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Chapter 14

GLOBAL TRADE, LOCAL ECONOMIES, AND THE BIODIVERSITY CONVENTION

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The Convention on Biological Diversity represents one of the international legal system's initial efforts to unite economic and environmental issues in a relatively balanced way within a single legal instrument.¹ In fact, the Biodiversity Convention is one of the most ambitious attempts in any legal system to integrate environmental goals with a wide range of economic sectors.

The Biodiversity Convention's provisions on trade in "genetic resources"—one of the economically valuable aspects of biodiversity—embody an innovative approach to the interplay of trade and environmental concerns. These provisions are based on the principle that trade in genetic resources must take place within a framework of rules which ensure that not only the trade but the overall production process of which it is part are sustainable. Thus while the convention is ordinarily considered a part of international environmental law, it can also be viewed as a sustainable trade agreement. As such, it should be a useful reference point and precedent in the future evolution of trade law.

Particularly innovative are the Biodiversity Convention's provisions requiring countries to take special measures to protect customary resource uses and local and indigenous communities' traditional knowledge, innovations, and practices, where they carry on sustainable traditions. These provisions reflect an understanding that local economies—especially local economies where long-standing residents use natural resources according to customary rules that take into account ecological constraints—can be more sustainable than

the expanding global economy. They also help to affirm indigenous peoples' moral and political claims to lands, natural resources, and knowledge.

International trade law has given almost no consideration to environmental protection, sustainable use and development, or the rights and needs of indigenous communities within nation-states. A great American legal theorist once argued, however, that there is an inherent drive—however “sluggish” or “faint-pulsed”—that pushes even the most “wrong-headed and arbitrary legal system” closer to an “ideal of justice.”² In the Biodiversity Convention, international law takes a step, however tentative, toward justice in the fields of economic and environmental regulation—justice with ecological and economic dimensions. The future challenge for activists, lawyers, and governments is to put the convention's innovative ideas into practice, in both international and national law.

THE BIODIVERSITY CONVENTION

The Biodiversity Convention is one of the crop of international agreements on sustainable development harvested at the Earth Summit at the close of the UN Conference on Environment and Development in Rio de Janeiro in June 1992.³ The convention has been signed by over 170 countries and ratified or acceded to by over 120, plus the European Economic Community.⁴

The convention defines biodiversity as “the variability among living organisms from all sources, including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.” This broad definition encompasses the diversity of life found in all natural habitat as well as habitat modified by humans. It also includes the genetic diversity of varieties and breeds of domesticated species, such as wheat, apples, or cattle.

The convention recognizes “the importance of biological diversity for . . . maintaining life sustaining systems of the biosphere” and also acknowledges that “conservation and sustainable use of biological diversity is of critical importance for meeting the food, health and other needs of the growing world population.” The convention defines biodiversity's “value” broadly. It recognizes that biodiversity has intrinsic value and that biodiversity “and its components” have “ecological, genetic, social, economic, scientific, educational, cultural, recreational and aesthetic values.”

The Biodiversity Convention has three objectives: the conservation of biodiversity; the sustainable use of its components; and the equitable sharing of the benefits from the use of genetic resources (including both technologies and financial benefits). The convention provides for three interrelated types

of action to accomplish its objectives: implementation by parties through national law and policy; creation of an international structure to support national implementation and international cooperation; and establishment of a new set of rules for international transfers of genetic resources.

National implementation. The Biodiversity Convention requires parties to take a comprehensive set of broadly defined actions at the national level to achieve conservation and sustainable use. For example: parties must create national plans, strategies, or programs for biodiversity conservation; inventory and monitor the biodiversity within their own territories; identify destructive human activities, monitor their effects, and regulate them to reduce the impact on biodiversity; and integrate consideration of biodiversity conservation into national decision making.⁵ Because some threats to biodiversity transcend national frontiers, the convention also requires parties to cooperate on "matters of mutual interest" relating to conservation and sustainable use, such as conservation of biodiversity in areas outside national jurisdiction like the high seas. Recognizing that biodiversity conservation and loss will vary widely among and within countries, the convention defines most obligations in general terms to give parties flexibility in how they implement them.⁶

International structure. The Biodiversity Convention sets up an international structure to support national implementation and to promote continued international cooperation. The convention has a permanent secretariat and a Subsidiary Body on Scientific, Technical, and Technological Advice (SBSTTA). It will have an information clearinghouse to support scientific and technical cooperation. The parties meet periodically in Conferences of the Parties to elaborate the convention—for instance, by negotiating protocols (follow-up treaties on specific issues). Each party must submit reports to the Conferences of the Parties on the steps it has taken to implement the convention.

The international structure also includes a multilateral fund, funded by contributions from developed countries, that will help finance implementation of the convention in developing countries.⁷ Conservation of biodiversity benefits the entire world, but achieving conservation will be more difficult for developing countries, where most known biodiversity is found. In the convention, developed countries agreed to shoulder a heavier share of the financial burden of achieving the shared benefits of biodiversity conservation.⁸

Genetic resources trade. The Biodiversity Convention sets up a new regime for the international transfer of "genetic resources," which are defined as "genetic material of actual or potential value."⁹ The convention affirms each party's sovereign right to control access to its genetic resources, but requires each

party to take steps to facilitate access for other parties to its genetic resources. It also requires the users of genetic resources to share equitably the benefits, including technologies, with the providers of those resources.

The genetic and chemical structures found in diverse species, and varieties of species, are an extremely valuable source of products such as pharmaceuticals, biotechnology products and processes, and new varieties of crops.¹⁰ Scientists discovered the anticancer drug taxol in the bark of the Pacific yew, a tree previously considered to have no commercial value, that grows in the Northwest ancient forests. The hybrid varieties that yield bumper corn crops in the United States depend on traditional varieties or wild relatives of corn found in Mexico for resistance to disease or drought. The aggregate value of biodiversity as a present and future source of genetic and chemical information is difficult to measure, but clearly immense.

The convention uses the term "genetic resources" to refer to this aspect of biodiversity—biodiversity as a source of valuable information.¹¹ Previously, biodiversity information was considered a "common heritage" of humankind, exchanged freely among the countries of the world and owned by none. A number of developing countries became concerned, however, that they were donating their wealth of genetic resources freely but were receiving in return a disproportionately small share of the benefits from its use.¹²

The outcome of ensuing international discussions was the Biodiversity Convention's new rules for the transfer and use of the information content of biodiversity. The convention affirms that each country has control over access to its genetic resources—a step toward ownership of property, although in legal terms not precisely the same thing. It also provides for a measure of local community control over access to certain resources. The convention does not, however, abandon entirely the principle that there should be a degree of freedom of access to genetic resources. Thus parties agree to take steps to facilitate access to genetic resources by other parties. Articles 15, 16, and 19 require parties to ensure that users of genetic resources share the benefits, including technologies, with the providers of the resources.

One rationale for the shift to the new regime is that it is just and equitable for countries to own their genetic resources in the same way they own other natural resources such as oil or timber. Adding to the weight of this argument, there is strong evidence that individuals and communities in many societies have labored to conserve, modify, and improve genetic resources. In other words, many genetic resources are not just "found" in developing countries; they were made there, through human effort.

Finally, the new regime is also intended to help achieve sustainable development that uses biodiversity without depleting it. Agricultural scientists have collected seeds from Third World farmers' fields in gene banks, but the most reliable way to conserve them is on site. Tropical rain forests and coral

reefs are treasure troves of yet-undiscovered species of value that will not survive if their habitat is destroyed. Increasing the benefits to those who possess biodiversity is necessary to create an economic incentive for them to conserve it.

AN INTEGRATED APPROACH TO TRADE AND ENVIRONMENT

The Biodiversity Convention is innovative in that it is simultaneously a conservation agreement and a trade agreement. Conventional trade agreements treat the environment or conservation as marginal concerns when they mention them at all.¹³ They tend to view international trade in isolation from other human activities and detached from its environmental consequences.¹⁴ They show almost no regard for other considerations, such as environment, conservation, labor rights, human rights, public health, or worker safety. Indeed, trade agreements are drafted as if trade were not just the optimal means but the sole means of improving human welfare. Compounding the problem, the international legal system lacks mechanisms for linking trade agreements with instruments that cover these other issues.

A number of previous multilateral environmental agreements do link environment and trade, generally by restricting certain categories of trade to accomplish environmental or conservation goals. The Convention on International Trade in Endangered Species (CITES), for instance, provides for special treatment of certain products on environmental grounds.¹⁵ It sets up a system in which parties to the treaty agree to ban substantially all trade in products made from species that are listed as being in danger of extinction because of that trade. Consistent with this, CITES parties have banned the ivory trade because it led to huge declines in populations of African elephants. CITES and other multilateral environmental agreements demonstrate broad-based international understanding that trade must be controlled in certain circumstances to ensure that it does not damage the environment or natural resources.¹⁶ In sum, then, trade agreements treat environmental concerns as marginal and view them with suspicion, as potential obstacles to the overarching goal of free trade, whereas multilateral environmental agreements like CITES tend to place limits on trade that menaces environmental goals such as preservation of endangered species.

The Biodiversity Convention takes a different approach to trade and environment.¹⁷ In contrast to the neoclassical economic view of past trade agreements, the convention recognizes the principle of ecological economics that "the ecosystem contains the economy."¹⁸ Thus the convention places trade squarely within its ecological context. While affirming the value of the genetic resources trade, the convention insists that trade be sustainable

within the context of a sustainable process of production. Genetic resources are the raw material for "a process of production that extends from rainforests and coral reefs to drugstores, factories, and supermarkets."¹⁹ The Biodiversity Convention establishes basic rules for each stage of that process, rather than banning it altogether.

The first stage of commercial use consists of "prospecting" for useful genetic resources in the wild or in farmers' fields. This stage is covered by Article 10(b), which requires parties to take measures, "as far as possible and as appropriate," to avoid or minimize harm to biodiversity from "the use of biological resources." Biological resources under the convention include genetic resources and any other living component of ecosystems that is valuable for humanity, such as fish or timber. As we shall see, Article 8(j) also requires prospectors to involve local and indigenous communities.

In later stages in the process, a company or government in one country gains access to the genetic resources in another country and then uses them in research and development. Under Article 15(2), a convention party must take steps to facilitate access to its genetic resources, but only for "environmentally sound uses." In other words, the intended end use—in biotechnology, pharmaceuticals, or crop breeding—must not harm the environment, a key tenet of sustainability. As the power of biotechnology to create radically new organisms increases, this tenet will grow in importance. It is becoming easier and easier to transfer genes among widely different organisms that would never interbreed in nature. Corporations are now developing tomatoes that include genes and traits from flounders, for example. While the range of resulting products have tremendous productive potential, they also pose unprecedented environmental risks. To deal with these risks, parties must comply with the convention's requirement that uses of genetic resources be environmentally sound.

LOCAL ECOSYSTEMS AND THE GLOBAL ECONOMY

Genetic and biological resources, as they exist today in the hands of farmers, pastoralists, hunters, and gatherers, are not only valuable as raw materials for the manufacture of new commercial commodities. They are also essential as the means of production and reproduction in local economies that are relatively well integrated into local ecosystems.²⁰

Local people in these economies depend on a wide range of ecological and economic values of genetic and biological resources. Their gardens, farms, and surrounding areas include many different species and many varieties of species, which provide long-term stability in the face of climactic variation, crop diseases, and other changes, while also producing a range of valuable

products. Often they manage these local biological resources under traditional rules and institutions that take into account ecological constraints. For local economies, diversity is "the basis and foundation of production and economic activity, not merely an 'input.'"²¹ Diverse biological resources produce not only for subsistence and local markets but also for equally important nonmarketable ecological services (such as protection of water quality and flood control) as well as aesthetic, cultural, and spiritual values.

Larger scale markets generally do not capture the value of genetic and biological resources to local economies and tend to overstate the net benefits of long-distance trade.²² Similarly, most trade agreements, such as the General Agreement on Tariffs and Trade (GATT) and the North American Free Trade Agreement (NAFTA), are deliberately intended as legal tools for maintaining and expanding the field of operations for the global economy, regardless of the costs to local economies, however sustainable they may be. They help corporations move commodities to the most lucrative market for consumption and move capital to the cheapest site for production. Values of the environment and the community that are not commodified receive no consideration. Indeed, under the logic of free trade, a country gains a "comparative advantage" if it can produce goods more "efficiently" by lowering its environmental standards so that producers do not have to go to the expense of curbing pollution.

This conventional approach to trade is also inherently unsustainable in that it depends on constantly expanding extraction of resources and consumption and production of goods, which brings it up against fixed ecological constraints.²³ At the global level, this increase in extraction, consumption, and production correlates with an increase in the distance between consumers and producers.²⁴ When consumers and producers are separated by thousands of miles, the social connection between them is reduced to a minimum. It consists primarily of the economic relationship of the transfer of a commodity for value plus a legal connection through a trade law regime that requires nothing except deregulation of trade. International law and institutions lack the rich array of procedures, standards, and concepts needed to create links of communication and responsibility. Thus it is nearly impossible for one party to hold others accountable for environmental costs.

In contrast, many local economies are accustomed to operating within the constraints of local ecosystems and have evolved methods for dealing with them. Producers and consumers are more likely to live close to the means of production and thus are less able to "externalize" costs onto others. Sometimes they are the same individuals, or have bonds of kinship or marriage, and in any case they tend to live close together in the same community, all of which tends to increase accountability. While some of these communities

may have engaged in long-distance trade for centuries, they often have developed traditions that minimize its impact on their environments.

This discussion is not intended to romanticize non-Western or nonindustrial cultures. Those cultures, too, cause biodiversity loss, especially as their populations grow. And they, too, often seek some of the benefits of the industrial economy. But their traditional economies and styles of life are in many cases far more consistent with conservation than those of industrial society. As we shall see, the Biodiversity Convention could lead the way to legal recognition of this fact—which would be a major sustainable step forward in the context of international trade law.

PROTECTING LOCAL ECONOMIES AND ECOSYSTEMS

The Biodiversity Convention's treatment of local and indigenous communities is perhaps the most innovative aspect of the attempt to synthesize trade and environment. These provisions of the convention could lead to the recognition in international law of the value that cultural—and economic—diversity may have for sustainable development. Here two provisions are particularly relevant to the role of local traditional economies under pressure from the expanding global economy: Articles 8(j) and 10(c).²⁵ The discussion of Article 8(j) focuses on implementation of these provisions in the context of the genetic resources trade. Article 10(c) discusses an analogous analysis of how it should be integrated into regulation of the use of other biological resources (such as fisheries, forests, and farms).

Article 8(j). Article 8(j) of the Biodiversity Convention requires parties, “as far as possible and as appropriate,” to take measures to “respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for . . . conservation and sustainable use.”²⁶ Parties must also “promote [the] wider application” of such knowledge, innovations, and practices.²⁷ Article 8(j) also requires that governments obtain the indigenous and traditional communities' approval for this wider application and that they encourage fair sharing of benefits with those communities.

These requirements are relevant to the genetic resources trade, because many of the world's genetic resources are themselves innovations of indigenous and local communities. Their existence and conservation today are the result of the long-term application of traditional knowledge and practices by indigenous or local communities. For generations up to the present day, these communities may have husbanded and modified the genetic resources used

to create a patented plant.²⁸ In other cases, traditional knowledge may have provided a lead to discovery of a valuable patented product.²⁹

Those who take genetic resources under Article 15 from the territories of indigenous and local communities must therefore ensure the communities' prior approval and involvement. Governments must also encourage equitable sharing of the benefits with those communities whenever they encourage the wider application of the use of genetic resources—for instance, when they encourage or enforce “biodiversity prospecting agreements” with pharmaceutical companies seeking leads to new products.

There are a number of specific ways to implement these general requirements. First of all, governments should recognize the legal right of communities to make and enforce contracts for access to resources with commercial firms, so that the communities have a chance to reap a larger share of the benefits.³⁰ Moreover, they should consult with these communities on establishing minimum standards for such transactions. Governments should also explore whether to create new types of intellectual property rights (IPRs) to be held by indigenous and local communities over their genetic resources and knowledge about them.³¹ Governments could also consider affording legal protection to trademarks or certificates of origin for sustainably produced traditional products. This would permit communities to profit from sustainable use without facing unfair competition from misleadingly similar products that are not traditional and may not be sustainable. Another option would be to provide grants to local and indigenous communities to conduct (possibly in partnership with scientists) assessments of the sustainability of traditional practices or to develop small-scale sustainable enterprises based on traditional uses that are sustainable. Finally, governments could also implement these provisions by reforming systems of national accounting to account for a larger proportion of the value of nonmarket ecological values as well as local market and subsistence values of biodiversity-rich ecosystems.

Article 10(c). Article 10(c) requires parties, “as far as possible and as appropriate,” to “protect and encourage customary use of biological resources in accordance with traditional cultural practices that are compatible with conservation or sustainable use.” To satisfy the mandate of Article 10(c), governments should extend legal recognition and protection to traditional systems of resource management where they effectively promote sustainable use. These systems should have protection against incursions from competing users of resources, for instance by giving villages and citizens the legal right to enjoin outside users and recover damages from them for violations. Management systems warranting protection could include, for example, traditional land tenure or usufruct rights or village taboos on use of sacred groves.

Particularly worthy of attention are communal systems for regulating access to common resources. Privatization, which is often offered as the solution to the "tragedy of the commons" caused by open-access regimes, is not a sure route to sustainability. (Private ownership of midwestern farms has not stopped soil erosion.) Indeed, it can worsen environmental problems as well as increasing inequities of wealth and power. Traditional community regulation of access to common resources offers a range of effective models for sustainable management that resolve the problems of open-access regimes and may be better suited than privatization to local social structures. The Biodiversity Convention mandates that parties give these models priority.

Defining new terms. The terms "indigenous and local," "community," "customary," "traditional," and "sustainable use" do not have established meanings in international environmental law. Thus an essential task will be to develop rigorous definitions of these terms to prevent governments from using them as loopholes that permit unsustainable exploitation. One critical step will be to put the Biodiversity Convention in the hands of local and indigenous communities themselves, through training, education, and (where requested) legal assistance, so that they can interpret and enforce the terms of the convention.

In defining these terms, it might be worth investigating whether the protection in Articles 8(j) and 10(c) for "local" communities, "traditional" lifestyles, and "customary" uses could also be applied to centralized industrial economies in order to protect remnants of nonmarket or local uses. In the United States, for example, the household garden or the family farm might qualify as traditional, and the farmers' market might be a "customary" use in the "local community." To a significant extent, such activities may be associated with greater biodiversity, not to mention their other values for health, food cost and security, and social ties in local communities.³²

From this perspective, the Biodiversity Convention could help society move closer to sustainability through what Ivan Illich terms "modern subsistence."³³ Through economic activity supplementary to markets, society could reintegrate ecological values currently externalized by the market economy. The Biodiversity Convention offers the opportunity to explore these possibilities.

RECOMMENDATIONS

An obvious first step for the United States is to ratify the Biodiversity Convention. The Clinton administration supports the convention, and in the early stages of Senate discussions there was bipartisan support, but the Sen-

ate could not conclude the advice-and-consent process during the months of partisan struggle leading up to the November 1994 elections. The Senate should return to a bipartisan approach and give advice and consent, so that the United States can join the great majority of nations as a convention party.

Meanwhile, at the international level, governments will need to cooperate to develop some common ground for implementing the Biodiversity Convention's provisions on access to genetic resources and benefit-sharing. Implementation will raise complex legal questions as well as challenging political issues. The process should be inclusive and open. It must include the various interested groups, especially local communities, so that they have a chance to shape the outcome. When governments publish national reports on implementation as required by Article 26, they should make sure that the reports detail plans and actions for the convention's provisions on genetic resources and communities. At every stage, the involvement of nongovernmental organizations will be critical.

Successful implementation of the convention's provisions on genetic resources and communities could create a model for sustainable trade in other resources. This underscores the fact that the Biodiversity Convention is not the only forum in which governments should consider these issues. The progressive provisions of the convention should serve as minimum standards for measures to promote sustainable development within international trade law. To implement their obligation to cooperate on "matters of mutual interest," convention parties should raise this point in current discussions in the World Trade Organization (WTO) committee on trade and environment. The WTO must ensure that its elaboration and application of trade rules are consistent with the convention's guidelines. The convention should also guide negotiations on regional trade agreements, such as the proposed expansion of the North American Free Trade Agreement to other countries in such as Chile.

While there are good legal grounds for these proposals, it will be politically difficult to advance them. In general, trade experts and officials are unaccustomed to looking beyond conventional concepts of trade issues and trade policy for guidance, and it is unlikely that they will turn to the Biodiversity Convention unless environmentalists press for them to do so. Nevertheless, achieving sustainability requires precisely this kind of integration of environmental and economic principles.

NOTES

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1. Convention on Biological Diversity, open for signature June 5, 1992, 31 I.L.M. 818 (1992).

2. See Karl Llewellyn, *The Bramble Bush* (1930), p. 9.

3. In Rio, over 160 countries signed the Biodiversity Convention and the Framework Convention on Climate Change, both of which are legally binding. Governments also signed a set of "non-authoritative, non-legally binding forest principles," the Rio Declaration on Environment and Development, and Agenda 21, a several-hundred-page-long plan for achieving sustainable development by the twenty-first century.

4. See UN Environment Program, Conference of the Parties to the Convention on Biological Diversity, 1st Meeting, UN Doc. UNEP/CBD/COP/1/Inf. 4 (1994).

5. See Art. 6(a), 7(a)-7(c), 8(1), and 10(a).

6. Most of the obligations are qualified by the phrase "as far as possible and as appropriate." This phrase gives countries flexibility to fit implementation to their particular economic, social, cultural, and other conditions. It does not give them complete discretion; if it were a complete escape clause, it would have the absurd effect of erasing the obligation to which it applied.

7. Other recent multilateral environmental agreements, such as the Montreal Protocol on Substances That Deplete the Ozone Layer and the Framework Convention on Climate Change, also establish such financial mechanisms to support implementation by developing countries.

8. As of December 1994, it appeared that funding from developed countries under the Biodiversity Convention would amount to about \$40 million per year over the following three years.

9. "Genetic material" is defined in turn as "any material of plant, animal, microbial, or other origin containing functional units of heredity," that is, genes.

10. Ultimately all of our food, as well as most of our other daily needs, derive from the diversity of technologies that plants and other photosynthetic organisms use to tap the energy of the sun. The blueprints for these technologies are stored as genetic information. "If our ultimate natural resource is the solar flow of low entropy, then our ultimate capital is the gene pool in which evolution has evolved and stored technologies for tapping this basic flow for life generation." See Herman E. Daly and John B. Cobb, Jr., *For the Common Good* (Boston: Beacon Press, 1991), p. 205.

11. In general, most samples of biodiversity transferred internationally will probably include some genetic material and thus will qualify as genetic resources, although some chemical extracts from species may be exceptions. See David R. Downes, "New Diplomacy for the Biodiversity Trade: Biodiversity, Biotechnology and Intellectual Property in the Convention on Biological Diversity," *Touro Journal of Transnational Law* 4 (1993):14; David R. Downes and Chris Wold, "Biodiversity Prospecting: Rules of the Game," *BioScience* 44 (1994):382; Lyle Glowka et al., *A Guide to the Convention on Biological Diversity* (Gland, Switzerland: IUCN, 1994), p. 22.

12. The controversy over control of biodiversity information is analogous to conflicts over other types of information in several respects. As a practical matter, it is more difficult for someone to be the sole and exclusive owner of information than of

physical property, because information is relatively cheap to reproduce and easy to move. As an ethical matter, there is less agreement about who is the rightful "owner" of information than of physical property, and it is less clear how far rights of ownership over information extend. Democratic principles argue for strict limits on private rights over information in order to maximize freedom of debate and the free exchange of ideas and information and to guard against domination by the government or other powerful actors. Yet there are moral grounds for existing ownership rights such as copyrights or patents: they help creators and inventors obtain the recognition and reward for their efforts that they deserve. Such intellectual property rights (IPRs) also create economic incentives to innovate, which benefit society as a whole. Analogously, there are both moral and incentive arguments for giving countries, communities, or individuals property rights over biodiversity information.

13. NAFTA, for instance, relegates most environmental issues to a side agreement, which provides for consideration of environmental aspects of trade policy only in very narrowly defined circumstances. GATT mentions the environment only insofar as Article XX provides for narrowly defined exceptions from general trade rules for measures "necessary to protect human, animal or plant life or health" or "relating to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restriction on domestic production or consumption." The Uruguay Round agreements concluded by GATT parties at the end of 1993 follow essentially the same approach.

14. In this respect, trade agreements reflect the neoclassical economic view that the economy contains the ecosystem. See Herman E. Daly and Kenneth N. Townsend, "Introduction," in *Valuing the Earth: Economics, Ecology, Ethics* (Cambridge, MA: The MIT Press, 1993), pp. 1, 3. Thus "the ecosystem is not the containing natural matrix of the economy but just one more sector within the all-inclusive economy waiting for its due allocation of resources according to individual willingness to pay for its service or product."

15. Other multilateral environmental agreements that regulate trade to accomplish environmental goals are the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal and the Montreal Protocol on Substances That Deplete the Ozone Layer.

16. See Robert Housman et al., eds., *The Use of Trade Measures in Selected Multilateral Environmental Agreements* (Geneva: United Nations Environment Programme, 1995).

17. For a detailed analysis of the relationship between the Biodiversity Convention and GATT see David R. Downes, "The Convention on Biological Diversity and the GATT," in Housman et al., *The Use of Trade Measures*.

18. See Daly and Townsend, "Introduction." The ecosystem supplies the economy with "a throughput of matter-energy," without which the economy could not survive.

19. See Downes and Wold, "Biodiversity Prospecting," p. 383.

20. See for example, Charles Victor Barber et al., *Breaking the Log Jam: Obstacles to Forest Policy Reform in Indonesia and the United States* (Washington, D.C.: World Resources Institute, 1994), John A. Dixon and Paul B. Sherman, *Economics of Pro-*

tected Areas: A New Look at Benefits and Costs (Washington, D.C.: Island Press, 1990), pp. 186–188.

21. See Vandana Shiva, "Biodiversity, Biotechnology and Profits," in Vandana Shiva et al., eds., *Biodiversity: Social and Ecological Perspectives* (London: Zed Books, 1991), pp. 43–44.

22. For instance, large-scale markets do not reflect the tremendous value of biological resources at the local level through subsistence use and local market exchange. The monetary rewards of international trade are increased because those engaging in trade pass on many environmental costs of trade to others. Examples of these costs include the damage from introduction of alien species and greenhouse gas emissions from fossil-fuel-powered transportation.

23. See Herman E. Daly, "Introduction to Essays Toward a Steady-State Economy," in Daly and Townsend, *Valuing the Earth*, pp. 11, 14–15, 38; see also Herman E. Daly, "Problems with Free Trade: Neoclassical and Steady-State Perspectives," in D. Zaelke et al., eds., *Trade and the Environment: Law, Economics and Policy* (Washington, D.C.: Island Press, 1993), pp. 147, 151.

24. See for example, Madhav Gadgil and Ramachandra Guha, *This Fissured Land: An Ecological History of India* (Berkeley: University of California Press, 1992), p. 52.

25. Other relevant provisions are Article 10(d) (requiring parties to help local populations develop and implement projects to restore biodiversity in degraded ecosystems) and Article 14(1)(a) (requiring parties to institute environmental assessment procedures that include "appropriate" public participation).

26. Article 8(j)'s obligation is "subject to [each party's] national legislation." As with other qualifying language, this phrase does not give the party complete discretion in implementation. See note 6 above. Rather, this caveat makes clear that parties can maintain the legal concepts and structures they use to govern indigenous affairs in particular, such as legal definitions of indigenous tribes. See Melinda Chandler, "The Biodiversity Convention: Selected Issues of Interest to the International Lawyer," *Colorado Journal of International Environmental Law and Policy* 4 (1993):141, 154 (noting that the clause "preserves the U.S. relationship with Native American tribes as well as other national laws governing that relationship").

27. This clause implies that governments are to bring local resources into large-scale trade. It illustrates the dynamic tension between global trade and local sustainability expressed in the Biodiversity Convention; the Convention does not entirely abandon the trade policy principle of promoting global trade. As has been explained, however, the convention does require that trade and the overall production process be sustainable.

28. Informal innovation and continuing conservation have resulted in myriad "folk varieties" or "land races" of crops, vastly improving crop productivity and enriching plant genetic resources over millennia. See Jack R. Kloppenburg, Jr., *First the Seed* (Cambridge: Cambridge University Press, 1988), pp. 185–186.

29. Indigenous and local communities have "sophisticated and detailed knowledge of the uses of local biota" that can provide leads for discovery of valuable compounds. See Downes and Wold, "Biodiversity Prospecting," p. 382; see also Walter V.

Reid et al., "A New Lease on Life," in Walter V. Reid et al., eds., *Biodiversity Prospecting: Using Genetic Resources for Sustainable Development* (Washington, D.C.: World Resources Institute, 1993); Mark J. Plotkin, "The Outlook for New Agricultural and Industrial Products from the Tropics," in E. O. Wilson, ed., *Biodiversity* (Washington, D.C.: National Academy Press, 1988).

30. Since biodiversity is frequently associated with indigenous and traditional communities, when a country sets up a system for regulating access to genetic resources pursuant to Article 15 it is in effect "promoting wider application" of traditional knowledge, innovations, and practices within the terms of Article 8(j). In such cases, Article 15 access regulation must incorporate the consent and benefit-sharing requirements of Article 8(j).

31. Regardless of whether they create new IPRs, governments must ensure that existing IPR systems are applied consistently with Article 8(j). A number of national IPR systems allow for patents over modified plants or animals, IPR-like "plant breeders' rights" over crop varieties, or patents over chemicals derived from living organisms. If the proprietary organism, variety, or chemical is derived in part from genetic resources or traditional knowledge, then the existing IPR system has "promoted the wider application" of traditional knowledge and innovations, in the terms of Article 8(j). The legal system must therefore ensure that the source community gives its prior approval before IPRs are granted. It must also provide for "respect" of the community's contribution (which could be accomplished by requiring the patent applicant to make acknowledgment in the application) and encourage sharing of benefits. See Frederic Hendrickx, Veit Koester, and Christian Prip, "Access to Genetic Resources," in V. Sanchez and C. Juma, eds., *Biodiplomacy: Genetic Resources and International Relations* (Nairobi, Kenya: ACTS Press, 1994).

32. See for example, Wendell Berry, *The Gift of Good Land* (San Francisco: North Point, 1981), p. 167.

33. "The term 'subsistence economy' is now generally used only to designate group survival which is marginal to market dependence and in which people make what they use by means of traditional tools and within an inherited, often unexamined, social organization. I propose to recover the term by speaking about modern subsistence. Let us call modern subsistence the style of life that prevails in a post-industrial economy in which people have succeeded in reducing their market dependence, and have done so by protecting—by political means—a social infrastructure." See Ivan Illich, *Toward a History of Needs* (New York: Pantheon Books, 1978), p. 52.

