Bioprospecting, Alien Invasive Species, and Hydrothermal Vents: Three Emerging Legal Issues in the Conservation and Sustainable Use of Biodiversity

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I. INTRODUCTION

One of the most exciting aspects of the Convention on Biological Diversity (CBD or the Convention) is the forum it provides for more than 175 states to address biodiversity-related issues not yet addressed globally.[1] Bioprospecting, alien invasive species, and the conservation and sustainable use of the biodiversity associated with hydrothermal vents are three important issues that have emerged. All three of these issues intersect with law.

The purpose of this Article is to survey briefly some of the legal aspects of these issues and to describe how they are being treated under the CBD.

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1. Convention on Biological Diversity, June 5, 1992, U.N. Conference on Environment and Development, UNEP/Bio.Div./N7BINC5/4, 33 I.L.M. 818 (1992) [hereinafter CBD].

II. BIOPROSPECTING[2]

One objective of the CBD is the fair and equitable sharing of benefits derived from the utilization of genetic resources; it is the conceptual basis for a number of CBD articles, notably Article 15 (Access to Genetic Resources), Article 16 (Access to and Transfer of Technology) and Article 19 (Handling of Biotechnology and Distribution of its Benefits).[3] These articles seek to establish a new relationship between CBD contracting parties (CPs) that provide genetic resources and the CPs within which genetic resources are used.[4]

Article 15 applies to all plant, animal, and microbial genetic resources.[5] It is premised on three fundamental principles: (1) sovereignty over genetic resources, (2) reaching mutually agreed terms (MATs), and (3) prior informed consent (PIC).[6] These principles provide the international legal basis for a *quid pro quo* between CBD CPs: access to genetic resources in exchange for a fair and equitable share in the benefits derived from their use.[7] Both international and national law are key tools in achieving this goal.

Almost all countries in the world have laws related to access to biological resources. These laws typically focus on research, collection, or exportation. A key issue is whether they can be used to ensure benefit sharing for the use of genetic resources embodied in the biological resources. States have always had the right to capture the benefits derived from genetic resources, but usually did not seek to do so. The CBD formalized the possibilities, both politically and legally.

Almost seven years into the Convention's implementation, fifteen states or state provinces are regulating access to ensure benefit

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2. *See generally* WALTER V. REID ET AL., BIODIVERSITY PROSPECTING: USING GENETIC RESOURCES FOR SUSTAINABLE DEVELOPMENT (1993). Biodiversity prospecting is defined as "the exploration of biodiversity for commercially valuable genetic and biochemical resources." *Id.* at 1.

3. *See* CBD, *supra* note 1, arts. 15, 16, 19.

4. *See generally* LYLE GLOWKA, A GUIDE TO DESIGNING LEGAL FRAMEWORKS TO DETERMINE ACCESS TO GENETIC RESOURCES (1998).

5. *See* CBD, *supra* note 1, art. 15.

6. *See id.* art. 15(1), (4)-(5).

7. *See generally* GLOWKA, *supra* note 4.

sharing.[8] At least another thirty-five states or provinces are planning to regulate access to ensure benefit sharing.[9]

The emerging legal frameworks to determine access to genetic resources are evidence that the principles of the CBD are actually being implemented. A disturbing trend, however, is materializing. Some states, developing countries in particular, are rushing to draft and enact legislation. In many cases the issue is not examined carefully and fundamental guiding principles that strive for regulatory simplicity and clarity are typically violated.[10]

Lawyers are often asked to draft access laws without the benefit of a multi-stakeholder policy planning process to guide the drafting exercise.[11] The result is ill-formed laws whose transaction costs perversely hinder scientific research and drive bioprospectors away. States often fail to realize that the goal is to control access to ensure benefit sharing, not merely to control access per se.

Many laws are defensive reactions to a political, industrial, and scientific climate that places the entire burden of ensuring benefits on the country providing the genetic resources.[12] Providing countries are justifiably suspicious of those seeking access to their genetic resources. These countries are concerned about biopiracy: the removal and subsequent use of genetic resources without prior informed consent. This, however, is not a reason to avoid planning.

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8. The regions, states, or provinces currently regulating access to genetic resources to ensure benefit sharing include: the Andean Pact (Bolivia, Colombia, Ecuador, Peru, Venezuela), Australia (the Western State of Australia and the State of Queensland), Brazil (the States of Acre and Amapa) Cameroon, Costa Rica, the Republic of Korea, Malaysia (the State of Sarawak), Mexico, and the Philippines.

9. Those regions, states, or provinces planning to regulate access to genetic resources to ensure benefit-sharing include: ASEAN, Australia (the Commonwealth), Brazil (the State of Sao Paulo), Cote d' Ivoire, Cuba, Ethiopia, Eritrea, Fiji, the Gambia, Guatemala, India, Indonesia, Kenya, Lao PDR, Lesotho, Malawi, Malaysia (and the State of Sabah), Mozambique, Namibia, Nicaragua, Nigeria, the Organization of African Unity, Pakistan Papua New Guinea, Samoa, the Seychelles, the Solomon Islands, South Africa, Tanzania, Thailand, Uganda, the United States of America (within Yellowstone National Park and other national parks), Vanuatu, Vietnam, and Yemen. Belize, China, El Salvador, Ghana, Hungary, Panama, the Russian Federation, and Zimbabwe may also be planning to regulate access to genetic resources.

10. *See* LYLE GLOWKA ET AL., WORLD CONSERVATION UNION (IUCN), A GUIDE TO THE CONVENTION ON BIOLOGICAL DIVERSITY (IUCN Environmental Policy and Law Paper No. 30, 1994) [hereinafter GLOWKA ET AL., A GUIDE TO THE CONVENTION ON BIOLOGICAL DIVERSITY]; Lyle Glowka, *The Next Rosy Periwinkle Won't Be Free: Emerging Legislative Frameworks to Implement Article 15*, 27 ENVTL. POL'Y & L. 441 (1997) [hereinafter Glowka, *The Next Rosy Periwinkle*].

11. It is a well established principle in modern conservation circles that key stakeholders must be involved in any drafting process whose result may have an impact upon their activities.

12. *See* Glowka, *The Next Rosy Periwinkle*, *supra* note 10, at 458.

If a law is too cumbersome, genetic resources will not be sought. There will be no chance to derive benefits, and opportunities will be lost. The issue is how best to balance control of physical access to genetic resources with the need to ensure benefit sharing.

One important aspect is simply to get providing countries to plan better. Capacity building is key. Another important aspect is to shift part of the burden from providers to users and their governments to ensure benefit sharing.[13] This would create a basis for establishing a climate of goodwill between genetic resource providers and users, which could transcend the suspicions of biopiracy upon which many laws are premised. The result would be beneficial for both developed and developing countries.[14]

The legal basis for shifting the burden is CBD Article 15(7).[15] Each CBD CP is to take legislative, administrative, or policy measures which aim to achieve fair and equitable benefit sharing.[16] Article 15(7) indicates that, as a user of genetic resources, a CP is obliged to take action aimed at fair and equitable benefit sharing.[17]

A continuum of measures by government and the private and professional sectors can be envisioned. Government activities could include the adjustment of intellectual property regimes to require the country of origin to be identified. PIC could be confirmed as a condition of the application process for a patent.[18] Incentive measures could be created to encourage industry to secure PIC and share benefits.

Private and professional sector initiatives might include establishing codes of conduct or defining best practices. Independent systems to certify the legality and fairness of genetic resource transactions could also be considered.

The CBD Conference of the Parties (COP) will be looking more closely at both sides of the genetic resource transaction at its fifth and sixth meetings in 2000 and 2002.[19] At its fourth meeting in Bratislava in 1998, the CBD COP created an expert panel on access and benefit

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13. *See id.*

14. *See* Lyle Glowka, *Letter to the Editor*, INT'L HERALD TRIB., Dec. 2, 1999, *responding to* A. Pollack, *Developing Nations Seek Biotech Payback*, INT'L HERALD TRIB., Nov. 27-28, 1999.

15. *See* CBD, *supra* note 1, art. 15, (7).

16. *See id.*

17. *See id.*

18. *See* Frederic Hendrickx et al., *The Convention on Biological Diversity—Access to Genetic Resources: A Legal Analysis*, 23 ENVTL. POL'Y & L. 250 (1993).

19. *See* CBD, *Clearing-House Mechanism, List of CBD Meetings* (visited June 10, 2000) <http://www.biodiv.org/conv/meetings.html>.

sharing.[20] This panel was charged with developing a common understanding of basic concepts and directed to explore all options for access and benefit sharing, including guiding principles, guidelines and codes of best practice.[21]

For the first time under the CBD, the panel addressed the user side of the transaction.[22] The panel concluded, "The degree of legislative simplicity in countries providing genetic resources will increase to the extent that countries and organizations receiving genetic resources take . . . measures to offer security to providers . . . ."[23] It suggested that the CBD COP consider developing international guidelines or principles for such measures.[24] The panel also stated, "Guidelines establishing standards for both providers and users of genetic resources . . . and voluntary industry measures and guidelines could also assist Parties to supplement access legislation and support fair and equitable partnerships."[25]

Six years into the implementation of CBD Article 15, the principle of access to genetic resources in exchange for benefit sharing has yet to produce many tangible benefits for states providing genetic resources. However, it is only a matter of time until this occurs. In the interim, the challenge will be to sustain the momentum generated by states providing genetic resources, by helping them to move beyond the first generation of laws, while balancing their efforts with user-based measures and initiatives. This will help to lower perverse access barriers and provide more possibilities for benefit sharing in the future.

III. ALIEN INVASIVE SPECIES[26]

A. Background

For many years conservation biology circles have been dominated by horror stories about the threats to biological diversity posed by alien invasive species. The legal and institutional

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20. *See Conference of the Parties to the Convention on Biological Diversity, Access and Benefit-Sharing*, U.N. Environment Programme, 5th mtg., Decision IV/8, U.N. Doc. UNEP/CBD/COP/4/27 (1999).

21. *See id.*

22. *See Conference of the Parties to the Convention on Biological Diversity, Report of the Panel of Experts on Access and Benefit-Sharing*, U.N. Environment Programme, 5th mtg., U.N. Doc. UNEP/CBD/COP/5/8 (1999).

23. *Id.* at 17, para. 94.

24. *See id.*

25. *Id.* at 19, para. 103.

26. *See generally* Lyle Glowka, *Take Me to Your Lawyer: Law, Institutions and Invasive Species*, *in* 3 WORLD CONSERVATION (1998).

dimensions of the problem have received little attention, even though environmental lawyers have some equally horrific tales to tell.

For example, a 1995 study of European laws revealed considerable differences between countries in their legal and institutional approaches to alien species. [27] Where legislation exists, it rarely addresses intentional introductions holistically.[28] In other words, the legislation does not examine all organisms and the environments into which they are likely to be introduced.

Similarly, the study found that quarantine controls do not seek to prevent introductions in a broad ecological sense.[29] Instead they are premised on narrow economic grounds primarily related to agriculture or human health.[30]

The study also unearthed some other legal and institutional skeletons. For example, marine introductions and biological control agents are largely ignored, and non-native plant introductions are rarely regulated. Additionally, provisions to limit the range of or eradicate introduced species are rare. Accidental or unintentional introductions are rarely addressed. Offenses are generally considered minor despite the damage which invasive species can inflict. Finally, civil liability for deliberate or negligent introductions is rarely mentioned.

Legal and institutional approaches to the environment, environmental protection, and natural resource production systems tend to be largely sector-oriented, making complete legal coverage and normalization on aliens difficult. Reactionary approaches are prevalent. Proactive approaches targeted at preventing introductions are rare.

Using the European study, one can infer the state of alien species legislation worldwide: With introductions on the rise, the legal and institutional measures in many countries appear to be far from adequate.[31] Furthermore, another legal study recently commissioned by the Global Invasive Species Programme (GISP) supports this view.[32]

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27. *See generally* Cyrille de Klemm, *Introductions of Non-native Organisms Into the Natural Environment, Report to the Group of Experts on Legal Aspects of Introduction and Re-introduction of Wildlife Species*, Council of Europe, Strasbourg (T-PVS (95) 17) (1995) (on file with author).

28. *See id.*

29. *See id.*

30. *See id.*

31. *See id.*

32. *See generally* Clare Shine, *Invasive Species and Nature Conservation* (1999) (unpublished paper presented at the Workshop on Legal and Institutional Dimensions of Invasive

The situation at the national level exists despite the entry into force of at least eighteen binding global or regional multilateral treaties and a number of nonbinding soft law instruments, such as Agenda 21.[33] This impressive collection of instruments demonstrates

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Alien Species Introduction and Control: Legal Component of the SCOPE/IUCN Global Invasive Species Programme, Bonn, Germany, Dec. 10-11, 1999) (on file with author). The GISP is coordinated by the Scientific Committee on Problems of the Environment (SCOPE), the IUCN, CAB Bioscience, and the U.N. Environment Programme (UNEP). The GISP's official website is located at <http://jasper.stanford.edu/gisp/>.

33. *See* U.N. Conference on Environment and Development, June 3-14, 1992, Agenda 21, U.N. Doc. A/CONF.151/26 (1992) [hereinafter Agenda 21]; *see also* Lyle Glowka, *Non-Indigenous Species Introductions: References in International Instruments* (1996) (unpublished chart distributed for comments at the Norway/U.N. Conference on Alien Species, July 1, 1996) (on file with author) [hereinafter *Non-Indigenous Species Introductions*].

Global Conventions that have entered into force include: CBD, *supra* note 1; International Plant Protection Convention, 150 U.N.T.S. 67 (entered into force Apr. 3, 1952); Convention on the Conservation of Migratory Species of Wild Animals, June 23, 1979, 19 I.L.M. 15 (1980) (entered into force Nov. 1, 1983); U.N. Convention on the Law of the Sea, Dec. 10, 1982, U.N. Doc. A/CONF.62/122, 21 I.L.M. 1245, 1261 (1982) [hereinafter UNCLOS] (entered into force Nov. 16, 1994); Agreement on the Application of Sanitary and Phytosanitary Measures, Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1A, LEGAL INSTRUMENTS—RESULTS OF THE URUGUAY ROUND (1994) [hereinafter SPS Agreement].

Conventions addressing the continent of Antarctica include: Agreed Measures for the Conservation of Antarctic Fauna and Flora, June 2-13, 1964, 17 U.S.T. 996, *amended by* Modification of the Agreed Measures Adopted Under Recommendation III-8 for the Conservation of Antarctic Fauna and Flora, Nov. 29, 1968, 24 U.S.T. 1802; Convention on the Conservation of Antarctic Marine Living Resources, May 20, 1980, 33 U.S.T. 3476, 1329 U.N.T.S. 47, 9 I.L.M. 841 (entered into force Apr. 7, 1982); Protocol to the Antarctic Treaty on Environmental Protection, Oct. 4, 1991, 30 I.L.M. 1455 (entered into force Jan. 14, 1998).

Regional Conventions that have entered into force include: Convention Concerning Fishing in the Waters of the Danube, Jan. 29, 1958, Bulg.-Rom.-U.S.S.R.-Yugo., 339 U.N.T.S. 58; African Convention on the Conservation of Nature and Natural Resources, Sept. 15, 1968, 1001 U.N.T.S. 3; Convention on the Conservation of Nature in the South Pacific, *opened for signature* June 12, 1976, 1990 Austl. T.S. No. 41 (entered into force June 28, 1990); Convention on the Conservation of European Wildlife and Natural Habitats, Sept. 19, 1979, Europ. T.S. No. 104; 1982 Gr. Brit. T.S. No. 56 (Cmd. 8738) (1982) [hereinafter Convention on European Wildlife]; Benelux Convention on Nature Conservation and Landscape Protection, June 8, 1982 [hereinafter Benelux Convention], *reprinted in* INTERNATIONAL ENVIRONMENTAL LAW—MULTILATERAL AGREEMENTS 982 (W.E. Burhenne et al. eds., 1974); Protocol Concerning Mediterranean Specially Protected areas, Apr. 3, 1982, U.N.T.S. Reg. No. 24079; Protocol Concerning Protected Areas and Wild Fauna and Flora in the Eastern African Region, June 21, 1985, 1986 O.J. (C 253) 10; North American Free Trade Agreement, Pub. L. No. 103- 182, 107 Stat. 2057 (1993) (codified at 19 U.S.C. §§ 3301-3473 (1994)); North American Agreement on Environmental Cooperation, 32 I.L.M. 1480 (1993); Agreement on the Preparation of a Tripartite Environmental Management Programme for Lake Victoria, Nov. 30, 1993, attach. 1.2, *reprinted in* INTERNATIONAL ENVIRONMENTAL LAW—MULTILATERAL AGREEMENTS 994 (W.E. Burhenne et al. eds., 1974) [hereinafter Lake Victoria Agreement]; and Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean (Barcelona, 1995).

Global Conventions that have not entered into force include the Convention on the Law of Non-Navigational Uses of International Watercourses (New York, 1997). Regional Conventions that have not entered into force include: ASEAN Agreement on the Conservation of Nature and Natural Resources (Kuala Lumpur, 1985); Protocol for the Conservation and Management of Protected Marine and Coastal Areas of the Southeast Pacific (Paipa, 1989); Protocol Concerning

that alien species introductions have been recognized by the international community as an environmental problem for many years. From the 1980s until the present, the number of citations has grown quickly. During this period, alien invasive species were beginning to be recognized as a developmental problem as well.

Action at the international level, however, may be part of the problem. Inconsistencies in treatment and approach at the national level are as striking as those at the international level. For example, more than 180 states have undertaken obligations to implement at least one binding treaty referring to alien species. This simple statistic, however, does not illustrate the wide variety of contexts addressed by the instruments ratified: phytosanitary measures, biodiversity, birds and other migratory species, oceans, regional seas, mountainous areas, and particular river or lake systems.

Some instruments apply broadly to introductions both inside and outside protected areas. Other instruments are limited to introductions only in protected areas, overlooking the possibility that introductions into surrounding areas will spread into protected areas.

Consultation with neighboring states prior to the intentional introduction of an alien organism is specifically required by only one

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Specially Protected Areas and Wildlife to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (Kingston, 1990); Convention for the Conservation of the Biodiversity and Protection of Wildlife Areas in Central America (Managua, 1992) [hereinafter Central America Conservation Convention]; Agreement on the Preparation of a Tripartite Environmental Management Programme for Lake Victoria (Arusha, 1994); and Agreement on the Conservation of African-Eurasian Migratory Waterbirds (Hague, 1995).

Soft law instruments include: Recommendation No. R(84)14 of the Committee of Ministers to the Council of Europe Member States Concerning the Introduction of Non-Native Species (Council of Europe, 1984); Non-Legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation and Sustainable Development of All Types of Forests (UNCED, 1992); Agenda 21, *supra* note 33; Guidelines for Preventing the Introduction of Unwanted Aquatic Organisms and Pathogens from Ships' Ballast Water and Sediment Discharges (International Maritime Organization (IMO), 1993); Programme of Action for the Sustainable Development of Small Island Developing States (Global Conference on the Sustainable Development of Small Islands Developing States, 1994); Code of Conduct for the Import and Release of Exotic Biological Control Agents (FAO, 1995); Code of Conduct for Responsible Fisheries (FAO, 1995); and Global Plan of Action for the Protection of the Marine Environment from Land-based Activities (UNEP, 1995).

Technical guidance documents include: IUCN, Position Statement on Translocation of Living Organisms: Introduction, Re-introductions and Re-Stocking (1987); and International Council for the Exploration of the Sea (ICES) and European Inland Fisheries Advisory Commission (EIFAC), Code of Practice on the Introductions and Transfers of Marine Organisms (1994). *See* Lyle Glowka & Cyrille de Klemm, *International Instruments, Processes, Organizations and Non-Indigenous Species Introductions: Is a Protocol to the Convention on Biological Diversity Necessary?*, *in* Invasive Species and Biodiversity Management 389 (O.T. Sandlund et al. eds., 1999); *see also* Glowka, *Non-Indigenous Species Introductions*, *supra* note 33.

instrument.[34] Accidental introductions are almost never expressly mentioned. Control or eradication measures are generally addressed in the global treaties, but only appear in three regional instruments.[35] Finally, even the most comprehensive instrument does not examine the specifics of implementation of the introduction of an alien species.

Unfortunately, soft law does not adequately fill the gaps left by the collection of treaties. For example, the chapters of Agenda 21 inconsistently refer to "exotics," "aliens," "biological control agents," "pests," "foreign" plants and animals, "non indigenous species," and "noxious aquatic species."[36] The few calls for regulatory measures in Agenda 21 tend to be set out against activities which generally encourage alien species introductions such as aquaculture, afforestation and reforestation, and biological control in integrated pest management. This implicitly reflects a tension between biodiversity conservation, environmental protection, and human activities contributing to development.

In 1996, legal commentators participating in the Norway/UN Conference on Alien Species in Trondheim argued that the fragmented and incomplete legal coverage addressing alien species at the global, regional, and national levels was problematic.[37] They signaled the need for the international community to accept and apply a minimum number of principles aimed at anticipating and repairing the damage caused by inappropriate alien species introductions.[38]

Furthermore, the commentators argued that the implementation of CBD Article 8(h) was the best opportunity for developing a comprehensive global approach to alien species introductions and their eradication or control.[39] The CBD's global nature, the availability of financial resources through its financial mechanism, and its wide ratification would support this approach.[40] However, they cautioned that the risk of the CBD promoting another fragmented approach was great.[41]

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34. *See* Benelux Convention, *supra* note 33.

35. *See* Convention on European Wildlife, *supra* note 33; Central America Conservation Convention, *supra* note 33; Lake Victoria Agreement, *supra* note 33.

36. *See generally* Agenda 21, *supra* note 33.

37. *See* Glowka & de Klemm, *supra* note 33.

38. *See id.* at 402.

39. *See id.* at 403; CBD, *supra* note 1, art. 8(h). "Each Contracting Party shall . . . [p]revent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species." *Id.*

40. See Glowka & de Klemm, *supra* note 33, at 403.

41. *See id.* at 402.

For example, in 1995, the COP recognized the significance of alien species introductions as a threat to marine and coastal biodiversity by accepting the recommendations of the CBD's Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA).[42] However, the COP failed to make two key recommendations that would have been obvious to lawyers and economists. Individual CPs should have been directed to: (1) create legal and institutional frameworks, supplemented by the use of incentive measures, for addressing alien species introductions and their eradication or control, and (2) establish liability for damaging introductions. This oversight at such an early stage in the CBD's implementation foreshadowed the potential for other substantive oversights if alien species were addressed by the COP in other contexts.[43]

It was argued that the alien species issue needed to be formally included as a stand-alone item in the CBD COP's medium-term program of work.[44] This would provide the basis for the COP to prepare a minimum set of principles to guide future work on the issue. Each CP could in turn consider the principles when designing an approach to implement Article 8(h) as part of their national

42. *See Report of the Second Meeting of the Conference of the Parties to the Convention on Biodiversity*, at 18, 44, U.N. Doc. UNEP/CBD/COP/2/19 (1995) [hereinafter *Report of the Second Meeting of the COP*]. In its report, the SBSTTA recommended, *inter alia*: (1) treating use of non-indigenous species in mariculture as an introduction into the wild because of the high risk of escape; (2) adhering, as a "minimum requirement," to the ICES Code and that of the International Epizootic Organization in mariculture operations; (3) undertaking rigorous pre-introduction environmental impact assessment, including risk assessment, based on the precautionary principle and assessing whether post-introduction monitoring can take place; (4) undertaking post-introduction monitoring; (5) assessing and giving preference to indigenous or local species alternatives; (6) addressing the implementation of CBD Article 8(h) in a party's national plan, including implementation of international protocols and guidelines; (7) notifying neighboring states on shared watercourses prior to introduction; (8) determining whether any adverse effects can be reversed within two human generations; (9) assessing the environmental impact of canal construction which may link coastal water bodies; (10) conducting public education on the possible dangers of releasing ornamental and sport fishery species; (11) undertaking research on non-indigenous species impacts on *in-situ* conservation; (12) supplying information assessing the effectiveness of prevention, eradication, and control technologies via the CBD's Clearing-house Mechanism; (13) supporting and providing input into, as well as reviewing, IMO's work on ballast water guidelines; and (14) contacting relevant international bodies and instruments to ensure that adequate controls on alien or living modified organisms are addressed. *See Report of the First Meeting of the Subsidiary Body on Scientific, Technical and Technological Advice*, Recommendation I/8, at 36, U.N. Doc. UNEP/CBD/COP/2/5 (1995).

43. *See* Glowka & de Klemm, *supra* note 33, at 401.

44. *See id.*

biodiversity planning processes.[45] Indicative principles and criteria were suggested.[46] These principles could then be used as the

45. *See* CBD, *supra* note 1, arts. 6(a), 8(h). Article 6(a) requires each CP to develop new or adopt existing national strategies, plans, or programs to conserve and sustainably use biodiversity.

46. *See* Glowka & de Klemm, *supra* note 33, at 404-05. The principles and criteria that were suggested included: (1) acknowledging invasive non-indigenous species introductions as a threat to environment and development in all countries; (2) applying the preventative and precautionary approaches to all non-indigenous species introductions; (3) establishing the "polluter or originator pays" principle for harmful non-indigenous species introductions to internalize externalities; (4) establishing clear state responsibilities with regard to neighboring states, including notification, consultation, and liability; (5) adhering to existing relevant codes of conduct and international technical guidance as minimum requirements; (6) clarifying use of terms, especially for "non-indigenous species" and "introduction;" (7) addressing non-indigenous species introductions and their eradication or control in national biodiversity strategies and action plans; (8) creating a legal and institutional framework to address non-indigenous species introductions, including the use of non-indigenous biological control agents, while exploring possibilities for integrated approaches in the areas of genetically modified organisms and organisms of sanitary and phytosanitary concern; (9) designating a single national focal point or creating a coordinating mechanism to clearly establish institutional authority for introductions and, where necessary, their eradication or control in terrestrial, aquatic, and marine areas; (10) creating a general prohibition on intentional introductions, whether by importation, or inter-regionally within a country, without authorization from a competent authority; (11) shifting to the originator the burden of establishing no harmful impact of proposed intentional introduction; (12) requiring pre-introduction assessment (environmental impact, risk, and/or benefit/cost), including an alternatives analysis and contingency requirements, as a minimum pre-requisite to obtaining a permit to introduce non-indigenous species; (13) monitoring and assessing the ecological consequences of non-indigenous species after introduction; (14) ensuring that organisms authorized for release are free from pathogens and other organisms which could affect biodiversity, not just economic interests such as agriculture; (15) identifying, assessing, and controlling pathways of accidental introductions, such as ballast water discharge, as well as restricting the import and sale of non-indigenous pets, ornamental plants, birds, and fish to those which cannot survive in the wild; (16) recommending that bilateral and multilateral development agencies assess and, where appropriate, adjust their policies and activities to eliminate or minimize non-indigenous species introductions which could affect biodiversity; (17) assessing and, where necessary, modifying or prohibiting development projects which could lead to introductions; (18) building alliances and cooperating with relevant businesses, industry, and other organizations either contributing to non-indigenous species introductions or negatively impacted by them; (19) developing and implementing control and eradication plans for already introduced invasive non-indigenous species which are harmful, prioritizing where necessary, and ensuring that the means ultimately chosen are first assessed for their environmental impact, risk, and/or benefit/cost; (20) avoiding the inadvertent protection of non-indigenous species through legal paradoxes such as negative lists of protected species; (21) establishing an early warning system to detect introductions; (22) establishing fast response or emergency procedures early after introduction is detected; (23) providing criminal penalties and civil liability for unauthorized intentional introductions and liability for negligence resulting in harmful accidental introductions; (24) ensuring statutes of limitation reflect the long lead time it may take for harm to be detected; (25) conducting public education and awareness campaigns; (26) undertaking research and training, while facilitating technology transfer; (27) providing adequate financial resources and eliminating perverse incentives, while establishing incentive measures to prevent non-indigenous species introductions and ensure their eradication or control; and (28) providing input into relevant flora. *See id.*

foundation upon which to build comprehensive national approaches to the alien species problem.

At its third meeting in November 1996, in Buenos Aires, Argentina, the COP took its first steps to comprehensively address the alien invasive species issue and the implementation of Article 8(h).[47] It decided that alien species introduction should become a thematic issue.[48] In other words, alien species introduction would be addressed comprehensively as a stand-alone issue.

At its fourth meeting in May 1998, in Bratislava, Slovak Republic, the CBD COP built on this initiative when it decided to adopt the SBSTTA's report of its third meeting.[49] The decision was important in four ways. First, alien species were deemed "a crosscutting issue" for implementation of many objectives of the Convention.[50] Alien species would be addressed within other themes while remaining a stand-alone issue. For example, alien species were referenced in the fourth meeting's decisions on inland waters biodiversity and forest biodiversity.[51] Second, a clear basis was established for CPs to finance alien species projects through the Convention's financial mechanism.[52] This action distinguished the CBD from all other conventions referring to aliens to date. The CBD alone had the possibility to support implementation of its alien species obligation with money. Third, CPs were invited to address alien species in their national biodiversity strategies and action plans.[53] This would help to ensure the systematic treatment of alien species at the national level. Fourth, and most significantly, the COP directed

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47. *See* Report of the Third Meeting of the Conference of the Parties to the Convention on Biological Diversity, at 24, 67, U.N. Doc. UNEP/CBD/COP/3/38, Decision III/9 (1997).

48. *See id.* at 67.

49. *See* Report and Recommendations of the Third Meeting of the Subsidiary Body on Scientific, Technical and Technological Advice, at 14, U.N. Doc. UNEP/CBD/COP/4/2 (1998) [hereinafter Report and Recommendations of the Third Meeting of the SBSTTA].

50. *See id.*

51. *See Development of Guiding Principles for the Prevention of Impacts of Alien Species by Identifying Priority Areas of Work on Isolated Ecosystems and by Evaluating and Giving Recommendations for the Further Development of the Global Invasive Species Programme*, at 1, U.N. Doc. UNEP/CBD/SBSTTA/4/8 (1999) [hereinafter *Development of Guiding Principles for the Prevention of Impacts of Alien Species*]; *Status and Trends of the Biological Diversity of Inland Water Ecosystems and Options for Conservation and Sustainable Use*, U.N. Doc. UNEP/CBD/COP/4/4, Decision IV/4 (1998) (parties are to assess threatened species, conduct inventories and impact assessments of alien species in inland water ecosystems, and raise awareness of the possible problems and costs of deliberate or accidental alien species introductions); *Forest Biological Diversity*, U.N. Doc. UNEP/CBD/COP/4/27, Decision IV/7 (1998).

52. *See Report and Recommendations of the Third Meeting of the SBSTTA*, *supra* note 49.

53. *See id.*

the SBSTTA to develop "guiding principles" on the prevention, introduction and eradication of alien species for the upcoming fifth COP meeting in Nairobi in May 2000.[54]

B. The Guiding Principles

At its fourth meeting in June 1999, the SBSTTA requested that the CBD Secretariat develop the aforementioned principles in cooperation with GISP.[55] The recommendations were to draw on principles proposed in the meeting by New Zealand as well as the World Conservation Union (IUCN) Draft Guidelines on the Prevention of Biological Diversity Loss Due to Biological Invasions.[56] Case studies submitted by each of the CPs would supplement the work. The principles would be presented to the SBSTTA and considered at its fifth meeting in January 2000. By late December 1999, the CBD Secretariat had prepared draft guiding principles (the Guiding Principles) for the SBSTTA to consider.[57]

The SBSTTA did not recommend to the CBD COP that it adopt the Guiding Principles. Instead, it acknowledged the need for CPs to provide further comments in time for the SBSTTA's sixth meeting on what were now called the "Interim Guiding Principles for the Prevention, Introduction and Mitigation of Impacts of Alien Species."[58] This foreshadowed their further elaboration. The need for standardized terminology was particularly emphasized for "alien or alien species" and "alien invasive species."[59] The SBSTTA recommended that the COP request the CBD Secretariat to cooperate with other international bodies and legal instruments, such as the global and regional biodiversity-related conventions and, for example, the global and regional instruments and organizations addressing the

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54. *See id.*

55. *See Development of Guiding Principles for the Prevention of Impacts of Alien Species*, *supra* note 49, Item VII, at 18.

56. *See id.*; INVASIVE SPECIES SPECIALIST GROUP, SPECIES SURVIVAL COMM'N (SSC), IUCN GUIDELINES FOR THE PREVENTION OF BIODIVERSITY LOSS CAUSED BY ALIEN INVASIVE SPECIES (visited June 10, 2000) <http://www.iucn.org/themes/ssc/pubs/policy/invasivesEng.htm>.

57. *See Subsidiary Body on Scientific, Technical and Technological Advice, Alien Species: Guiding Principles for the Prevention, Introduction and Mitigation of Impacts*, U.N. Environment Programme, 5th mtg., U.N. Doc. UNEP/CBD/SBSTTA/5/5 (2000) [hereinafter Guiding Principles].

58. *Conference of the Parties to the Convention on Biological Diversity, Reports of the Subsidiary Body on Scientific, Technical and Technological Advice*, U.N. Environment Programme, 5th mtg., Annex I, Item V/4, at 44, U.N. Doc. UNEP/CBD/COP/5/3 (2000).

59. *See id.*

organisms of quarantine concern.[60] Finally, CPs and other governments were urged to implement alien invasive species strategies and action plans as soon as they are developed.[61]

The fifteen Guiding Principles are grouped into four sections: (1) general, (2) prevention, (3) introduction, and (4) mitigation. The Guiding Principles are designed with all states in mind, not just the CBD CPs. The following sections of this Article briefly analyze selected Guiding Principles.

1. General Principles

Of the first six general principles, Guiding Principles 2 and 4 are the most significant.[62] Principle 2 is the Guiding Principle for all alien species work.[63] The first stage of the three-stage hierarchical approach prescribed by Principle 2 is preventing introductions. By emphasizing prevention, Principle 2 strives to shift action from reactive to proactive measures. To support this, it highlights that

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60. *See id.* at 43-44. For example, the SBSTTA explicitly mentioned the Convention on the Conservation of Migratory Species of Wild Animals, the Convention on International Trade in Endangered Species of Wild Fauna and Flora, the International Plant Protection Convention, and the various regional plant protection organizations established by international agreement among the bodies and instruments with which the CBD Secretariat should cooperate. *See id.*

61. *See id.* at 44.

62. *See* Guiding Principles, *supra* note 57, at 10-11. The provisions of the six principles under the first section (General) can be summarized as follows:

> Principle 1 - Precautionary approach: States' "efforts to identify and prevent unintentional introductions" and "decisions concerning intentional introductions should be based on the precautionary approach." Preventive action should not be avoided where there is no scientific certainty on environmental, social, and economic risks posed by a species or pathway. Eradication or control efforts should not be postponed where there is uncertainty on the long-term implications of introduction.
>
> Principle 2 - Three stage hierarchical approach: (1) preventing entry of alien species should be given priority; (2) where entry has occurred, take actions to prevent the species from establishing itself and spreading by eradicating it; and (3) containment and long term control should be considered where eradication is not feasible.
>
> Principle 3 - Ecosystem approach: State measures to deal with alien species should be based on the ecosystem approach.
>
> Principle 4 - State responsibility: States should recognize the risk they pose to other states as a potential source of alien invasive species pursuant to CBD Article 3 and Principle 2 of the 1992 Rio Declaration. Risk activities include: (1) intentional or unintentional transfer of an alien invasive species to another state and (2) intentional or unintentional introductions into their own state if there is a risk of subsequent spread to another state.
>
> Principle 5 - Research and monitoring: States should develop research and monitoring for an adequate knowledge base.
>
> Principle 6 - Education and public awareness: States should facilitate public education and awareness on the risks of alien introductions and support for mitigation measures.

63. *See id.* at 10.

prevention is more cost-effective and environmentally desirable than reactionary measures. The second stage—preventing establishment and spread—applies to situations where the organism has already been introduced. Here eradication is emphasized at the earliest possible stage of the invasion. However, eradication may not be feasible or cost-effective. In this situation, stage three emphasizes containment and long-term control measures.

Principle 4 establishes that states have the responsibility to recognize the risks they pose to other states as a potential source of alien invasive species and should take steps to minimize the risks.[64] Principle 4 could provide the basis for establishing state liability and could also provide the basis for a damaged state to seek redress, perhaps in the form of restoration or compensation.

The legal basis of Principle 4 is derived from CBD Article 3.[65] For the first time, Article 3 codified Principle 21 of the Stockholm Declaration and Principle 2 of the Rio Declaration into an international environmental treaty.[66]

Principle 4 could catalyze the COP's treatment of liability and redress in the context of aliens. Liability and redress for damage to biodiversity is something that CBD Article 14(2) obliges the CBD COP to examine.[67] However, the CBD COP has yet to properly examine this issue.[68] To date, liability under the CBD has only been considered in one other related area within the negotiations for a biosafety protocol: the safety of genetically modified organisms.

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64. *See id.* at 11.

65. *See* CBD, *supra* note 1, art. 3. In pertinent part, CBD Article 3 reads: "States have . . . the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction." *Id.*

66. *See* GLOWKA ET AL., A GUIDE TO THE CONVENTION ON BIOLOGICAL DIVERSITY, *supra* note 10.

67. *See* CBD, *supra* note 1, art. 14(2).

68. The CBD COP's treatment of liability and redress for damage to biodiversity may, however, be gearing-up. At its fourth meeting in Bratislava, the COP invited CPs and others to provide the CBD Secretariat with information on national, international, and regional measures and agreements on liability and redress applicable to damage to biological diversity. *See Conference of the Parties to the Convention on Biological Diversity, Measures for Implementing the Convention on Biological Diversity*, U.N. Environment Programme, 4th mtg., U.N. Doc. UNEP/CBD/COP/4/27 (1998).

Information on access by foreign citizens to national courts in cases of transboundary harm is to be included. CPs were also invited to address liability and redress in their national reports. Finally, the Secretariat was invited to prepare a synthesis report on the information supplied. *See Conference of the Parties to the Convention on Biological Diversity, Synthesis of Information Contained in National Reports on the Implementation of the Convention*, U.N. Environment Programme, 4th mtg., U.N. Doc. UNEP/CBD/COP/4/11/Rev.1 (1998). Still outstanding is when the COP will consider the information provided.

2. Prevention Principles

Under the second section of Guiding Principles, Principle 9 supplements Principle 4 by helping to define one aspect of the scope of a state's responsibility to other states.[69] According to this principle, a state of origin should provide information to a receiving state, when it is aware that a species being exported could be invasive in the receiving state, especially where the two states have similar environments conducive to the organism's establishment.[70] This echoes CBD Article 19(4) which creates a bilateral obligation for a CP directly or through its legal and natural persons to provide information on living modified organisms prior to export to another CP.[71]

The key preconditions to implement such a concept will be: (1) access to information on the species, and (2) using the information in an export/import quarantine system for all plants and animals. This could build on existing quarantine systems, such as those that have developed for plants under the International Plant Protection Convention (IPPC), or that developed for animals overseen by the International Office of Epizootics.[72]

CBD Article 14(1)(c) addresses procedural obligations of notification, exchange of information, and consultation concerning activities with potential transboundary effects.[73] This Article

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69. *See* Guiding Principles, *supra* note 57, at 12. The provisions of the three principles under the second section (Prevention) can be summarized as follows:

> Principle 7 - Border control and quarantine measures: States should implement border control and quarantine measures to ensure that (1) intentional introductions are authorized and (2) unintentional or unauthorized introductions are minimized. Measures should be based on the risks posed by alien species and their potential pathways.
>
> Principle 8 - Exchange of information: States should support the development of databases that compile and disseminate information on aliens that threaten ecosystems, habitats, or species to support prevention, introduction, and mitigation activities.
>
> Principle 9 - Cooperation, including capacity building: The exporting state should provide information to a receiving state when it is "aware" that a species being exported has the potential to be invasive. Bilateral or multilateral agreements "should be developed and used to regulate trade in certain alien species, with a focus on particularly damaging invasive species." States should support capacity building programs for states lacking expertise and resources.

70. *See id.*

71. *See* CBD, *supra* note 1, art. 19(4).

72. *See* International Plant Protection Convention, Apr. 3, 1952, 150 U.N.T.S. 67 [hereinafter IPPC]. The International Office of Epizootics was created in 1924 and is located in Paris. *See* International Agreement for the Creation at Paris of an International Office for Dealing with Contagious Diseases in Animals, Jan. 25, 1924, 57 L.N.T.S. 136.

73. *See* CBD, *supra* note 1, art. 14(1)(c).

demonstrates that Principle 9 overlooks another aspect of a state's responsibility: consultation with neighboring states. For example, states should have the general responsibility to consult neighboring states when intentional introductions within their jurisdiction or control may pose a transboundary threat.[74] Evaluation procedures to determine risk, environmental impact, or cost/benefit of proposed introductions should provide an opportunity for neighboring states to comment. These comments should be considered in the decision-making process. Both of these additions could be considered here or under Principle 10, which addresses intentional introductions.

A glaring omission from Principle 9 is a statement on the relationship between alien introductions and trade. For example, states need to ensure that measures taken are not disguised barriers to trade.[75] General criteria might be provided in the principle to guide states in creating "trade friendly" approaches to intentional and unintentional alien introductions, especially to avert challenges within the World Trade Organization (WTO). The IPPC could be a source of useful principles because it has been amended to be in harmony with the WTO Agreement on the Application of Sanitary and Phytosanitary Measures (the SPS Agreement).[76]

Useful IPPC principles include: (1) limiting measures to those that are necessary and technically justified, (2) publishing measures immediately for the benefit of other states, and (3) limiting measures to those that are least restrictive and result in the minimum impediment to international movement of people, commodities, and conveyances.[77] National treatment is another trade-related principle that could be included as well. National treatment ensures that direct or indirect measures taken by an importer do not afford treatment less

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74. *See* Glowka & de Klemm, *supra* note 33, at 404.

75. *See* J. Werksman, *Invasive Alien Species and the World Trade Organisation* (1999). (unpublished paper presented at the Workshop on Legal and Institutional Dimensions of Invasive Species Introduction and Control: Legal Component of the SCOPE/IUCN Global Invasive Species Programme, Bonn, Germany, Dec. 10-11, 1999) (on file with author). Global trade is recognized generally as the driving force behind alien introductions. There are at least four ways that aliens can be defined in global trade: (1) aliens as traded products (e.g., horticulture products); (2) aliens resulting as a by-product of trade (e.g., inter-breeding with local populations and diluting the local gene pool); (3) aliens as a contaminant of traded products (e.g., insects or rodents infesting commodities such as wood products or agricultural commodities); and (4) aliens associated with product delivery (e.g., ballast water organisms). *See id.*

76. *See* IPPC, *supra* note 72; SPS Agreement, *supra* note 33, art. 2.2.

77. *See* IPPC, *supra* note 72, arts. VI(1)(b), VII(2)(b), (g). *See generally*, J. Hedley, *The IPPC and Invasives* (1999). (unpublished paper presented to the Workshop on Legal and Institutional Dimensions of Invasive Species Introduction and Control: Legal Component of the SCOPE/IUCN Global Invasive Species Programme, Bonn, Germany, Dec. 10-11, 1999) (on file with author).

favorable to that afforded to a like domestic product. That concept is a central premise of the SPS Agreement.[78]

3. Introduction Principles

The next section, consisting of two principles, is found under the "Introduction of Species" heading.[79] Principle 10 establishes criteria for regulating intentional introductions.[80] It is comprehensive, but does not explicitly establish that intentional introductions should be presumed a potential threat to ecosystems, habitats, and species. Unless proven otherwise, these introductions should be avoided.[81] Additionally, Principle 10 should require the proposer to demonstrate other alternatives to the alien introduction, including the use of native species.[82] Presently it does not. It also does not address consultation with neighboring states and the consideration of their comments. A provision suggesting that introductions should avoid certain environments could be considered. Examples might be provided to guide states.[83] Finally, the need for penalties proportional to the magnitude of possible damage for unauthorized introductions also needs to be addressed.

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78. *See* SPS Agreement, *supra* note 33.

79. *See* Guiding Principles, *supra* note 57, at 12-13. The provisions of the two principles under the third section (Introduction of species) can be summarized as follows:

> Principle 10 - Intentional introductions: No intentional introduction should take place without proper authorization. The evaluation process should include a "risk assessment, including environmental impact assessment." States should authorize only those introductions unlikely to cause "unacceptable harm to ecosystems, habitats or species," both within the state and in neighboring states. The proposer should have the burden of proof to show that a proposed introduction is unlikely to cause harm. The proposed introduction's anticipated benefits "should strongly outweigh any actual or potential adverse effects and related costs." Conditions can accompany the authorization including on mitigation and monitoring.
>
> Principle 11 - Unintentional introductions: States should have provisions in place to address unintentional introductions including laws and institutions with appropriate responsibilities and operational resources. Common pathways leading to unintentional introductions need to be identified. Environmental impact assessment legislation for sectoral activities leading to unintentional introductions "should also require an assessment of the risks associated with unintentional introductions of alien invasive species."

80. *See id.*

81. *See* de Klemm, *supra* note 27.

82. *See* IUCN, TRANSLOCATION OF LIVING ORGANISMS (ICUN Position Statement 1987) (on file with author); Glowka & de Klemm, *supra* note 33.

83. For example, the 1987 IUCN Position Statement on the Translocation of Living Organisms states that "[n]o alien species should be deliberately introduced into any natural habitat (a habitat not perceptively altered by man), island, lake, sea, ocean or centre of endemism." IUCN. *Supra* note 82.

Principle 11 applies to unintentional introductions.[84] This principle parallels CBD Articles 7(c) and 8(l).[85] Notably, it suggests that states need to identify common pathways leading to unintentional introductions and they should take steps to minimize introductions.[86]

It may not be enough to simply identify common pathways without ascertaining the underlying factors supporting the pathway. For example, some pathways may be supported by economic or other policies that have the perverse effect of leading to introductions. These policies would need to be modified to have an effect on alien introductions.

4. Mitigation Principles

The last section of four principles is entitled "Mitigation of Impacts."[87] Principle 12 establishes the hierarchy of actions that should be taken once an alien species becomes invasive.[88] It emphasizes the need for and usefulness of acting early.[89]

Among other things, Principle 12 enumerates criteria to guide the selection and use of techniques to eradicate, contain, or control

84. *See* Guiding Principles, *supra* note 57, at 13.

85. *See* CBD, *supra* note 1, arts. 7(c), 8(*l*). Article 7(c) provides: "Each Contracting Party shall, . . . for the purposes of articles 8 and 10 . . . [i]dentify processes and categories of activities which have or are likely to have significant adverse impacts on the conservation and sustainable use of biological diversity and monitor their effects." *Id.* art. 7(c). Article 8(*l*) provides: "Each Contracting Party shall, . . . [w]here a significant adverse effect on biological diversity has been determined pursuant to Article 7, regulate or manage the relevant processes and categories of activities." *Id.* art. 8(*l*).

86. *See* Guiding Principles, *supra* note 57, at 13.

87. *See id.* at 13-14. The provisions of the four principles under the forth section ("Mitigation of impacts") can be summarized as follows:

> Principle 12 - Mitigation of impacts: States should eradicate, contain, and control a detected alien invasive species to mitigate its effects. Techniques "should be cost effective, safe to the environment, humans and agriculture, as well as socially, culturally and ethically acceptable." Mitigation should occur early; early detection is important and should be combined with rapid response.
>
> Principle 13 - Eradication: Eradication of established alien invasive species should take priority over other measures. Eradication should occur in the early stages of an invasion; early detection is critically useful at high-risk entry points. Community support with consultation should be integral to eradication projects.
>
> Principle 14 - Containment: Limiting the spread of alien invasive species is appropriate when eradication is not and where the invasive species' range is limited and containment within defined boundaries is possible. Monitoring outside control boundaries and quick action to eradicate new outbreaks is essential.
>
> Principle 15 - Control: Control measures should focus on reducing damage caused by alien invasive species. A range of integrated techniques will be needed, regularly applied, and supported by a budget and a long-term commitment. Biological control should be treated as an intentional introduction.

88. *See id.* at 13.

89. *See id.*

alien invasive species.[90] The techniques chosen are to be "socially, culturally and ethically acceptable."[91] While laudable, this very broad language may actually limit the ability of authorities to take quick action when the need arises. For example, animal rights activists have contested particular eradication and control methods as cruel, even when doing nothing leads to even more damage to the environment and biodiversity.

This points to the need for a general provision in principle twelve requiring decision-makers to consult with the public on all mitigation measures proposed to be taken. As currently written, only Principle 13, which deals with eradication, suggests comprehensive community consultation.[92] A provision allowing limited or no coordination procedures for bona fide emergency situations might be considered.

As written, mitigation techniques need to be "safe to the environment, humans, and agriculture . . . ."[93] "Environment" seems to include biodiversity, but it is unclear. Conspicuously missing from Principle 12 is a general requirement to evaluate the environmental impacts, risks, or costs and benefits of mitigation techniques.[94] Alternatives should be analyzed. As currently written in Principle 15, only biological control, a form of intentional introduction, would require such evaluation.[95]

Finally, Principle 15 should indicate who should pay for mitigation measures. This issue is particularly relevant to allocating state and individual responsibility and, consequently, liability.

In general, the burden should shift from the government to the introducer. A number of scenarios can be envisioned. For example, in the case of unauthorized intentional introductions, the introducer should be subject to criminal penalties and, at minimum, should be liable for the cost of mitigation. An interesting question is who bears the responsibility for funding mitigation measures when an authorized introduction becomes invasive?

For unintentional introductions that were foreseeable or avoidable, at minimum the introducer should be liable for the cost of mitigation. Where a group of actors is identifiable, the group should be liable for the cost of mitigation.

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90. *See id.*
91. *Id.*
92. *See id.*
93. *Id.*
94. *See id.*
95. *See id.*

Principle 11 might also address the issue of recurring unintentional introductions. For example, one commentator has concluded that, at a certain level of knowledge, those involved must be held responsible; what once was considered unintended consequences, when repeated over and over, must be considered as fully intentional.[96]

By addressing alien species introduction, the CBD COP is taking its most significant and tangible action to date on a threat to biodiversity second in magnitude only to habitat loss. It is too early to determine the impacts of the interim Guiding Principles. The CBD COP, individual parties, and the SBSTTA must still consider them. The important factor is that the CBD has asserted leadership on the issue. It is increasingly apparent that the CBD has an enormous potential to globally rationalize the treatment of alien species by fostering synergies with existing instruments, while adopting a complementary gap-filling role on those aspects of the issue yet to be addressed. The lessons learned from this process are potentially very powerful and should be applicable to other areas of the Convention's work.

IV. HYDROTHERMAL VENTS

Undersea biological discoveries since 1977 have helped to alter our view of the deep seabed as a "biological desert."[97] The sediments and seeps of the deep seabed are subjected to some of the most extreme environmental conditions on the planet, yet they harbor some of the planet's most diverse biological communities.[98]

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96. *See* P. Jenkins, *Avoiding a Rat-infested, Zebra Mussel-fouled, Nasty Weed Patch for a Planet: Global Policy Changes Needed to Stop Biological Invasions Caused by International Trade* (1999). (unpublished paper presented to the Workshop on Legal and Institutional Dimensions of Invasive Species Introduction and Control: Legal Component of the SCOPE/IUCN Global Invasive Species Programme, Bonn, Germany, Dec. 10-11, 1999) (on file with author).

97. *See* W.J. Broad, *The World's Deep Cold Ocean Floors Harbor a Riotous Diversity of Life*, N.Y. TIMES, Oct. 17, 1995, at C1; Fred Pearce, *Rockall Mud Richer Than Rainforest*, NEW SCIENTIST, Sept. 16, 1995, at 8.

98. *See* ELLIOTT A. NORSE ET AL., GLOBAL MARINE BIOLOGICAL DIVERSITY: A STRATEGY FOR BUILDING CONSERVATION INTO DECISION MAKING 6, 7, 11 (1993). Three examples are petroleum seeps (areas where petroleum naturally discharges from the ocean-floor), sediment pore-water seeps (areas on the ocean-floor where large volumes of cool water and dissolved hydrogen sulfide and methane gas percolate up through deep sediments and discharge from the sea-bed into the superjacent waters) and hydrothermal vents (underwater hot springs associated with tectonically active portions of the deep seabed whose fluid is a mixture of seawater, dissolved minerals and chemicals such as hydrogen sulfide). *See id.* at 7, 11. Hydrothermal areas are rich sources of macro- and micro-organisms. Norse provides one example where 223 of 236 vent species were found to be new to science. *See id.* at 7. These represented 100 new genera

Hydrothermal vents are the best known of the seeps. They are driven by volcanic activity. The most expansive region of oceanic volcanic activity is associated with a single, continuous 50,000 kilometer long undersea mountain range which runs through the Atlantic, Pacific, Indian, and Arctic Oceans like the stitches on a baseball.[99] Hydrothermal vents are widespread, but the vast majority has yet to be discovered and explored.[100]

Those that are most accessible are increasingly threatened by human activities. The activities most likely to involve hydrothermal vents and their biological communities are seabed mining, marine scientific research, biological sampling, and bioprospecting. The following is a brief survey of the threats to hydrothermal vents and how the 1982 United Nations Convention on the Law of the Sea (UNCLOS) and the CBD may apply.[101]

A. Seabed Mining

Mining for polymetallic sulphide deposits poses the greatest potential physical threat to hydrothermal vents and their biological communities. Direct adverse impacts may include physical damage and destruction; indirect adverse impacts may include sedimentation and disrupted water circulation systems.

Mining in areas of national jurisdiction, where vents with potentially valuable associated minerals lie close to shore, is the most immediate threat. Potentially rich in gold and other valuable metals, these vents offer the possibility of reasonable extraction and processing costs because of their accessibility. The best example is the plans of a mining consortium to explore the feasibility of mining polymetallic sulphide deposits from a vent system located in the Manus Basin of the Bismarck Sea.[102] The site is located within the

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and perhaps 22 families. Thus far micro-organisms, fish, crustacea, polychaetes, echinoderms, coelenterates, and mollusks have been discovered in vent areas. *See id.* at 41. Scientists now understand that micro-organisms provide the biological interface between the vents' physical and chemical environments. Scientists have also established that microbes support the biological communities associated with hydrothermal vents. *See id.* at 7. In addition, a seabed microbe has been used to confirm the existence of a third major branch of life on Earth: the Archaea. *See* V. Morell, *Life's Last Domain,* 272 SCIENCE 1043 (1996).

99. *See* M.D. Lemonick, *The Last Frontier*, TIME (INT'L), Aug. 14, 1995, at 52.

100. *See* Carl Franklin, *'Black Smokers' Multiply on Ocean Floor*, NEW SCIENTIST, Oct. 22, 1994, at 20.

101. UNCLOS, *supra* note 33.

102. W.J. Broad, *First Move Made to Mine Mineral Riches of Seabed*, N.Y. TIMES, Dec. 21, 1997, at 1.

Exclusive Economic Zone (EEZ) of Papua New Guinea. Papua New Guinea is a CP to UNCLOS and the CBD.[103]

The international legal basis to conserve and sustainably use hydrothermal vent areas within areas of national jurisdiction is fairly clear and national environmental regulatory processes may already exist. As a principle of international environmental law, a state has the sovereign right to exploit its natural resources provided it does not damage the environment of other states and areas beyond national jurisdiction. The extent to which it must account for the environmental impacts of actions within its own territory depends on its other international environmental obligations and its domestic national environmental laws.

As a CP to UNCLOS, Papua New Guinea has the very general obligations to: (1) "protect and preserve the marine environment" and (2) "protect and preserve rare or fragile ecosystems."[104] As a CP to the CBD it has a range of explicit obligations to conserve biological diversity and use its components sustainably. In order to ensure fulfillment of these obligations, Papua New Guinea should: (1) identify any biological communities associated with the target vent system and (2) regulate or manage the activity to eliminate or minimize impacts on biodiversity. Therefore, an environmental impact assessment should be required.

In addition, public participation should be allowed in Papua New Guinea's regulatory oversight and environmental impact assessment processes. This would allow marine scientific researchers to offer the best available information on the particular sites under review to help determine what the proposal's potential impacts would be. They might also be able to steer proposed activities away from rare or fragile sites or those of particular scientific interest.

In the area beyond the limits of national jurisdiction, polymetallic sulphide deposits are part of the common heritage of humankind.[105] In effect, they are international property. The right to

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103. *See* 21 I.L.M 1477 (UNCLOS list of signatories); 31 I.L.M. 1004 (CBD list of signatories).

104. UNCLOS, *supra* note 33, arts. 192, 194(5). The general obligation to protect and preserve rare or fragile ecosystems under Article 194(5) appears in a section entitled: "Measures to prevent, reduce and control pollution of the marine environment." *Id.* The intent is to ensure that UNCLOS CPs take into consideration the protection of rare or fragile ecosystems when they take measures to prevent, reduce, and control pollution. *See id.* There is some difficulty reading this as a stand alone obligation to protect rare or fragile ecosystems for reasons other than pollution prevention, reduction, and control. Notwithstanding this limitation, the CBD can be interpreted to provide a gap-filling function when a state is a party to both instruments.

105. *See* UNCLOS, *supra* note 33, pt. XI, § 2, art. 136.

explore and exploit them rests solely with the international community.[106] Like polymetallic nodules, the deposits are not currently economically exploitable. They are very expensive to recover and process. As a result, it is unclear when such mining will actually occur.

Pursuant to UNCLOS, the International Seabed Authority (ISA) needs to develop a mining code for sulphide deposits before any mining takes place. In 1998, the Russian delegation to the ISA brought an initiative to establish this code.[107] Unfortunately, it is still too early to determine the scope of the code. It will likely be modeled after the draft code for manganese nodule mining that the ISA has been working on for a number of years.

The forthcoming ISA polymetallic sulphide deposits code should include strong environmental impact assessment procedures. These procedures are not well developed in the draft nodule code. This would help to fulfill the stipulation in UNCLOS that the codes protect and conserve the area's natural resources and prevent damage to the flora and fauna of the marine environment.[108] The intergovernmental process to develop such a code would surely benefit from and could be influenced by available marine scientific research.

B. Marine Scientific Research

The most immediate threat to hydrothermal vent systems and their associated biological communities is marine scientific research. As a "use," marine scientific research needs to be sustainable just like any other natural resource-based activity.

The CBD defines "sustainable use" as using the "components of biological diversity in a way and at a rate that does not lead to the long term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of future generations."[109] This definition recognizes that biological diversity conservation cannot be separated from the sustainable use of its components: genomes, populations of species, and ecosystems. In other words, to conserve biological diversity, its tangible manifestations must be conserved and sustainably used.[110]

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106. *See id.* pt. XI, § 2, art. 137.

107. *See Oceans and the Law of the Sea: Report by the Secretary-General*, U.N. GAOR, 53rd Sess., Agenda Item 38(a), at 8, U.N. Doc. A/53/456 (1998).

108. *See* UNCLOS, *supra* note 33, art. 145(b).

109. CBD, *supra* note 1, art. 2.

110. *See* GLOWKA ET AL., A GUIDE TO THE CONVENTION ON BIOLOGICAL DIVERSITY, *supra* note 10.

Commentators have noted that one aspect of the threat posed by marine scientific research originates from a shift in research priorities from exploration and discovery to those emphasizing temporal processes.[111] Consequently, the "concentration of sampling, observation and instrumentation at a small number of well known hydrothermal sites" has led to the discovery "that certain activities are incompatible, and that even more cooperation and coordination will be required to resolve potential conflict."[112]

The main problem is a conflict between observational monitoring activities that depend upon an undisturbed state and those activities that involve manipulating or collecting biological or geological samples from a particular area. Commentators have asserted that "disturbance by researchers can have a substantial impact on vent systems" and that "anthropogenic changes in distribution and occurrence of vent fluid flows and of associated vent communities have been well documented at vents along the East Pacific Rise, on the Juan de Fuca Ridge and at the TAG field on the Mid-Atlantic Ridge."[113]

In areas of national jurisdiction, managing physical access to sites of scientific interest or of importance for biodiversity conservation may be a viable solution. At a minimum, the overseeing agency for marine scientific research within a coastal state's EEZ and on the continental shelf could provide a screening or clearing-house type function.

When a permit application to undertake research is first submitted, the agency could identify potential conflicts and make prospective researchers aware of them before they occur. If the state is particularly advanced, granting permission to undertake activities in an area might be informed by a management plan and an environmental impact assessment, particularly if the hydrothermal vent area has already been established as a protected area. This seems to be the approach that Canada will ultimately take with regard to the Endeavour Hot Vents site, a designated "pilot marine protected area" located on the Juan de Fuca Ridge within Canada's EEZ.[114]

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111. *See* Lauren Mullineaux et al., *Deep-sea Sanctuaries at Hydrothermal Vents: A Position Paper*, INTERRIDGE NEWS, Apr. 1998, at 15-16

112. *Id.*

113. *Id.*

114. *See* Canadian Ministry of Fisheries and Oceans, *Minister of Fisheries and Oceans Announces Two Offshore Pilot Marine Protected Areas* (visited June 10, 2000) <http://www.oceansconservation.com/mpa/docs/dec8.htm>.

Canada has not ratified UNCLOS and thus is not a CP that must implement the treaty's obligations. The Endeavour proposal would be a step towards implementing the spirit of the UNCLOS provisions to protect and preserve the marine environment and to protect rare and fragile ecosystems. It would also be a step towards implementing the various conservation obligations Canada has accepted as a CP to the CBD.

In this or other areas, zoning a vent system according to the UNESCO Biosphere Reserve approach could be envisioned. Although currently this approach is limited to terrestrial use, UNESCO is exploring how the concept can be applied to marine areas.[115]

Zoning entails delineating an area into zones to be managed to achieve particular objectives. These objectives might include: (1) a core area or areas devoted to strict protection where the possibility might exist for non-invasive observational research, (2) a delineated buffer zone where only research and other activities compatible with specified objectives could take place and, possibly, (3) a transition zone where more invasive activities such as seabed mining could take place.

Such an approach would certainly be in keeping with the general UNCLOS provisions on protecting and preserving the marine environment and protecting fragile or unique ecosystems. Proper zoning would also support the CBD objectives to conserve biodiversity and sustainably use its components by identifying and managing threats to biodiversity and creating protected areas.[116]

As one might imagine, the situation is considerably less structured in areas beyond the limits of national jurisdiction. At this time there is no agency with a mandate to oversee marine scientific research activities or biological resources on the seabed.

The ISA's mandate is limited to the seabed's mineral resources.[117] ISA addresses marine scientific research and the seabed's biological communities only when seabed mining is involved.[118] Without (1) direct measures taken by researching states to regulate the conduct of their marine scientific researchers in the area, (2) a new international treaty, or (3) voluntary oversight by the

115. UNESCO's official website is located at <www.unseco.org.>. *See also* Personal Communication with Mirielle Jardin, UNESCO Man and Biosphere Programme, Paris (Mar. 30, 2000).

116. *See* CBD, *supra* note 1, arts. 7(c), 8(a), (*l*).

117. *See* UNCLOS, *supra* note 33, Annex III.

118. *See id.*

scientific community itself, there is very little that UNCLOS or the CBD can directly offer at present to minimize the potential use conflicts and threats that marine scientific research may pose to a hydrothermal system. Although a new international treaty is unlikely, direct measures by an individual or a group of researching states are possible, especially pursuant treaty obligations under UNCLOS and the CBD.

The outstanding problem is motivating states to act in the first place. A related problem may involve coordinating and harmonizing disparate approaches states may take if they act individually. Both issues could be taken up by UNESCO's Intergovernmental Oceanographic Commission (IOC) whose mandate, among other things, includes marine scientific research. Intergovernmental processes, however, tend to be time consuming and slow.

Voluntary approaches, such as self-policing, initiated by marine scientific researchers may be the most expeditious way to minimize the conflicts and environmental impacts marine scientific research activities may pose. While such voluntary actions have been proposed,[119] coordination and collaboration between marine scientific researchers would be required for success. A coordinating body, such as a consortium of developed and developing states undertaking research on hydrothermal vents, would be needed.[120]

A step towards voluntary action is already being taken as a result of a 1995 recommendation by the InterRidge Biological Studies *Ad Hoc* Committee to demarcate "seabed sanctuaries."[121] This was subsequently elaborated further in a position paper, which proposed a "research reserve system . . . regulated entirely by consensus."[122] It was proposed that InterRidge would disseminate information and summarize controversies.[123] Researchers would be encouraged to devote dive time to explore new sites to alleviate collecting pressure at the most popular sites. Thus far, two sites in the area have been proposed, one on the East Pacific Rise, the other on the Mid-Atlantic Ridge.

Without state action, voluntary actions by marine researchers would support the spirit of UNCLOS since it applies to marine

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119. *See* Mullineaux et al., *supra* note 111, at 15-16.

120. InterRidge is an example of such a consortium. *See* (visited June 10, 2000) <www.lgs.jussieu.fr>.

121. *See* Daniel Desbruyeres et al., *Biological Studies Ad Hoc Committee Workshop Summary* (visited June 10, 2000) <http://www.lgs.jussieu.fr/~intridge/ws-bio95.htm>.

122. Mullineaux et al., *supra* note 111, at 15-16.

123. *See id.*

scientific research beyond the areas of national jurisdiction. The legal status of marine scientific research is determined by where the research takes place when the research is undertaken beyond the limits of any national jurisdiction.

On the high seas and in the Area, all states and competent international organizations have the right to conduct marine scientific research.[124] Unlike the high seas, all marine scientific research within the area "shall be carried out . . . for the benefit of [hu]mankind as a whole . . . ."[125] Unfortunately, UNCLOS defines neither "marine scientific research" nor "benefit of [hu]mankind as a whole."

Arguably, the scientific community's voluntary actions would contribute to the conservation and sustainable use of hydrothermal vents and their associated biodiversity, thereby benefiting humankind as a whole. This also would support the spirit of the CBD's international cooperation provisions and its declaration that biodiversity conservation is a "common concern of humankind."[126]

With any voluntary system the participants must know the principles upon which it is based. In lieu of regulatory oversight, the scientific community could undertake to develop a professional code of conduct for activities involving hydrothermal vents to guide researchers. The code could provide a reference point against which they could judge their own conduct and the conduct of their peers.

Furthermore, the ultimate success of any voluntary system or instrument, such as a professional code of conduct, is intimately related to the process by which it is developed. It is a well-established principle in modern conservation circles that the key stakeholders must be involved in any process whose result may have an impact upon their activities.

Incentives may need to be provided to encourage compliance. For example, national funding institutions could agree to conditionally grant money upon the demonstrable application of the code of conduct by the grantee. Peer pressure may also play a role in the ultimate success of any voluntary system. To fully ensure the codes' application, and to give it added weight, it may need to be solidified further by an intergovernmental body such as the UNESCO IOC. This would ensure oversight of its implementation at the global level and may encourage its voluntary application by states.

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124. *See* UNCLOS, *supra* note 33, art. 256.
125. *Id.* art. 143(1).
126. CBD, *supra* note 1, pmbl., para. 3.

C. *Biological Sampling*

Biological sampling of macro- and microorganisms is a primary goal of many marine scientific research activities both within and beyond the limits of national jurisdiction. Depending on the circumstances, sampling activities may put pressure on hydrothermal biological communities causing adverse impacts. Consequently, sampling may not be sustainable, especially for sampling involving invertebrates.

Direct impacts associated with sampling a limited population of organisms are clearly possible. Possible indirect impacts are less discernable. For example, sampling in unique environments may be an unsustainable use absent precautions to minimize the introduction of alien species from one site to another.

For such reasons, in areas of national jurisdiction, there are clear intersections between these activities, the UNCLOS provision on rare and fragile ecosystems previously described, and the CBD's sustainable use provisions.

As with seabed mining, a CBD CP is to identify actual or potential threats to biodiversity, and thereafter regulate or manage them to minimize those threats.[127] A complementary provision requires the coastal state to adopt measures relating to the use of biological resources to avoid or minimize adverse impacts on biological diversity.[128] Intersections with environmental impact assessment are apparent.[129] Finally, a CP is required to regulate and manage the collection of biological resources from natural habitats for ex-situ conservation purposes so as not to threaten ecosystems and in-situ populations of species.[130]

Beyond national jurisdiction, the situation is similar to that for general marine scientific research. Under UNCLOS, unsustainable collecting for research purposes could be interpreted as inconsistent with the requirement that marine scientific research is to be undertaken for the benefit of humankind as a whole. As suggested above, voluntary action by the marine scientific research community could suffice in the absence of a new treaty or until other state action takes place.

In 1995, the InterRidge Biological Studies *Ad Hoc* Committee recommended that the Member States of InterRidge establish a

127. *See id.* arts. 7(c), 8(*l*).
128. *See id.* art. 10(b).
129. *See id.* art. 14.
130. *See id.* art. 9(d).

voluntary international specimen or sample exchange agreement whose "aim is to avoid duplication of sampling which is costly not only in monetary terms but also in terms of environmental impact."[131] The idea was further elaborated by a group of scientists in 1997 at the First International Hydrothermal Vent Biology Symposium in Madeira, Portugal.

The exchange agreement would augment existing international specimen exchanges. Support would be provided by an internet-based database with information on existing biological samples. In addition, nonbiology research cruises would be provided with "bio-boxes" for collecting and preserving biological samples and making them available for exchange.

The draft agreement has yet to be officially endorsed by InterRidge Member States. National corresponding curators have been asked to draw on its terms and conditions, including its prohibitions on redistributing exchanged samples and using the samples for commercially-oriented research. The initiative would contribute to one aspect of the sustainable use of vent organisms.

D. Bioprospecting

Marine scientific research activities, particularly those related to biological and geological sampling, are becoming increasingly linked to onshore commercial bioprospecting activities.[132] The true extent of marine bioprospecting at hydrothermal vent sites within and beyond areas of national jurisdiction is unknown. These activities probably do not pose an immediate threat to biological communities associated with hydrothermal vents.

Sustainability may need to be considered where bioprospectors need large quantities of a macro-organism to obtain useful quantities of a secondary metabolite produced by a mutualistic micro-organism. If the secondary metabolite is not readily synthesizable and the micro-organism is not culturable, then harvesting the macro-organism at unsustainable levels could threaten both it and the particular ecosystem.[133]

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131. Desbruyeres et al., *supra* note 121.

132. *See* W.J. BROAD, THE UNIVERSE BELOW: DISCOVERING THE SECRETS OF THE DEEP SEA (1997); N. Gross, *Extreme Enzymes: Science is Commercializing Nature's Diehard Proteins*, BUSINESS WK., Apr. 1, 1996.

133. *See* Lyle Glowka, *The Convention on Biological Diversity: Issues of Interest to the Microbial Scientist and Microbial Culture Collections*, *in Culture Collections To Improve The Quality Of Life*, 8 INT'L CONGRESS FOR CULTURE COLLECTIONS 36, 51 (R.A. Sampson et al. eds., 1996).

Beyond environmental impacts, biological sampling at hydrothermal vents within the limits of national jurisdiction may have implications for marine scientific researchers and bioprospectors. There may be a need to seek PIC and negotiate MATs and ultimately share benefits for the use of genetic resources.

The CBD's genetic resources provisions only apply to marine areas within the areas of national jurisdiction.[134] These provisions require marine scientific researchers and bioprospectors to obtain the government's PIC before accessing the area.[135] PIC will be subject to mutually agreed upon terms, including benefit sharing. Similarly, within the limits of national jurisdiction, UNCLOS requires that consent first be acquired for marine scientific research.[136]

Under UNCLOS, consent is presumed unless the coastal state has reason to be believe the proposed research is "directly significant" to commercial exploration and exploitation of natural resources, whether living or nonliving.[137] Where the marine scientific research is for noncommercial purposes, the researching state is to: (1) ensure the participation of the scientists from the coastal state, (2) provide preliminary reports and final results upon request, (3) provide access to samples and data collected upon request, (4) provide sample and data assessment, and (5) research results upon request; and ensure international availability of the research results.[138]

Beyond the limits of national jurisdiction, the CBD's provisions on genetic resources access and benefit sharing are not applicable.[139] Nevertheless, the CBD COP has called upon the CBD Secretariat to study the conservation and sustainable use of deep seabed genetic resources in relation to bioprospecting.[140] The U.N. Secretary General

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134. *See* CBD, *supra* note 1, art. 15.

135. *See id.*

136. *See* UNCLOS, *supra* note 33, art. 246(2).

137. *See id.* arts. 246(3), (5)(a).

138. *See id.* art. 249.

139. *See* CBD, *supra* note 1, art. 4(a).

140. *See Report of the Second Meeting of the COP*, *supra* note 42, at 60, para. 12. In 1995, the CBD COP directed the CBD Secretariat as follows:

> [I]n consultation with the United Nations Office for Ocean Affairs and the Law of the Sea, . . . undertake a study of the relationship between the Convention on Biological Diversity and the United Nations Convention on the Law of the Sea with regard to the conservation and sustainable use of genetic resources on the deep seabed.

Id. This would "[enable] the [SBSTTA] to address, at future meetings, the scientific, technical and technological issues related to bio-prospecting of genetic resources on the deep seabed." *Id.* As of December 1999, the study has yet to be undertaken. For a general overview of the issue see Lyle Glowka, *Genetic Resources, Marine Scientific Research and the International Seabed Area*, *in* 8 REVIEW OF EUROPEAN COMMUNITY AND INTERNATIONAL ENVIRONMENTAL LAW 56

has highlighted the importance of the CBD study.[141] The Independent World Commission on Oceans has also called for a study.[142]

Even though UNCLOS and the CBD do not squarely address hydrothermal vents, they can still be used as the international legal basis to ensure conservation and sustainable use. The clearest applications exist in areas of national jurisdiction. The CBD study of seabed genetic resources could leverage a wider treatment of other deep seabed biodiversity issues, including those associated with hydrothermal vents.

(1999); and Lyle Glowka, *The Deepest of Ironies: Genetic Resources, Marine Scientific Research, and the Area*, 12 OCEAN Y.B. 154 (1996).

141. The U.N. Secretary General has noted:

> The general subject of marine and coastal biodiversity, as well as the specific issue of access to the genetic resources of the deep seabed, raise important questions. The topic touches not only on the protection and preservation of the marine environment, including that of the international seabed area, but also on such other matters as the application of the consent regime for marine scientific research, . . . the duties of conservation and management of the living resources of the high seas, and the sustainable development of living marine resources generally. The specific issue of access points to the need for the rational and orderly development of activities relating to the utilization of genetic resources derived from the deep seabed area beyond the limits of national jurisdiction. The study to be prepared for Parties to the Biodiversity Convention will be of equal, or possibly greater importance to States Parties to the United Nations Convention on the Law of the Sea, as well as Member States in the General Assembly . . . .

Law of the Sea: Report of the Secretary General, U.N. General Assembly, 51st Sess., Agenda Item 24(a), at 59, U.N. Doc. A/51/645 (1996).

142. *See* INDEPENDENT WORLD COMM'N ON THE OCEANS, THE OCEAN OUR FUTURE, THE REPORT OF THE INDEPENDENT WORLD COMM'N ON THE OCEANS (1998). "The potentials of the genetic resources of the seabed should become the subject of urgent study, focusing on their legal, environmental and economic implications, and negotiation leading to their inclusion within an appropriate international regulatory regime." *Id.*