate change; but they also could be a terrible threat to the preservation of biodiversity. The actual fate of GM trees remains to be seen. And depending on how quickly or slowly the science progresses, that fate may not be seen until long after the second commitment period has begun. Indeed, the few current proposals for CDM reforestation projects call for the use of native species—GM trees are not yet ready.[283] But this analysis suggests that once GM trees are ready, the CDM modalities already contain safeguards to protect biodiversity against such threats, even in the absence of an absolute ban. If this analysis is correct, a ban is unnecessary and perhaps even undesirable, since future, carefully designed applications of GM trees might present fewer risks to biodiversity. Therefore, participants in the next round of negotiations should not worry about banning one potential threat to biodiversity that may never materialize. Instead, these negotiations should focus on further strengthening the environmental safeguards already in place: the ability of local stakeholders to comment, the need to conduct environmental impact assessments, the power of the Executive Board to review and reject inadequate projects. It is through such mechanisms that the international community can best assert its interest in biodiversity, and, in doing so, ensure that the forests of the globe will remain lovely, dark, and deep.

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[282] *Marrakesh Addendum*, *supra* note 17, at 17/CP.7 ¶ 7(c).

[283] *See, e.g.*, UNFCC, *supra* note 276, at 4