CHAPTER 2

INTRODUCTION

This chapter examines core aspects of international law that apply to hydrothermal vents and their associated ecosystems. It begins with an examination of key concepts that are relevant to assessing the effectiveness of the existing law and any needed reforms. These concepts are sustainable development, the related concept of intergenerational equity, the precautionary principle and the ecosystem approach. The chapter then goes on to consider the extent to which existing international law can provide for the sustainable management of deep-sea hydrothermal vents. In particular it examines the core global treaties LOSC and the CBD. The chapter will then go on to examine recent developments on this issue within the context of both the SBSTTA and COP of the CBD. The chapter then concludes with an examination of the ongoing work of the United Nations Informal Consultative Process on the Law of the Sea [1] and relevant resolutions of the United Nations General Assembly. Parallel developments within the International Seabed Authority are canvassed in Chapter 9.

FOUNDATION CONCEPTS IN INTERNATIONAL ENVIRONMENTAL LAW AND POLICY

International environmental law is a modern construct. The key event often referred to as the beginning of international environmental law is the 1972 Stockholm

[1] Hereinafter UNICPLOS.

Conference on Environment and Development. The Stockholm Conference was attended by 114 states as well as a large number of international institutions and non-governmental observers.[2] The key outcomes of the Stockholm Conference were three non-binding instruments including a resolution on institutional and financial arrangements, the Stockholm Declaration containing 26 Principles, and an Action Plan containing 109 recommendations.[3] Of these outcomes the Stockholm Declaration is by far the most significant. Although it did not specifically use the term sustainable development, it is widely reagarded as laying the groundwork for its subsequent acceptance as a core principle of international environment law and policy.[4]

The most widely accepted definition of sustainable development is that contained in the Brundtland Report.[5] That is

> "development that meets the needs of the present without compromising the ability of future generations to meet their own needs"[6]

The significance of the Brundtland Report and in particular its articulation of the concept of sustainable development went far beyond merely introducing a new concept into international discourse. As Sands notes the Bruntland Report

> "focused world attention on population, food security, the loss of species and genetic resources, energy, industry, and human settlements, recognizing that these are connected and cannot be treated in isolation from each other. On international co-operation and institutional reform the focus included the role of the international economy, managing global commons,

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[2] P Sands, *Principles of international environmental law: Frameworks standards and implementation*, (1995), 34.
[3] Sands, above n 2.
[4] D Hunter, J Salzman and D Zaelke, *International Environmental Law and Policy*, (2002), 177.
[5] World Commission on Environment and Development, *Our Common Future*, (1987).
[6] World Commission on Environment and Development, above n 5, 43.

> the relationship between peace, security, development and the environment and institutional and legal change."[7]

The Brundtland Report then went on to make recommendations in respect of each of these matters identifying key challenges for the development of international law in areas in and beyond national jurisdiction.

Thus not only did the Bruntland Report provide a widely acceptable definition of sustainable development, it also then mapped out the road to achieve it. Following this road map sustainable development has been a core concept at the centre of subsequent developments in international law and policy, including the outcomes of the 1992 United Nations Conference on Environment and Development in Rio de Janeiro[8] (such as the Rio Declaration[9]) and development of treaties such as the CBD.

Intergenerational Equity

A key principle of international law closely allied with sustainable development is the notion of intergenerational equity.[10] In essence the principle of intergenerational equity is a principle of fairness that requires "that present generations not leave future generations worse off by the choices we make today regarding the environment".[11] In implementing the principle of integenerational equity the current generation must

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[7] P Sands, *Principles of international environmental law: Frameworks standards and implementation*, (1995), 46.
[8] Hereinafter referred to as the Rio Earth Summit.
[9] *Declaration of the UN Conference on Environment and Development, Rio de Janeiro*, 3-14 June 1992 UN Doc. A/CONF 151/26. Hereinafter referred to as the Rio Declaration.
[10] The principle of intergenerational equity is widely reflected in international law in treaties such as the CBD and in instruments such as the Stockholm Declaration
[11] D Hunter, J Salzman and D Zaelke, *International Environmental Law* and Policy, (2002), 398.

ensure that it uses natural resources sustainably and avoids irresponsible environmental damage.[12]

The Precautionary Prnciple

The precautionary principle is another principle of direct relevance to examining regulation of human activities at hydrothermal vents and considering proposals for reform to international law. The most widely accepted forumaltion of the precautionary principle is that contained in Principle 15 of the Rio Declaration.[13] Principle 15 of the Rio Declaration provides

> "In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation"[14]

The Precautionary Principle is reflected in numerous examples of State Practice, International treaties and other sources of international and domestic law.[15] It has been suggested that given the widespread adoption of the Precuationary Principle it may well be regarded as having crtystalised into customary international law, although this is not universally accepted.[16]

The exact nature of the precautionary principle is widely contested and a detailed review of the adademic discourse on this issue is beyond the scope of this chapter.

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[12] Ibid.

[13] D Hunter, J Salzman and D Zaelke, *International Environmental Law and Policy*, (2002), 406.

[14] Principle 15 Rio Declaration.

[15] For a detailed review of examples of incorporation of the precautionary principle in international legal instruments see J Cameron and J Abouchar, 'The Precautionary Principle: A Fundamental Principle of Law and Policy for the Protection of the Global Environment' (1991) 14(1) *Boston College International & Comparative Law Review* 1 and de Sadeleer N, *Environmental Principles. From Political Slogans to Legal Rules*, (2005), 94-139.

[16] Ibid.

Nonetheless it is worth noting that many commentators accept that "the precautionary principle acts to shift the burden of proof necessary for triggering policy responses from those who support prohibiting or reducing a potentially offending activity to those who want to continue the activity".[17] However, precaution defined as involving a reversal of the onus of proof has been subject to considerable criticism.[18] Depending on the context in which the Precautionary Principle is being considered it has been suggested that it may be more appropriate for the Precautionary Principle to be considered as setting the standard of proof required rather than reversing the onus of proof.[19]

Regardless of the precise characterisation of the Precautionary Principle it is clear that it is a Principal of great significance in international environmental law and policy discourse, and is of particular relevance to considering gaps in law and policy and in identifying needed reforms.

The Ecosystem Approach

Finally, before considering the operation of substantive treaties it is worth commenting briefly on the significance of the ecosystem approach for dealing with environmental issues. The ecosystem approach is not a legal principle as such. Instead the

> " ecosystem approach is a method for sustaining or restoring natural systems and their functions and values. It is goal driven, and it is based on a collaboratively developed vision of

[17] D Hunter, J Salzman and D Zaelke, above n 13.
[18] J Peel, *The Precautionary Principle in Practice. Environmental Decision-Making and Scientific Uncertainty*, (2005), 155.
[19] Ibid.

> desired future conditions that integrates ecological, economic, and social factors. It is applied within a geographic framework defined primarily by ecological boundaries.
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> The goal of the ecosystem approach is to restore and sustain the health, productivity, and biological diversity of ecosystems and the overall quality of life through a natural resource management approach that is fully integrated with social and economic goals.".[20]

The ecosystem approach has been widely adopted in a range of contexts and in numerous legal instruments. One of the most significant endorsements of the ecosystem approach was by the COP to the CBD. In 2000 decision V/6 the COP of the CBD defined and endorsed the ecosystem approach in the context of the CBD in the following terms:

> "1. The ecosystem approach is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. Thus, the application of the ecosystem approach will help to reach a balance of the three objectives of the Convention: conservation; sustainable use; and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources.
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> 2. An ecosystem approach is based on the application of appropriate scientific methodologies focused on levels of biological organization, which encompass the essential structure, processes, functions and interactions among organisms and their environment. It recognizes that humans, with their cultural diversity, are an integral component of many ecosystems.
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> 3. This focus on structure, processes, functions and interactions is consistent with the definition of "ecosystem" provided in Article 2 of the Convention on Biological Diversity: "'Ecosystem' means a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit." This definition does not specify any particular spatial unit or scale, in contrast to the Convention definition of "habitat". Thus, the term "ecosystem" does not, necessarily, correspond to the terms "biome" or "ecological zone", but can refer to any functioning unit at any scale. Indeed, the scale of analysis and action should be determined by the problem being addressed. It could, for example, be a grain of soil, a pond, a forest, a biome or the entire biosphere.
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> 4. The ecosystem approach requires adaptive management to deal with the complex and dynamic nature of ecosystems and the absence of complete knowledge or understanding of their functioning. Ecosystem processes are often non-linear, and the outcome of such processes often shows time-lags. The result is discontinuities, leading to surprise and uncertainty. Management must be adaptive in order to be able to respond to such uncertainties and contain elements of "learning-by-doing" or research feedback. Measures may need to be taken even when some cause-and-effect relationships are not yet fully established scientifically.

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[20] US Department of Commerce, *The Ecosystem Approach: Healthy Ecosystems and Sustainable Economies*, (1995) available from https://www.denix.osd.mil/denix/Public/ES-Programs/Conservation/Ecosystem/ecosystem1.html#approach accessed 9 November 2005.

> 5. The ecosystem approach does not preclude other management and conservation approaches, such as biosphere reserves, protected areas, and single-species conservation programmes, as well as other approaches carried out under existing national policy and legislative frameworks, but could, rather, integrate all these approaches and other methodologies to deal with complex situations. There is no single way to implement the ecosystem approach, as it depends on local, provincial, national, regional or global conditions. Indeed, there are many ways in which ecosystem approaches may be used as the framework for delivering the objectives of the Convention in practice."[21]

Having now briefly examined core principles and concepts of international environmental law of relevance to the existing law that applies to hydrothermal vents and possible reforms to the law, the following discussion now turns to consider the operation of the key treaties the LOSC and the CBD.

UNITED NATIONS CONVENTION ON THE LAW OF THE SEA AND HYDROTHERMAL VENTS

LOSC establishes a comprehensive framework for the regulation of ocean space.[22] Apart from the CBD, LOSC is one of the most widely ratified treaties in the history of international law. As at 31 January 2005, 157 countries have signed LOSC. Of these countries 148 have subsequently ratified the treaty. While some countries have signed, but not yet ratified the treaty, pursuant to Article 18 of the 1969 *Vienna Convention on the Law of Treaties*,[23] pending ratification by these countries they are under an obligation to refrain from acts which would defeat its object and purpose.

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[21] CBD COP Decision V/6, available from http://www.biodiv.org/decisions/?m=cop-05 accessed 9 November 2005.

[22] B Zuleta, Special Representative of the Secretary-General to the Third United Nation Conference on the Law of the Sea, in United Nations , *The Law of the Sea: United Nations Convention on the Law of the Sea with Index and Final Act of the Third United Nations Conference on the Law of the Sea* (1983).

[23] *Convention on the Law of Treaties*, opened for signature 23 May 1969, 8 I L M (1969), 679 (in force 27 January 1980).

The regime established by LOSC and the Part XI Agreement governs, inter alia, the limits of national jurisdiction over ocean space, access to the seas, navigation, protection of the marine environment, exploitation of living resources and conservation, MSR, sea-bed mining, exploitation of non-living resources, and the settlement of disputes.[24] In many respects LOSC has rightly been called a "comprehensive constitution for the oceans".[25] While this may have been true in 1982, today its ability to deal with new emerging issues such as the sustainable management of the deep-sea and hydrothermal vents in particular is less comprehensive. Hydrothermal vents and their dependant ecosystems, although known to exist as early as 1977, were not considered during LOSC's negotiations.[26] As such, in examining the applicability of LOSC we must recognise that what we are trying to do is to make the law of another era fit the needs of today. While to some extent the provisions of LOSC are flexible and can be stretched in part to meet the needs of today, they are far from elastic enough.

JURISDICTIONAL ZONES OF THE OCEANS UNDER LOSC

LOSC divides ocean space up into a number of jurisdictional zones. For present purposes the most significant zones are the 12 nautical mile territorial sea, the 200 nautical mile EEZ, the Continental Shelf, the High Seas and that portion of the sea-

[24] B Zuleta, above n 22, XXIV.
[25] T T Koh, President of the Third United Nations Conference on the Law of the Sea, in United Nations, above n 2, xxxiii.
[26] As distinct from their associated mineral resources.

bed beyond national jurisdiction on the high seas known as the Area.[27] Within the territorial sea, coastal States possess sovereignty to regulate all access to and exploitation of all living and non living resources located within the territorial sea and seabed.[28] Similarly in exercise of their sovereignty, coastal States have the exclusive right to regulate, authorize and conduct MSR in their territorial sea.[29]

Part V of LOSC establishes the regime of the EEZ. The rights of the coastal state within its EEZ are as follows:

> "(a) sovereign rights for the purposes of exploring and exploiting, conserving and managing the natural resources, whether living or non-living, of the waters superjacent to the sea-bed and its subsoil, and with regard to other activities for the economic exploitation and exploration of the zone, such as the production of energy from the water, currents and winds;
> (b) jurisdiction as provided for in the relevant provisions of [LOSC] with regard to:
> (i) the establishment and use of artificial islands, installations and structures;
> (ii) marine scientific research;
> (iii) the protection and preservation of the marine environment
> (c) other rights and duties provided for in [LOSC]".[30]

Rights in relation to the seabed and subsoil are subject to the provisions of Part VI of LOSC, which sets out the continental shelf regime. Similarly the rights of the coastal State are also subject to the freedoms of navigation and overflight, and recognised rights in relation to the laying of submarine cables and pipelines and other internationally lawful uses of the sea related to those freedoms.[31]

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[27] The Area is defined in Article 1(1) as the sea-bed and ocean floor and subsoil thereof, beyond the limits of national jurisdiction. The legal status of the Area is discussed in more detail below in the context of considering the deep-sea mining regime established under LOSC and the Part XI Agreement.

[28] LOSC, article 2.

[29] LOSC, article 245.

[30] LOSC, article 56.

[31] LOSC, article 58(1).

The specific legal regime of the EEZ established by Part V also includes very detailed provisions as to the coastal States' rights and duties to conserve and manage specific species.[32] It is significant to note, however, that pursuant to Article 68 the provisions of Part V do not apply to the so called sedentary species. The importance of this distinction is discussed in more detail below. In exercise of its sovereign rights to explore, exploit, conserve and manage the living resources in the EEZ the coastal State may "take such measures, including boarding, inspection, arrest and judicial proceedings, as may be necessary to ensure compliance with the laws and regulations adopted by it in conformity" with LOSC.[33]

The Continental shelf regime

Part VI of LOSC establishes the legal regime of the Continental Shelf. Under Article 76 the continental shelf is defined in relation to the coastal state as:

> "the sea-bed and subsoil of the submarine areas that extend beyond its territorial sea throughout the natural prolongation of its land territory to the outer edge of the continental margin, or to a distance of 200 nautical miles from the baselines from which the breadth of the territorial sea is measured where the outer edge of the continental margin does not extend up to that distance".[34]

The continental margin comprises the submerged prolongation of the landmass of the coastal State, including the seabed and subsoil of the shelf, the continental slope and the continental rise. It does not include the deep ocean floor with its oceanic ridges or the subsoil thereof.[35]

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[32] Specifically articles 61, 62, 63, 64, 65, 66, 67 and 68.
[33] LOSC, article 72.
[34] LOSC, article 76(1).

[35] LOSC, article 76(3).

Pursuant to Article 77(1) the coastal State has sovereign rights to explore and exploit the natural resources of the continental shelf.[36] The term "natural resources" as used in Part VI consists of the "mineral and other non-living resources of the sea-bed and subsoil together with living organisms belonging to the sedentary species," that is, "organisms which, at the harvestable stage, either are immobile on or under the sea-bed or are unable to move except in constant physical contact with the sea-bed or the subsoil."[37]

These rights are exclusive to the coastal State. If the coastal State does not explore the continental shelf or exploit its natural resources no other State or person may do so without the express consent of the coastal State.[38] Similarly under Article 81 of LOSC, the coastal State has the exclusive right to authorise and regulate drilling on the continental shelf for all purposes.[39]

However, the rights of the coastal State over the continental shelf do not affect the legal status of the superjacent waters or of the air space above those waters.[40] Similarly, under Article 78(2), the exercise of the rights of the coastal State must not infringe or result in unjustifiable interference with navigation and other rights and freedoms of other States provided for under LOSC.

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[36] LOSC, article 77(1).
[37] LOSC, article 77(4).
[38] LOSC, article 77(2).
[39] LOSC, article 81.
[40] LOSC, article 78(1).

The High Seas

Part VIII contains the provisions dealing specifically with the high seas. The high seas for the purposes of LOSC are regarded as

> "all parts of the sea that are not included in the EEZ, in the territorial sea or in the internal waters of a State, or in the archipelagic waters of an archipelagic State".[41]

They are reserved for peaceful purposes,[42] and no State may validly purport to subject any part of the high seas to its sovereignty.[43] Every State (both coastal and land-locked) has the right to sail ships flying its flag on the high seas.[44] LOSC specifically recognises the traditional notion of freedom of the high Seas which may be exercised by all States whether coastal or land-locked.[45] Without limiting what may be regarded as an exercise of the freedom of the high seas, article 87 states that it includes:

- freedom of navigation;
- freedom of overflight;
- freedom to lay submarine cables and pipelines (subject to Part VI);
- freedom to construct artificial islands and other installations permitted under international law (subject to Part VI);
- freedom of fishing (subject to Parts VI and XIII); and
- freedom of scientific research (subject to Parts VI and XIII).

[41] LOSC, article 86.
[42] LOSC, article 88.
[43] LOSC, article 89.
[44] LOSC, article 90.
[45] LOSC, article 87.

These freedoms must be exercised by all States with due regard for the interests of other States in their exercise of the freedom of the high seas, other rights under LOSC and with respect to activities in the Area.[46]

LOSC Part XII-Protection and Preservation of the Marine Environment

Under article 192 of LOSC States have accepted the general "obligation to protect and preserve the marine environment."[47] This general obligation would appear to be a separate discrete obligation from the more detailed obligations dealing with specific issues contained in other provisions of LOSC.[48] Some guidance on how the general obligation under Article 192 is to be implemented is provided by Article 197 which states:

> "States shall co-operate on a global basis and, as appropriate, on a regional basis, directly or through competent international organization [sic], in formulating and elaborating international rules, standards and recommended practices and procedures consistent with this Convention, for the protection and preservation of the marine environment, taking into account regional features."[49]

LOSC therefore leaves the means of implementation of the general obligation under Article 192 to be formulated at a later date. This is a reflection of the fact that LOSC is essentially a framework convention stating general principles and obligations, leaving the expansion and implementation of these general obligations to the development of other treaties, with particular emphasis placed on their development and implementation on a regional basis. It is at the regional level that this general obligation has principally been expanded and implemented.

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[46] See LOSC article 87(2).
[47] LOSC, article 192.
[48] For example, those dealing specifically with pollution in the marine environment under articles 207-212 or those dealing with the environmental impact of deep-sea mining contained within article 145 and Annex III of LOSC.
[49] LOSC, article 197.

Additional provisions deal with aspects of the protection of the marine environment in specific jurisdictional zones. Quite clearly any hydrothermal vent sites that lie within a coastal State's territorial sea would be governed by any particular measures introduced by individual coastal State's within their territorial sea. A number of State's have implemented measures that apply to hydrothermal vent sites within their territorial waters and or EEZ. These are examined in Chapter 6.

The position within the EEZ and the area governed by the Continental shelf Regime is more complicated. As noted above under Article 56(b)(iii), the coastal State has jurisdiction within the EEZ with regard to the protection and preservation of the marine environment. Pursuant to Article 61 of LOSC the coastal State is also specifically authorised to determine the allowable catch of the living resources in its EEZ. Article 61 is supplemented by a number of other provisions of Part V, which also establish different regimes for the exploitation and conservation of living marine resources depending upon whether or not they fall within particular scientific categories. Thus specific provision is made for highly migratory species,[50] which are governed by Article 64, Marine Mammals, which are governed by Article 65, Anadromous stocks, which are governed by Article 66, and Catadromous species governed by Article 67. However, as noted earlier, Article 68 specifically excludes the provisions of Part V from applying to sedentary species. This therefore raises the question as to whether species associated with hydrothermal vents are sedentary

[50] Being particular species listed in Annex 1 to LOSC, eg Bluefin tuna.

species, in which case the provisions of Part VI, establishing the Continental shelf Regime might apply.

Are hydrothermal vent species sedentary species?

The extent to which the coastal State can regulate activities at hydrothermal vents on its continental shelf is unclear. Pursuant to Article 77(1) of LOSC, the coastal State has 'sovereign rights' to explore and exploit the natural resources of the continental shelf. The term 'natural resources', as used in Part VI, is defined in Article 77(4) of LOSC as the "mineral and other non-living resources of the sea-bed and subsoil together with living organisms belonging to the sedentary species."

The literature to date[51] has established the difficulty in attempting to bring species associated with hydrothermal vents within the definition of sedentary species contained in Article 77(4). As Allen notes, the definition of sedentary species "has little or no relationship to biological taxonomy"[52] and working out whether hydrothermal vent species fall within the definition of sedentary species presents a number of problems. Firstly, there are clearly difficulties in identifying the harvestable stage of many hydrothermal vent species. Indeed, most species such as microbes are not collected in a way that can be regarded as harvesting.[53] More problematic, though, is the requirement that such species be either immobile on or

[51] The most detailed consideration to date being C H Allen, 'Protecting the Oceanic Gardens of Eden: International Law Issues in Deep Sea Vent Resources Conservation and Management' (2001) 13 *Georgetown International Environmental Law Review* 563 and H Korn, S Friedrich and U Feit, *Deep Sea Genetic Resources in the Context of the Convention on Biological Diversity and the United Nations Convention on the Law of the Sea* (2003).
[52] Allen, above n 51, 621.
[53] Allen, above n 51, 622-623.

under the seabed, or unable to move except in constant physical contact with the seabed or the subsoil. Some species found at hydrothermal vent sites arguably fall within this requirement (for example molluscs and gastropods and possibly tubeworms), while others such as fish and octopus species, are clearly capable of movement through the water without being in constant physical contact with the seabed, and therefore, clearly fall outside the definition.[54] Given the different miens in which microbes are found, some, such as those found in hydrothermal plumes, arguably fall outside the definition of sedentary species, while others, such as those under the seabed, may arguably fall within the definition, if immobile at the harvestable stage. Therefore, within one ecosystem around an individual vent field there will be both macrofauna and microfauna that meet the test for sedentary species and therefore fall within the Continental Shelf Regime, as well as macrofauna and microfauna that will not fulfil the definition of sedentary species and which therefore fall outside the Continental Shelf Regime.[55]

Korn et al[56] have suggested that since many species fall outside the sedentary species definition this leads to a "fractured regulatory approach regarding management and conservation" of hydrothermal vents and their associated biological resources. Does the failure of some macrofauna and microfauna to fall within the definition of sedentary species really matter? Is the consequence as significant as Korn et al and Allen's detailed analysis suggest? If the particular macrofauna or microfauna cannot

[54] Allen, above n 51, 625-628.
[55] Allen, above n 51,627- 628.
[56] Korn et al, above n 51, 40.

be regarded as falling within the definition of sedentary species, but they are located within the coastal State's EEZ then the coastal State nonetheless has both the sovereign right to explore, exploit, conserve and manage such macrofauna or microfauna as natural resources under Article 56(1)(a) of LOSC, as well as the jurisdiction to take measures to protect and preserve such living resources as part of the marine environment under Article 56(1)(iii). That is, if such species are found within the EEZ and are not sedentary species then the EEZ regime applies.

If the particular macrofauna or microfauna do fall within the definition of sedentary species, and are located within the coastal State's EEZ and its continental shelf then the coastal State has the sovereign right to explore and exploit such natural resources under Article 77. The rights are expressed as sovereign rights. Such sovereign rights would include the right to prohibit any form of exploitation and or the right to make exploitation for any purpose subject to or conditional on compliance with measures to protect and preserve individual vent sites or to minimise the environmental impact of such activities. Although such measures are not specifically mentioned they would arguably constitute a legitimate exercise of sovereign rights with respect to such resources. The practical effect, therefore, would be that a State could take the same measures within the area of its continental shelf as it could within the EEZ.

However, the distinction between sedentary species and non-sedentary species might matter where a hydrothermal vent site is found outside the EEZ but on the continental

shelf. That is where a State claims a continental shelf that extends beyond the limit of the EEZ. However, by operation of Article 76(3) of LOSC, hydrothermal vent sites associated with the mid ocean ridges fall outside the scope of the Continental shelf regime. This is because Article 76(3) specifically excludes oceanic ridges of the deep ocean floor from the continental shelf regime. Likewise, in accordance with Article 76(4) and Article 76(5), the continental shelf of a coastal State will generally not extend to include hydrothermal vents below 2500 metres in depth. Nonetheless, the issue may arise where a hydrothermal vent is not associated with the mid ocean ridge system but is located on a coastal State's continental shelf. Such sites occur on New Zealand's continental shelf. The implications of this for New Zealand are discussed in Chapter 6.

LOSC and marine pollution-Light and noise pollution in the deep-sea.

The most comprehensive provisions of LOSC dealing with protection of the marine environment are those relating to pollution. Article 1(4) of LOSC defines "pollution of the marine environment" as:

> "the introduction by man [sic], directly or indirectly, of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities."[57]

While this definition obviously includes more typical types of pollution such as oil, polychlorinated biphenyls or PCB's, and heavy metals (such as lead, mercury and

[57] LOSC, article 1(4).

cadmium),[58] the definition has a potentially wider scope of operation. The reference to "energy" could be read to cover all forms of energy including noise[59] and light.

This provision of LOSC is based on an earlier version prepared by the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection.[60] The original definition referred only to the introduction of substances but the term "energy" was added later following concerns about thermal pollution.[61]

A wide interpretation of the term "energy" to include noise and light pollution would be consistent with Article 31(1) of the *Vienna Convention on the Law of Treaties* [62]which provides that

> "a treaty shall be interpreted in good faith in accordance with the ordinary meaning to be given to terms of the treaty in their context and in the light of its object and purpose". [63]

Energy could therefore arguably be interpreted as including light and noise energy.

The use of the expression "results or is likely to result" in the definition in Article 1(4) indicates that the deleterious effects need not have manifested themselves yet, but can reasonably be expected to occur.[64] Even in the absence of full scientific certainty as to whether deleterious effects have occurred or are about to occur, there is

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[58] R R Churchill and A V Lowe, *The Law of the Sea* (1999), 331.
[59] H M Dotinga and A G Oude Elferink, 'Acoustic Pollution in the Oceans: The Search for Legal Standards' (2000) 31 *Ocean Development & International Law* 151, 158.
[60] Dotinga and Oude Elferink, above n 59.
[61] Dotinga and Oude Elferink, above n 59, 158.
[62] Dotinga and Oude Elferink, above n 59.
[63] *Convention on the Law of Treaties*, opened for signature 23 May 1969, 8 ILM (1969) 671, (entered into force 27 January 1980).

a need to act with caution and not delay preventative action where the circumstances require such.[65] Such an interpretation is consistent with the precautionary principle.

One of the unique environmental impacts of human activities in the deep-sea is the introduction of light. There is evidence that the introduction of light may result in "deleterious effects" that harm the living resources of the deep-sea. For example, there is evidence that the introduction of light to the deep-sea environment may lead to blindness in species of shrimp associated with hydrothermal vents whose eyes are adapted to the total darkness of the deep-sea.[66]

Light is introduced into the deep-sea environment by scientists carrying out research in the deep-sea, by bioprospecting and in the course of deep-sea tourism. Although deep-sea mining has not yet commenced, it is reasonable to expect that the introduction of light energy into the deep-sea environment will also have an environmental impact associated with deep-sea mining. Likewise, although little is known about the impact of noise pollution in the deep-sea environment, and on hydrothermal vent ecosystems in particular, it is conceivable that there may be some impact. Pending further scientific research to clarify this a precautionary approach should be adopted.

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[64] Dotinga and Oude Elferink, above n 59, 159.
[65] Dotinga and Oude Elferink, above n 59, 159.
[66] P J Herring et al, 'Are vent shrimps blinded by science?' (1998) 398 *Nature* 116.

So far there have been no steps taken specifically to implement measures to regulate the introduction of light or noise into the deep-sea environment. However, the use of the term "energy" in article 1(4) does appear to provide a legal basis for the adoption of such regulation at some future date. In addition to LOSC, it should be noted that the definition in article 1(4) has been incorporated verbatim into many other international and regional instruments dealing with the protection of the marine environment.[67] These include the OSPAR Convention,[68] the 1974 Convention on the Protection of the Marine Environment of the Baltic Sea Area,[69] the 1992 Convention of the same name[70] and most of the framework treaties adopted under the United Nations Environment Programme[71] and the Regional Seas Program (including some protocols dealing with specific sources of marine pollution). [72] It would, therefore, appear that, at both an international and a regional level, there is existing law that provides a framework to implement measures to protect hydrothermal vent ecosystems from the possible environmental impacts of light and noise pollution.

LOSC and other sources of marine pollution

LOSC contains a number of other provisions of relevance to pollution other than noise and light pollution. A general obligation is contained in Article 194 (1) under which States are obliged to take, either individually or jointly as appropriate:

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[67] Dotinga and Oude Elferink, above n 59, 159.
[68] *Convention for the Protection of the Marine Environment of the North-East Atlantic*, opened for signature 22 September 1992, 32 ILM (1992) (entered into force 25 March 1998).
[69] *Convention on the Protection of the Marine Environment of the Baltic Sea Area*, opened for signature 19 February 1974, 13 I L M (1974) (entered into force 5 October 1976).
[70] *Convention on the Protection of the Marine Environment of the Baltic Sea Area*, done at Helsinki, 9 April 1992 (entered into force 17 January 2000).
[71] Hereinafter UNEP.
[72] Dotinga and Oude Elferink, above n 59, 159.

> "all measures consistent with [LOSC] that are necessary to prevent, reduce and control pollution of the marine environment from any source, using for this purpose the best practicable means at their disposal and in accordance with their capabilities."[73]

Article 194(2) also requires States to take:

> "all measures necessary to ensure that activities under their jurisdiction or control are so conducted as not to cause damage by pollution to other States and their environment, and that pollution arising from incidents or activities under their jurisdiction or control does not spread beyond the areas where they exercise sovereign rights in accordance with" [LOSC][74]

However, pursuant to Article 194(4), in implementing those measures States are required to refrain from unjustifiable interference with activities carried out by other States in the exercise of their rights and duties under LOSC. Pursuant to article 194(3) the measures which States are obliged to adopt under Part XII are defined quite widely to deal with all sources of pollution of the marine environment. Without limiting the measures that can lawfully be adopted under Part XII, article 194(3) defines such measures as including those designed to minimise:

> "(a) the release of toxic, harmful or noxious substances, especially those which are persistent, from land-based sources, from or through the atmosphere or by dumping;
> (b) pollution by vessels, particular measures for preventing accidents and dealing with emergencies, ensuring the safety of operations at sea, preventing intentional and unintentional discharges, and regulating the design, construction, equipment and manning [sic] of vessels;
> (c) pollution from installations and devices used in exploration or exploitation of the natural resources of the sea-bed and subsoil, in particular measures for preventing accidents and dealing with emergencies, ensuring the safety of operations at sea, and regulating the design, construction, equipment, operation and manning [sic] of such installations or devices;
> (d) pollution from other installations and devices operating in the marine environment, in particular measures for preventing accidents and dealing with emergencies, ensuring the safety of operations at sea, and regulating the design, construction, equipment, operation and manning [sic] of such installations or devices".[75]

[73] LOSC article 194(1).
[74] LOSC article 194(2)
[75] LOSC, article 194 (3).

Part XII also contains specific provisions to deal with the main known sources of marine pollution. Thus Article 207 obliges States to adopt laws and regulations to prevent and control pollution of the marine environment from land based sources. Article 210 deals with pollution caused by ocean dumping. Article 211 deals with pollution from vessels and Article 212 covers pollution from or through the atmosphere. To a large extent these obligations have been implemented through a combination of general multilateral, regional and bilateral treaties.[76]

Pollution of the sea-bed

LOSC also specifically addresses the issue of pollution of the seabed. Different regimes apply depending on whether the pollution occurs within areas of national jurisdiction or within the Area. Article 208(1) deals with pollution from seabed activities in areas subject to national jurisdiction. Coastal States are required to:

> "adopt laws and regulations to prevent, reduce and control pollution of the marine environment arising from or in connection with seabed activities subject to their jurisdiction and from artificial islands, installations and structures under their jurisdiction".[77]

Article 208(2), similarly provides that States are required to take other measures as may be necessary to prevent, reduce and control such pollution. Article 208(3) requires those laws to be no less effective than international rules, standards and recommended practices and procedures. Articles 208(4) and 208(5) contemplate that these rules, regulations and procedures shall be developed through appropriate international and regional organisations.

[76] For an overview of these treaties see Churchill and Lowe, above n 58.

LOSC does not provide a definition of what is meant by "seabed activities". Traditionally this expression has been associated with activities such as deliberate or operational pollution associated with the exploration for and exploitation of oil and gas in the territorial sea and on the continental shelf. Such deliberate pollution may be caused by such things as chemicals used in drilling, or the discharge of sewerage and other waste from such operations.[78] It also includes accidental pollution from mining operations such as ruptured pipelines or collisions of vessels and mining installations.[79] While not explicitly stated in the text of LOSC, there appears to be no reason why such a definition could not also extend to cover pollution possibly associated with other activities such as MSR, bioprospecting, and deep-sea tourism. Such an interpretation seems valid when article 208 is considered in light of Part II and Part V of LOSC, which, as noted above, provide specifically for sovereignty over the territorial sea. In exercise of their sovereignty some States have implemented measures consistent with these obligations. Some of these measures relevant to hydrothermal vents are considered in Chapter 6.

Pollution of the sea-bed from Activities beyond national jurisdiction

Importantly Part XII also specifically addresses pollution in the deep seabed in areas beyond national jurisdiction. Thus Article 209(1) of LOSC provides:

> "International rules, regulations and procedures shall be established in accordance with Part XI to prevent, reduce and control pollution of the marine environment from activities in the Area. Such rules, regulations and procedures shall be re-examined from time to time as necessary."[80]

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[77] LOSC, article 208(1).
[78] Churchill and Lowe, above n 58, 371.
[79] Ibid.
[80] LOSC, article 209(1).

Likewise individual States are also required to:

> "adopt laws and regulations to prevent, reduce and control pollution of the marine environment from activities in the Area undertaken by vessels, installations, structures and other devices flying their flag or of their registry or operating under their authority as the case may be. The requirements of such laws and regulation shall be no less effective than the international rules, regulations and procedures referred to in paragraph 1."[81]

The mechanism as to how these rules, regulations and procedures are to be adopted is specifically addressed in Article 145 of LOSC. Article 145 requires the ISA to adopt rules, regulations and procedures, inter alia, for the prevention, reduction and control of pollution in the deep seabed beyond national jurisdiction. So far the ISA has partially addressed the issue of pollution in its Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area[82] and in its ongoing work in relation to draft regulations for prospecting and exploration for hydrothermal polymetallic sulphides and cobalt-rich ferromanganese crusts in the Area. These regulations are examined in detail in Chapter 9 in the context of considering the desirability of expanding the mandate of the ISA.

PART XI OF LOSC AND THE PART XI AGREEMENT

By the late 1960s there was much interest in the potential for commercial exploitation of the mineral resources of the deep-sea, especially manganese nodules. However, there was considerable disagreement within the international community as to their legal status. Developing states in particular were concerned that only the wealthier developed states had the capacity to carry out deep seabed mining. Many developing states, then in the process of developing their own terrestrial mineral resources, were

[81] LOSC, article 209(2).
[82] International Seabed Authority, *Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area*, UN Doc ISBA/6/A/18, adopted by the Assembly of the ISA on 13th July 2000.

also concerned about the potential impact of deep-sea mining on the world markets for such minerals. Debate essentially focussed on three possible interpretations of their legal status. The first such interpretation centred on the notion of sovereign rights to the resources of the continental shelf first asserted by the United States of America[83] in the *Truman Proclamation* of 1945. A second interpretation of the law, as it stood at that time,[84] was that rights to the continental shelf did not extend as far as claimed by many nations, but were confined to areas corresponding roughly to the geological continental shelf.[85] As such the abyssal plains of the sea floor were *res communis,* ie the area and its resources could be used by any State but no State could appropriate or claim exclusive title or other rights to the area.[86] A third interpretation suggested that the deep seabed should be treated as *res nullius*. As such, title to areas of the seabed could have been gained by their occupation through use by mining States.[87]

It took nearly thirty years of negotiations and a false start with the original provisions of Part XI of LOSC, but the legal uncertainty concerning the mineral resources of the high seas was resolved with the entry into force on 28 July, 1996 of the deep-sea

[83] Hereinafter USA.
[84] Principally the *Convention on the Continental Shelf*, opened for signature 29 April, 1958, 499 UNTS 311 (in force 10 June 1964); the *Convention on the Territorial Sea and Contiguous Zone*, opened for signature 29 April, 1958, 516 UNTS 205 (in force 10 September, 1964); and *Convention on the High Seas*, opened for signature 29 April, 1958, 450 UNTS 82 (in force 30 September, 1962). See H B Heim, 'Exploring the Last Frontiers for Mineral Resources: A Comparison of International Law Regarding the Deep Seabed, Outer Space, and Antarctica' (1990) 23 *Vanderbilt Journal of Transnational Law* 819.
[85] Churchill and Lowe, above n 58, 225.
[86] Ibid.
[87] Ibid.

mining regime established pursuant to Part XI of LOSC, as amended by the subsequent 1994 Part XI Agreement, which now regulates exploitation of the mineral resources of the Area.

Pursuant to article 136, the Area and its resources are declared the common heritage of mankind [sic].[88] In addition, under article 137, all claims or exercise of sovereignty or sovereign rights over any part of the Area or its resources are prohibited. All rights in the mineral resources of the Area are vested in mankind [sic] as a whole. Article 138 provides that the general conduct of all States in relation to the Area must be in accordance with the provisions of Part XI, "the principles embodied in the Charter of the United Nations and other rules of international law in the interests of maintaining peace and security and promoting international co-operation and mutual understanding."[89] Article 140 also requires that such activities be carried out for the "benefit of mankind [sic]",[90] while article 141 requires the Area to be used exclusively for peaceful purposes. However, neither Part XI nor any rights granted or exercised pursuant to Part XI shall affect the legal status of the waters superjacent to the Area or that of the air space above those waters.[91]

A novel feature of Part XI is that it created a specific entity with responsibility for regulating activities associated with deep-sea mining in the Area, namely the ISA.[92]

[88] LOSC, article 136.
[89] LOSC, article 138
[90] LOSC, article 140.
[91] LOSC, article 135.
[92] LOSC, article 156.

All parties to LOSC are ipso facto members of the ISA.[93] LOSC specifically provides that the ISA is the organization through which State Parties shall "organize and control activities in the Area, particularly with a view to administering the resources of the Area."[94] At first glance this would tend to suggest that the ISA has a very wide mandate, almost the total ability to regulate all activities on the deep-sea floor. In a recent report to the Assembly[95] of the ISA the Secretary-General of the ISA asserts that the ISA has a broad "regulatory role with respect to the protection and preservation of the marine environment (including its biodiversity) in the Area generally."[96] Is the ISA effectively a deep-sea Environmental Protection Authority?[97] Can it regulate bioprospecting, MSR and deep-sea tourism? The simple answer is no. The ISA is neither a deep-sea EPA nor does it currently have competence in relation to activities (other than mining and to a limited extent pollution) that have been identified as constituting threats to hydrothermal vent ecosystems. This is because the expression "activities in the Area" used so liberally in many provisions of Part XI[98] is very narrowly defined in Part 1, Article 1(3) to mean

> "all activities of exploration for, and exploitation of, the resources of the Area"[99]

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[93] LOSC, article 156(2)
[94] LOSC, article 157(1).
[95] The Assembly is one of the principle organs of the ISA. Its role is discussed in Chapter 9.
[96] See *Report of the Secretary-General of the International Seabed Authority under Article 166. Paragraph 4 of the United Nations Convention of the Law of the Sea,* 7 June, 2002, UN Doc. ISBA/8/A/5, 12.
[97] Hereinafter referred to as EPA.
[98] These provisions include the requirement that activities in the Area be conducted for the benefit of mankind [sic] under article 140(1), the requirement of equitable sharing of financial and other economic benefits derived from activities in the Area under article 140(2) and provisions dealing with transfer of technology and scientific knowledge under article 144(1)(a).

[99] LOSC, article 1(3).

More significantly, "resources" are defined under Article 133(a) of LOSC as

> "all solid, liquid or gaseous mineral resources in situ in the Area at or beneath the seabed, including polymetallic nodules".[100]

Facilitating commercial mining of deep-sea mineral resources is the primary objective of the ISA. Specifically this objective is stated in Article 150 of LOSC, which provides

> "Activities in the Area shall, as specifically provided for in this part, be carried out in such a manner as to foster healthy development of the world economy and balanced growth of international trade, and to promote international cooperation for the over-all development of all countries, especially developing States, and with a view to ensuring:
> (a) the development of the resources of the Area;
> (b) orderly, safe and rational management of the resources of the Area, including the efficient conduct of activities in the Area and, in accordance with sound principles of conservation, the avoidance of unnecessary waste;
> (c) the expansion of opportunities for participation in such activities consistent in particular with article 144 and 148;
> (d) participation in revenues by the Authority and the transfer of technology to the Enterprise and developing States as provided for in this Convention;
> (e) increased availability of the minerals derived from the Area as needed in conjunction with minerals derived from other sources, to ensure supplies to consumers of such minerals;
> (f) the promotion of just and stable prices remunerative to producers and fair to consumers for minerals derived both from the Area and from other sources, and the promotion of long-term equilibrium between supply and demand;
> (g) the enhancement of opportunities for all State Parties, irrespective of their social and economic systems or geographical location, to participate in the development of the resources of the Area and the prevention of monopolization of activities in the Area;
> (h) the protection of developing countries from adverse effects on their economies or on their export earnings resulting from a reduction in the price of an affected mineral, or in the volume of exports of the mineral, to the extent that such reduction is caused by activities in the Area, as provided by Article 151;
> (i) the development of the common heritage for the benefit of mankind as a whole; and conditions of access to markets for the imports of minerals produced from the resources of the Area and for the imports of commodities produced from such minerals shall not be more favourable than the most favourable applied to imports from other sources."

Until such time as a wider mandate is conferred on the ISA, the ISA may only regulate activities associated with the exploration for, and exploitation of, the mineral

[100] LOSC, article 133(a).

resources of the Area. As Glowka[101] has pointed out, the ISA's current mandate does not extend to activities associated with either bioprospecting for genetic resources or deep-sea tourism. Its mandate with respect to pollution is again limited to pollution associated with activities of exploration for, and exploitation of, the mineral resources of the Area. The ISA's mandate to regulate mining and its track record to date is considered in detail in Chapter 9.

Marine Scientific Research under LOSC

The relevant provisions of LOSC dealing with MSR are contained in Part XIII. Under article 238 all States, irrespective of their geographical location, and competent international organizations have the right to conduct MSR subject to the rights and duties of other States under LOSC.[102] Such research shall be conducted exclusively for peaceful purposes.[103] Under article 241 MSR shall not constitute the legal basis for any claim to any part of the marine environment or its resources.[104] It must be conducted with appropriate scientific methods and means compatible with LOSC.[105] It must not unjustifiably interfere with other legitimate uses of the sea compatible with LOSC.[106]

Consistent with other provisions of LOSC the extent to which conduct of MSR is or can potentially be regulated is determined by where it is carried out. Under Article

[101] L Glowka, 'The Deepest of Ironies: Genetic Resources, Marine Scientific Research, and the Area.' (1996) 12 *Ocean Yearbook* 154.
[102] LOSC, article 238.
[103] LOSC, article 240(a).
[104] LOSC, article 241.

[105] LOSC, article 240(b).
[106] LOSC, article 240(c)

245 coastal States have the sovereign and exclusive right to regulate, authorise and conduct MSR in their territorial sea.[107] MSR within the territorial sea can only be conducted with the express consent of, and under conditions imposed by, the coastal State.[108] The requirement for consent is supplemented by the provisions of LOSC dealing with innocent passage of ships through the territorial sea. Although under both LOSC[109] and customary international law, ships of all States have the right of innocent passage through the territorial sea, passage ceases to be innocent if the particular ship carries out research or survey activities.[110]

Article 246 of LOSC also recognises that the coastal State has the right to regulate, authorise and conduct MSR in its EEZ and on its continental shelf. However, there is some ambiguity as to the precise legal position with respect to MSR in the waters above the continental shelf and beyond the EEZ. Article 246 of LOSC speaks of the coastal State's right with respect to MSR *on* the continental shelf (ie arguably on the seabed of the continental shelf),[111] whereas Article 257 recognises the right of States and international organisations to conduct MSR "in the water column beyond the limits of the exclusive economic zone".[112] It is unclear what the significance is of this distinction. Does this mean, for example, that MSR in relation to hydrothermal vent

[107] LOSC, article 245. In addition LOSC article 21(1)(g) specifically recognises the right of the coastal State to adopt laws and regulations in relation to MSR and hydrographic surveys.
[108] LOSC, article 245.
[109] Specifically LOSC article 17.
[110] By virtue of LOSC article 19(2)(j). It is also worth noting that under LOSC article 20, unless consent for MSR has been given all submarines and other underwater vehicles exercising the right of innocent passage are required to navigate on the surface and to show their flag. This would apply to submarines and ROV's carrying out research on hydrothermal vents.
[111] Churchill and Lowe, above n 58, 407.
[112] LOSC, article 257.

sites on the continental shelf beyond the EEZ will require coastal State consent where that research relates to the vent chimney, but coastal State approval is not required for research in relation to the plume that rises above the chimney in the water column above?

Such an interpretation appears to be supported by Article 246(5). This provision recognises that the coastal State, may at its discretion withhold consent to conduct MSR within the EEZ or *on* the continental shelf if a particular research project is inter alia:

- of direct significance for the exploration and exploitation of natural resources, whether living or non-living:[113] or
- involves drilling into the continental shelf, the use of explosives or the introduction of harmful substances into the marine environment.[114]

This tends to suggest a distinction between applied research (which potentially impinges upon the interests of coastal states in exercising their sovereign rights over their natural resources), and pure research. [115] This may be true for most of the existing resources that could potentially be exploited at the time that LOSC was negotiated, but is an artificial distinction, which arguably leads to a fractured regulatory regime (similar to that previously considered in relation to sedentary

[113] LOSC, article 246(5)(a).
[114] LOSC, article 246(5)(b).
[115] Churchill and Lowe, above n 58, 405.

species) where newly exploitable resources such as bacteria and archaea are concerned.

To the extent that MSR is regulated within the EEZ and *on* the continental shelf, in addition to the right to grant or withhold consent the coastal State is entitled to be informed, at least six months prior to such research commencing of:

- the nature and objectives of the project;[116]
- the method and means to be used, including name, tonnage, type and class of vessels and a description of scientific equipment;[117]
- the precise geographical areas in which the project is to be conducted;[118]
- the expected date of first appearance and final departure of the research vessels, or deployment of the equipment and its removal;[119]
- the name of the sponsoring institution, its director, and the person in charge of the project;[120] and
- the extent to which it is considered that the coastal State should be able to participate or to be represented in the project.[121]

In addition, article 249 recognises a number of rights of the coastal State with respect to such research including:

[116] LOSC, article 248(a).
[117] LOSC, article 248(b).
[118] LOSC, article 248(c).
[119] LOSC, article 248(d).
[120] LOSC, article 248(e).
[121] LOSC. article 248(f).

- the right to participate in the research including the right to place representatives or observers on research vessels;[122]
- the right to be provided with preliminary reports and final results of such research;[123]
- the right to be supplied with access to data and samples in relation to such research;[124]
- the right to request an assessment or assistance in assessment of such data samples;[125]
- the right to be informed of any major change in the research program;[126] and
- the right to require that scientific research installations or equipment be removed once research is completed.[127]

Once the information required by article 249 has been supplied, under article 252 the coastal State is deemed to have given its consent if, after six months it has not withheld its consent under article 248. If the information given regarding the nature and objectives of the project does not conform to the manifestly evident facts, if supplementary information is required under article 248 or 249, or outstanding obligations exist with respect to previous MSR. Under article 253 the coastal State

[122] LOSC, article 249(1)(a).
[123] LOSC, article 249(1)(b).
[124] LOSC, article 249(1)(c).
[125] LOSC, article 249(1)(d).
[126] LOSC, article 249(1)(f)

[127] LOSC, article 249(1)(g).

may suspend or order the cessation of MSR within its EEZ or on its continental shelf if the research is not being conducted in accordance with the information provided under article 248, or in the event of failure to comply with conditions of approval imposed under Article 249.

Marine Scientific Research on the High Seas and in the Area.

The right to carry out MSR on the High Seas is expressly recognised as a High Seas freedom under article 87(1)(f) of LOSC. All states have the right to conduct MSR in the water column beyond the limits of the EEZ.[128] Such research must be conducted in accordance with the general principles outlined above. Under article 257 all States and competent international organisations also have the right to conduct MSR in the Area, provided such research is conducted in conformity with the provisions of Part XI of LOSC. This right is also recognised by the first part of article 143(3). Article 143(3) of LOSC requires State parties to promote international co-operation in MSR in the Area including, inter alia, by effectively disseminating the results of research and analysis.

Pursuant to Article 143, MSR in the Area shall be carried out exclusively for peaceful purposes and for the benefit of mankind [sic] as a whole. In addition to the rights of States and international organisations to carry out research under Article 257, under Article 143(2) the ISA is entitled to carry out MSR in the Area and in relation to its resources,[129] and the ISA may enter into contracts for that purpose.

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[128] LOSC, article 256.

[129] As that term is defined in article 133(a) of LOSC.

Where research moves on to the stage of prospecting and exploring for mineral resources such applied research would be subject to the approval and control of the ISA.[130] This is because such activity would clearly fall within the definition of "activities in the Area" contained in Article 1(3). However, if such applied research did not relate to the mineral resources of the Area, for example, bioprospecting for genetic resources in the Area, it would not be subject to control by the ISA.

This has important implications with respect to regulation of the environmental impact of MSR in the Area. As noted earlier in this chapter, under Article 240(d) the ISA clearly has the competence to implement measures to regulate MSR associated with the exploitation of mineral resources of the Area. However, this authority appears not to extend to other forms of MSR or bioprospecting that may be carried out in conjunction with such research. The possible exception to this is where such research interferes with "activities in the area", that is to the extent of interference with activities for the exploration for, and exploitation of the mineral resources of the Area.

LOSC and Tourism

There is no specific provision of LOSC that regulates tourism per se. However, like all other activities in the ocean, the extent to which it can be regulated depends in large part on where such activities occur. Clearly it would be within the competence of the coastal State to regulate tourism activities within its territorial sea. Examples

[130] Churchill and Lowe, above n 58, 404.

where this has occurred are discussed in Chapter 6. The coastal State would also be entitled to regulate tourism within its EEZ to the extent such regulation relates to protection and preservation of the marine environment.

Interesting questions are raised by the overlap between tourism and MSR. If a research vessel is carrying out MSR within the territorial sea or within the EEZ, that research is subject to the provisions of articles 245 and 246 of LOSC discussed above. Does the presence of fee paying tourists on board such a research vessel convert otherwise pure research into some form of commercial enterprise? What impact does this have on the legal rights to carry out MSR and the rights of the coastal State to regulate activities within its EEZ and or on its Continental shelf?

This is a difficult issue to express a conclusive opinion on. As noted in Chapter 1, so far the limited number of tourist dives that have occurred appear primarily to be associated with MSR cruises. Funds obtained from paying passengers are used as a supplemental source of funding for such research. Perhaps in those circumstances it would be fair to conclude that limited tourism such as this does not impact upon the right to carry out MSR. But this position is by no means clear.

The position of tourism on the continental shelf is perhaps somewhat clearer because such activities would generally occur in the water column above the continental shelf, and do not involve any exploration for or expropriation of the mineral resources of the continental shelf. However, what if deep-sea tourists were to take a mineral

sample from a hydrothermal vent as a souvenir of their dive? Would that involve expropriation of mineral resources of the continental shelf and therefore require the consent of the relevant coastal State in accordance with the coastal State's rights under the continental shelf regime? This is unclear.

While the position within the EEZ or on the continental shelf is not clear, tourism on the high seas is totally permissible and unregulated by LOSC. The exception to this would be where tourism has the potential to impact on or interfere with "activities in the Area", as that term is used in Part XI. Arguably, given the ISA's mandate to regulate activities in the Area, the ISA possibly has competence to regulate deep-sea tourism to the extent that that is reasonably necessary to prevent interference with "activities in the Area", that is to the extent of interference with activities for the exploration for, and exploitation of the mineral resources of the Area.

UNITED NATIONS CONVENTION ON BIOLOGICAL DIVERSITY

The provisions of LOSC and the Part XI Agreement must also be read in conjunction with the provisions of the CBD.[131] The CBD has three main objectives: the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources.

[131] Article 22 of the CBD makes clear that in the event of conflict between the provisions of the CBD and LOSC, LOSC prevails.

It establishes a framework of general flexible obligations aimed at implementing these objectives.[132]

These obligations are subject to several very significant qualifications. Firstly, the CBD is a framework treaty. It sets out overall goals, policies and general obligations only with respect to biodiversity conservation, and provides a limited structure for technical and financial cooperation. Responsibility for achieving its goals is left to the individual State parties. This is reinforced by article 3 of the CBD, which recognises that States have the sovereign right to exploit their own resources pursuant to their own environmental policies, and 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. Obligations under the CBD are subject to, and therefore secondary to each State's sovereign right to exploit their own resources and set their own environmental policies.

[132] These include obligations to create plans, strategies, or programs for conservation and sustainable use of biodiversity (article 6). States must also identify and monitor components of biodiversity important for its conservation and sustainable use, and identify processes and categories of activities that have, or are likely to have, significant adverse impacts on the conservation and sustainable use of biodiversity (article 7). States also have an obligation to take various steps to regulate activities that threaten biodiversity, including through measures such as establishing a system of protected areas to conserve biodiversity (articles 8, 9, 10 and 11). Article 15 of the CBD is of particular relevance to bioprospecting and deals with access to genetic materials, including a requirement that access shall be on mutually agreed terms and subject to prior informed consent. The implementation of these provisions has been further clarified following the adoption of the Bonn Guidelines on Access to Genetic Resources and the Fair and Equitable Sharing of the Benefits Arising out of their Utilisation. For discussion of the Bonn Guidelines see M I Jeffery, 'Bioprospecting: Access to Genetic Resources and Benefit Sharing under the Convention on Biodiversity and the Bonn Guidelines' (2002) 6 *Singapore Journal of International and Comparative Law* 747.

Of even more significance is the limitation imposed by article 4. The coastal State is obliged to implement its obligations under the CBD in its inland waters, territorial sea, contiguous zone, within its EEZ and parts of its continental shelf.[133] However, beyond national jurisdiction the State parties may only regulate the activities of their own nationals to achieve the objectives of the CBD. So far no State has implemented measures specifically regulating activities of their nationals at hydrothermal vents on the high seas. Thus, under the existing provisions of the CBD, access to and use of the genetic resources of the oceans and the deep-sea beyond national jurisdiction is totally unregulated. As Glowka has noted this is ironic because the most immediately exploitable and lucrative resources of the deep-sea are arguably its genetic resources, yet such resources fall outside of the main legal regime applicable to the deep-sea, the deep-sea mining regime under Part XI of LOSC, and the main treaty dealing with biodiversity conservation, the CBD.[134]

Despite this significant lacuna in the law, until recently this issue has been subject to only scant consideration by the main organs of the CBD. The most important meetings that have considered the genetic resources of the deep-sea so far are the meetings of the Conference of Parties[135] in Jakarta in November 1995 and 2004 and

[133] A C de Fontaubert, D R Downes and T S Agardy 'Biodiversity in the Seas: Implementing the Convention on Biological Diversity in Marine and Coastal Habitats' (1998) X(3) *Georgetown International Environmental Law Review* 753.
[134] Glowka, above n 101.
[135] Hereinafter COP.

the meeting of the Subsidiary Body on Technical and Technological Advice[136] in Montreal in March 2003.

Jakarta 1995

At the Jakarta meeting in 1995 the COP agreed on a program of action for implementing the CBD with respect to marine and coastal biodiversity, now known as the Jakarta Mandate on Marine and Coastal Biological Diversity.[137] More significantly though, in paragraph 12 of decision II/10 adopted at the COP meeting in Jakarta in 1995, the COP requested the Executive Secretary of the CBD, in conjunction with the United Nations Office for Ocean Affairs and the Law of the Sea, to:

> 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, with a view to enabling the Subsidiary Body on Scientific, Technical and Technological Advice to address at future meetings, as appropriate, the scientific, technical, and technological issues relating to bioprospecting of genetic resources on the deep seabed.[138]

The study requested by COP II/10 took nearly 8 years to be prepared and was finally published in February 2003. Prior to the report's preparation a preliminary assessment of the areas that might be considered in the final study was published in an unofficial report in 1996. In some respects this preliminary assessment reflects the ultimate conclusions and recommendations of the study requested by COP II/10 released in 2003. In particular, the preliminary assessment concurred with Glowka's assessment

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[136] Hereinafter SBSTTA.

[137] de Fontaubert and Downes, above n 133. Consistent with the Jakarta Mandate several states, including Canada, Portugal and Papua New Guinea, have begun to design and implement measures regulating access to particular hydrothermal vent sites within their territorial sea and EEZ. These regimes are discussed in detail in Chapter 6.

[138] COP Decision II/10, para 2, UNEP/CBD/COP2/19.

noted above, recognising that the genetic resources of the deep seabed are 'unregulated resources'.[139] However, given the lack of information on the commercial potential of deep-sea genetic resources, the preliminary assessment concluded that the knowledge base on which to make informed and appropriate decisions about how this area might be controlled was then almost non-existent.[140] Despite this obvious and significant absence of a knowledge base, the preliminary report suggested several 'foreseeable scenarios' as to how bioprospecting in relation to these resources could develop. These are:

(a) leaving marine genetic resources unregulated and freely available to those who spend the resources to collect them;
(b) bringing them within the regime governing the Area and the [International Sea-bed Authority's] authority;
(c) bringing them within the CBD regime; and
(d) establishing an entirely new regime to deal with these special and new resources.[141]

These 'foreseeable scenarios', with the exception of the last one, were ultimately endorsed by the final study released in 2003.[142]

The SBSTTA Study on the Relationship between LOSC and the CBD

The SBSTTA study released in early 2003 confirmed the existence of a lacuna in the law with respect to the genetic resources of the deep-sea as first identified by Glowka. The study concluded that there are three options available for a regime for the

[139] Convention on Biological Diversity, Subsidiary Body on Scientific, Technical and Technological Advice, *Bioprospecting of Genetic Resources of the Deep-sea-Bed*, Note by the Secretariat, UN Doc UNEP/CBD/SBSTTA/2/15.
[140] Ibid.
[141] Ibid.
[142] These options have also been proposed by Dosoo Jang, *Accessing Marine Genetic resources Under the Law of the Sea Convention and the Convention on Biological Diversity,* Doctor of Philosophy in Marine Studies Thesis, University of Delaware, 2000 and by Korn et al above n 51.

management of activities relating to genetic resources beyond national jurisdiction. They are:

- maintaining the status quo;
- application of the regime under Part XI of LOSC, currently limited to the management of mineral resources;
- application of the regime of conservation and sustainable use of genetic resources under the Convention on Biological Diversity.

The SBSTTA study noted that the last two of these options are not mutually exclusive and could be integrated. The SBSTTA study also noted two additional options for regulation that were not examined in detail or referred to in the study's conclusion and recommendations. These are the potential role of MPAs on the high seas, and intellectual property rights as incentives for benefit sharing and sustainable use of deep-sea genetic resources. It is unclear from the report why these alternatives were ruled out without further consideration. It seems inappropriate for a study of options to rule out two possible options without detailed consideration. This is especially so given the wealth of literature and interest in both options. MPAs on the high seas especially has been the subject of detailed consideration at a number of recent international forums.[143]

[143] See for example K Gjerde and C Breide, *Towards a Strategy for High Seas Marine Protected Areas: Proceedings of the IUCN, WCPA and WWF Experts Workshop on High Seas Marine Protected Areas* (2003) and discussion below.

The SBSTTA study stops short of endorsing any one option, but it appears from the tone of the report that it supports an expanded mandate for the ISA as a preferred option. There are, of course, immediately obvious benefits associated with such an option. Clearly expanding the mandate of an existing international institution might be more efficient than starting over and establishing an entirely new institution with possibly overlapping mandates. Although it has only been operational for 10 years, the ISA has accumulated a considerable level of expertise and data on the deep-sea environment. However, significant issues would need to be considered before proceeding with such an option. Some, but by no means all of these issues, include:

(1) To what extent will there need to be changes to the ISA's existing structure? This issue is considered in detail in Chapter 9.

(2) To what extent will the principles embodied in the CBD and the principles of international environmental law more generally be reflected in any amended structure?

(3) How will the proposed regime deal with the question of benefit sharing?

(4) Should the genetic resources of the deep-sea be regarded as the common heritage of mankind [sic]? This issue is addressed in Chapter 5.

(5) Finally, to what extent would a new regime attempt to distinguish between MSR and bioprospecting? Is it even feasible to attempt such a distinction in law when at times it is almost impossible to distinguish the two in practice?

These and many more issues will need to be addressed in the future if such a proposal is to be advanced. However, this presupposes such an option is desirable and the ISA, and in particular member states, are willing to consider an expanded mandate for the ISA in the first place. These issues are canvassed further in Chapter 9.

Repeating the Mistake of the Sedentary Species Definition?

It should also be noted that the SBSTTA study contained an important qualification in the following terms:

> "that the study's recommendations addresses only the biological resources attached to the ocean floor and not the free swimming fish above, which fall within the regime of fisheries on the high seas, covered by Articles 116-119 of the Convention, as well as by the United Nations Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (the 1995) Fish Stocks Agreement) where appropriate".[144]

COP Decision II/10, which authorised the preparation of the study, made no mention of resources 'attached to the ocean floor'. It refers only to the 'genetic resources on the deep seabed'. Is there any difference between genetic resources 'on' or 'attached to' the deep seabed? Perhaps, as the later parts of the above extract suggests, not if the intention is merely to exclude fisheries. It may be that this particular statement was

[144] Convention on Biological Diversity, Subsidiary Body on Scientific, Technical and Technological Advice (2003) Marine and Coastal Biodiversity: Review, Further Elaboration and Refinement of the Programme of Work. *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.* UN Doc UNEP/CBD/SBSTTA/8/1.

included to allay any concerns that this report has any relevance to high seas fisheries, a contentious issue. However, there will be a significant defect in any future regime if it only applies to the resources 'attached to the ocean floor'. A regime along those lines would exclude integral components of the hydrothermal vent ecosystem. For example, it would exclude the genetic resources associated with microbes found in the hydrothermal plume. Likewise microbes that have formed symbiotic relationships with other species not necessarily attached to the seabed such as shrimp, crabs etc would also be excluded. It seems a somewhat arbitrary distinction that fails to take account of the entire ecosystem, of which those resources attached to the seabed form only part. It is inconsistent with an ecosystem based approach, and is reminiscent of the complex sedentary species definition under the Continental Shelf Regime discussed above.

SBSTTA Meeting Montreal, March 2003 and COP VII, and Kuala Lumpur, March 2004

The SBSTTA study was presented for consideration at the eighth meeting of the SBSTTA in Montreal from 10-14 March, 2003. The subsequent debate in relation to the report at the Montreal meeting revealed further significant differences of opinion between States on this issue. For example, Brazil, Argentina, Colombia and Peru and several other developing states objected to the competence of both the SBSTTA and the CBD to deal with issues related to the deep seabed beyond national jurisdiction.[145] In contrast the European Union, Greece and the Seychelles stated their position that

[145]Earth Negotiations Bulletin, *Summary of the Eighth Session of the Subsidiary Body on Scientific, Technical and Technological Advice of the Convention on Biological Diversity* 10-14 March 2003, 9(252) *Earth Negotiations Bulletin.*

these issues fell within the CBD's mandate under articles 3 and 4. In addition, they noted that the SBSTTA was competent to deal with its scientific aspects under Decision II/10 on marine and coastal diversity.[146] Canada objected to a recommendation encouraging Parties to start working through the ISA on issues related to conservation and sustainable use of genetic resources, as this may, according to Canada, prejudice the outcome of more considered deliberations.[147]

In the end the impasse was resolved by calling for further study of the issue. The Montreal meeting made three main recommendations to the COP. These recommendations were as follows:

1. That the Executive Secretary, in consultation with Parties and other Governments and in collaboration with relevant international organisations,[148] compile and synthesise information on the status and trends of deep seabed genetic resources and on methods to identify, assess and monitor genetic resources of the deep seabed in areas beyond the limits of national jurisdiction. This is to include identification of threats to such genetic resources and the means for their protection, with a view to addressing processes and activities under article 4(b) of the CBD, and to report on progress thereon to the

[146] Ibid.
[147] Ibid.
[148] Namely the United Nations Division for Ocean Affairs and the Law of the Sea, the United Nations Environment Programme, the International Seabed Authority and the Intergovernmental Oceanographic Commission of the United Nations Educational, Cultural and Scientific Organization.

SBSTTA, which will prepare recommendations for the consideration of the COP at its eighth meeting.

2. Invite the UN General Assembly to call upon relevant organisations[149] to review issues relating to the conservation and sustainable use of genetic resources of the deep seabed beyond the limits of national jurisdiction and make appropriate recommendations to the General Assembly regarding appropriate actions.

3. Invite Parties and other States to identify activities and processes under their jurisdiction or control which may have significant adverse impacts on deep seabed ecosystems and species beyond the limits of national jurisdiction, in order to comply with article 3 of the CBD.[150]

The recommendations of the SBSTTA outlined above were considered at the seventh meeting of the COP in Kuala Lumpur, Malaysia in March 2004. At that meeting the COP considered hydrothermal vents in the context of its review of the programme of work on marine and coastal biodiversity. Hydrothermal vents were considered in two

[149] Specifically the United Nations Environment Programme, the International Maritime Organisation, the International Seabed Authority, the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization, the International Hydrographic Organisation, the World Meteorological Organisation, the Secretariat of the Convention on Biological Diversity, and the United Nations Division for Ocean Affairs and the Law of the Sea.

[150] Convention on Biological Diversity, Conference of the Parties, *Report of the Subsidiary Body on Scientific, Technical and Technological Advice on the work of its eight meeting.* UN Doc UNEP/CBD/COP/7/3, 90.

parts of its ongoing work. Firstly, in examining the issue of MPAs beyond national jurisdiction in COP Decision VII/5, the COP agreed that :

> "there is an urgent need for international cooperation and action to improve conservation and sustainable use of biodiversity in marine areas beyond the limits of national jurisdiction, including the establishment of further marine protected areas consistent with international law, and based on scientific information, including areas such as seamounts, hydrothermal vents, cold-water corals and other vulnerable ecosystems".[151]

The COP endorsed no further action other than working with other international bodies to identify ways to establish MPAs beyond national jurisdiction within the framework of LOSC.[152] The major problem with pursuing this option though is that no mechanism currently exists for the creation of MPAs on the High Seas.[153]

The second and more detailed consideration by the COP related to an agenda item headed 'Conservation and sustainable use of deep seabed genetic resources beyond national jurisdiction: issues arising from the study of the relationship between the Convention on Biological Diversity and the United Nations Convention on the Law of the Sea'. The COP resolved to request:

> the Executive Secretary, in consultation with Parties and other Governments and the International Seabed Authority, and in collaboration with international organizations, such as

[151] CBD COP Decision VII/5, para 30, available from http://www.biodiv.org/convention/cops.asp# accessed 15 July, 2004.

[152] The complete text of this section of Decision COP VII/5 states that the COP 'Recognizes that the law of the sea provides a legal framework for regulating activities in marine areas beyond national jurisdiction and requests the Executive Secretary to urgently collaborate with the Secretary-General of the United Nations and relevant international and regional bodies in accordance with their mandates and their rules of procedure on the report called for in General Assembly resolution 58/240, paragraph 52, and to support any work of the General Assembly in identifying appropriate mechanisms for the future establishment and effective management of marine protected areas beyond national jurisdiction'. See COP Decision VII/5, para 31, available from http://www.biodiv.org/convention/cops.asp# accessed 15 July, 2004.

[153] For detailed discussion of the current state of international law as it relates to MPAs on the High seas see Gjerde and Breide above n 143 and R Warner, *Marine Protected Areas Beyond National Jurisdiction: Existing Legal Principles and a Future International Law Framework* (2001).

> the United Nations Division for Ocean Affairs and the Law of the Sea, the United Nations Environment Programme, and the InterGovernmental Oceanographic Commission of the United Nations Educational, Cultural and Scientific Organization, if appropriate, to compile information on the methods for the identification, assessment and monitoring of genetic resources of the seabed and ocean floor and subsoil thereof, in areas beyond the limits of national jurisdiction; compile and synthesize information on their status and trends including identification of threats to such genetic resources and the technical options for their protection; and report on the progress made to the Subsidiary Body on Scientific, Technical and Technological Advice.[154]

The COP also invited the Parties:

> to raise their concerns regarding the issue of conservation and sustainable use of genetic resources of the deep seabed beyond limits of national jurisdiction at the next meeting of the General Assembly and [and invited] the General Assembly to further coordinate work relating to conservation and sustainable use of genetic resources of the deep seabed beyond the limits of national jurisdiction.[155]

Finally the COP invited:

> Parties and other States to identify activities and processes under their jurisdiction or control which may have significant adverse impact on deep seabed ecosystems and species beyond the limits of national jurisdiction, in order to address Article 3 of the Convention[156]

Soft Law and other recent developments

In theory a number of principles of Customary International Law also apply to hydrothermal vents in areas beyond national jurisdiction. Many of these principles have been restated or expanded in both LOSC and in the CBD. For present purposes detailed discussion of these principles is not warranted, as none of these principles provide a clear basis for the sustainable management of human activities at hydrothermal vents beyond national jurisdiction. While consideration of customary international law principles does not appear to add further to consideration of these

[154] CBD COP Decision VII/5, para 54, available from http://www.biodiv.org/convention/cops.asp# accessed 15 July, 2004

[155] CBD COP Decision VII/5, para 55, available from http://www.biodiv.org/convention/cops.asp# accessed 15 July, 2004

[156] CBD COP Decision VII/5, para 56, available from http://www.biodiv.org/convention/cops.asp# accessed 15 July, 2004.

issues, several developments in Soft Law and other recent developments are worth noting.

The term "Soft Law" is generally taken to mean non-binding statements or declarations by members of the international community. Although non-binding, these statements have played an important role by pointing to the likely future direction of formally binding obligations, and by informally establishing acceptable international norms of behaviour.[157] Many of these principles have subsequently been incorporated in treaties and are important both as a source of law and in interpreting and understanding some of the provisions of these treaties.

The main instruments setting out key soft law principles are the Stockholm Declaration,[158] the Rio Declaration,[159] and Agenda 21.[160] Chapter 17 of Agenda 21 specifically relates to the sustainable management of the oceans and in particular addresses issues such as the protection and restoration of endangered marine species and the preservation of habitats and other ecologically sensitive areas on the high seas.[161]

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[157] P Sands, *Principles of international environmental law: Frameworks, standards and implementation,* (1995), 103

[158] *Declaration of the UN Conference on the Human Environment, Stockholm.* 5-16 June 1972, UN Doc. A/CONF/.48/14/REV.1 (1972).

[159] Declaration of the UN Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992 UN Doc. A/CONF 151/26.

[160] *Report of the UN Conference on Environment and Development*, UN Doc. A/CONF.151/26/REV.1

[161] Gjerde and Breide, above n 143, 93.

Subsequent to the Rio meeting, in 2002 the World Summit on Sustainable Development[162] agreed to a range of objectives of relevance to the conservation of marine biodiversity. Of these three time bound objectives in relation to marine biodiversity are worth noting. They are (1) the establishment of a representative network of MPAs by 2012; (2) restoration of fisheries to maximum sustainable yields by 2015; and (3) bringing about a significant drop in the rate of species extinction by 2010.[163] Pursuant to the Plan of Implementation endorsed at the WSSD[164] measures were also endorsed as possible ways these objectives could be achieved. For present purposes the most significant provisions of the WSSD Plan of Implementation are those contained in paragraph 32, sub-paragraphs (a) to (d) which call on States to

> "In accordance with chapter 17 of Agenda 21, promote the conservation and management of the oceans through actions at all levels, giving due regard to the relevant international instruments to:
> (a) Maintain the productivity and biodiversity of important and vulnerable marine and coastal areas, including areas within and beyond national jurisdiction;
> (b) Implement the work programme arising from the Jakarta Mandate on the Conservation and Sustainable Use of Marine and Coastal Biodiversity of the Convention on Biological Diversity, including through the urgent mobilization of financial resources and technological assistance and the development of human and institutional capacity, particularly in developing countries;
> (c) Develop and facilitate the use of diverse approaches and tools, including the ecosystem approach, the elimination of destructive fishing practices, the establishment of marine protected areas consistent with international law and based on scientific information, including representative networks by 2012 and time/area closures for the protection of nursery grounds and periods, proper coastal land use and watershed planning and the integration of marine and coastal areas management into key sectors;
> (d) Develop national, regional and international programmes for halting the loss of marine biodiversity, including in coral reefs and wetlands".[165]

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[162] Hereinafter WSSD.
[163] Ibid.
[164] Plan of Implementation of the World Summit on Sustainable Development, Annex to United Nations, *Report of the World Summit on Sustainable Development, Johannesburg, South Africa, 26 August-4 September 2002*, UN Doc No. A/CONF.199/20.
[165] Plan of Implementation of the World Summit on Sustainable Development, Annex to United Nations, *Report of the World Summit on Sustainable Development, Johannesburg, South Africa, 26 August-4 September 2002*, UN Doc No. A/CONF.199/20, para 32(a)-(d).

Although legally non-binding these aspects of the Plan of Implementation could guide future developments in international law.

Subsequent to the WSSD the United Nations General Assembly, in its annual resolution on Oceans and the Law of the Sea in 2002, called on States to implement the provisions of Part XII of LOSC dealing with the marine environment,[166] endorsed the WSSD Plan of Implementation[167] and encouraged relevant international organisations[168] and regional and sub-regional fisheries organisations to

> "consider urgently ways to integrate and improve, on a scientific basis, the management of risks to marine biodiversity of seamounts and certain other underwater features within the framework of [LOSC]".[169]

The "other underwater features" referred to in Resolution 57/141 include hydrothermal vents.

In addition Resolution 57/141 also reiterated

> "the importance of the ongoing elaboration by the [ISA] pursuant to article 145 of [LOSC], of rules, regulations and procedures to ensure the effective protection of the marine environment, the protection and conservation of the natural resources of the Area and the prevention of damage to its flora and fauna from harmful effects that may arise from activities in the Area".[170]

The progress of the ISA in this work is considered in Chapter 9.

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[166] UN General Assembly Resolution 57/141 UN Doc. A/RES/57/141, para 41.
[167] UN General Assembly Resolution 57/141 UN Doc. A/RES/57/141, paras 7 and 8.
[168] The international organisations referred to in resolution 57/141 are the Food and Agriculture Organisation of the United Nations, the International Hydrographic Organization, the International Maritime Organisation, the International Seabed Authority, the United Nations Environment Programme, the World Meteorological Organisaton, the secretariat of the Convention on Biological Diversity and the United Nations Secretariat (Division for Ocean Affairs and the Law of the Sea).

[169] UN General Assembly Resolution 57/141 UN Doc. A/RES/57/141, para 56.
[170] UN General Assembly Resolution 57/141 UN Doc. A/RES/57/141, para 16.

More recently hydrothermal vents have been subject to consideration during the work of UNICPLOS at its fifth meeting in New York from 7 to 11 June 2004. At this meeting UNICPLOS organised its discussions around the theme of

> "New sustainable uses of the oceans, including the conservation and management of the biological diversity of the seabed in areas beyond national jurisdiction".[171]

Issues canvassed under this theme included hydrothermal vents.[172] The meeting received presentations from a number of experts including, inter alia, experts in relation to hydrothermal vents including Professor Peter Rona from the Institute of Marine and Coastal Sciences at Rutgers University and Professor Kim Juniper from the University of Quebec, and the Secreatary-General of the ISA Ambassador Nandan. The meeting also saw the soon to be released IMAX film on hydrothermal vents "Volcanoes of the Deep Sea" referred to in Chapter 1 in the context of deep-sea tourism.[173] After lengthy discussion, including taking note of recent developments at the ISA and COP VII of the CBD, UNCIPLOS made a number of recommendations to the General Assembly of the United Nations. Although the recommendations of UNICPLOS also related to other aspects of the theme of its work, several of these recommendations relate to hydrothermal vents. These were recommendations 5, 6(a) and (b), and 7(a) and (b).

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[171] *Report on the Work of the United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea at its fifth meeting*, UN Doc. A/59/122.

[172] For full details of the issues canvassed see *Report on the Work of the United Nations Open-ended Infomal Consultative Process on Oceans and the Law of the Sea at its fifth meeting*, UN Doc. A/59/122.

Recommendation 5 stated

"Noting the call in the Plan of Implementation of the World Summit on Sustainable Development to maintain the productivity and biodiversity of important and vulnerable, marine and coastal areas both within and beyond national jurisdiction, it was proposed that the General Assembly:

(a) Welcome decision VII/5 adopted at the seventh meeting of the Conference of the Parties to the Convention on Biological Diversity; and

(b) Also welcome decision VII/28 adopted at the seventh meeting of the Conference of the Parties to the Convention on Biological Diversity suggesting that the Ad-Hoc Open-Ended Working Group on Protected Areas explore options for cooperation to promote the establishment of marine protected areas beyond national jurisdiction, consistent with international law, including the United Nations Convention on the Law of the Sea, and on the basis of the best available scientific information, and encourage the participation of oceans experts in the Working Group."[174]

In part Recommendation 6 provides

"It was proposed that the General Assembly:

(a) Urge States, either by themselves or through regional fisheries management organisations, where these are competent to do so, to consider on a case-by-case basis and where justified on a scientific basis, including the application of precaution, the interim prohibition of destructive practices by vessels under their jurisdiction that have an adverse impact on vulnerable marine ecosystems, including seamounts, hydrothermal vents and cold-water corals located beyond national jurisdiction.

(b) Encourage regional fisheries management organisations with a mandate to regulate bottom fisheries to urgently address the impact of deep sea bottom trawling on vulnerable marine ecosystems in accordance with international law."[175]

Finally Recommendation 7 provided

"It was proposed that the General Assembly:

(a) Welcome progress on and encourage the work of the International Seabed Authority relating to the regulations for prospecting and exploration for polymetallic sulphides and cobalt-rich crusts in the Area and procedures to ensure the effective protection of the marine environment, the protection and conservation of the natural resources of the Area and the prevention of damage to its flora and fauna from harmful effects that may arise from activities in the Area; and

(b) Encourage States, individually or in collaboration with each other or with relevant international organisations and bodies, to improve their understanding and knowledge of the deep sea in areas beyond national jurisdiction by increasing their marine scientific research activities in accordance with the Convention."[176]

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[173] *Report on the Work of the United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea at its fifth meeting*, UN Doc. A/59/122.

[174] Recommendation 5, *Report on the Work of the United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea at its fifth meeting*, UN Doc. A/59/122, 2-3.

[175] Recommendation 6(a)-(b), *Report on the Work of the United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea at its fifth meeting*, UN Doc. A/59/122, 3.

[176] Recommendation 7, *Report on the Work of the United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea at its fifth meeting*, UN Doc. A/59/122, 3-4.

The Recommendations from the fifth meeting of UNICPLOS were subsequently considered by the UN General Assembly in the course of its consideration of developments in the Law of the Sea at its 56th Meeting. At this meeting the General Assembly passed a resolution to establish an Ad Hoc Open-ended Informal Working Group to study issues relating to the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction. The work of this Working Group will include hydrothermal vents.[177]

CONCLUSION

This chapter has examined the extent to which LOSC and the CBD provide for the sustainable management of hydrothermal vents and has shown that there appears to be significant gaps in the existing law, particularly in areas beyond national jurisdiction. The ability of States to sustainably manage activities on the continental shelf is also unclear. While LOSC has detailed provisions dealing with pollution, pollution does not currently appear to be a major threat to hydrothermal vent ecosystems. On the other hand activities such as MSR, bioprospecting and tourism are unregulated. As we shall see in Chapter 9 the regulation of mining by the ISA to date has been far from adequate.

Recent developments within forums such as the CBD, UNICPLOS and the UN General Assembly show that the sustainable management of human activities in the

[177] As at 1 February 2005 the text of the relevant resolution is not publically available. But details of the General Assembly discussion and the Resolution are reported in United Nations Press Release GA/10299 available from http://www.un.org/News/Press/docs/2004/gal10299.doc.htm accessed 31 January 2005

deep-sea, including at hydrothermal vents, is increasingly a matter of international concern. With an understanding of the general nature of the legal issues to be addressed, it is useful to now consider how these issues can be addressed. The CBD and LOSC are not the only treaties that are of relevance in considering how we may provide for the sustainable management of hydrothermal vents. A number of other treaties merit consideration and are considered in Chapter 3.

While there is clearly a significant gap that exists in international law, there is increasing evidence of an emerging consensus within the international community that there is a need for more effective measures to provide for the sustainable management of the biodiversity of the high seas and the deep-sea beyond national jurisidiction. Until very recently there was little interest in the need for action but in 2004 there has been a flurry of activity within forums such as those associated with the CBD, UNICPLOS and the ISA.[178] The abyss had been ignored except for its mineral and fisheries resources until very recently. Now the deep-sea, including hydrothermal vents, is rapidly moving onto the international legal and policy agenda.

[178] The developments at the ISA are canvassed in detail in Chapter 9.

CHAPTER 3

Chapter 2 considered the extent to which activities at hydrothermal vents are subject to regulation under both LOSC and the CBD. While significant gaps exist under both these treaties, this chapter considers a number of other treaties that arguably apply to hydrothermal vents and that might provide useful framework regimes to assist in the conservation of the biodiversity of hydrothermal vents and the sustainable use of their resources. Exploring a role for these mechanisms is consistent with existing international law and it is consistent with the the WSSD Plan of Implementation to the extent that it calls for co-operation within existing regional organisations. The following discussion highlights a number of possible sources that to date have not been closely examined. The purpose of the discussion is not to conclusively nominate a preferred option, but rather to suggest some additional sources of law and institutions that merit further examination. These were not considered in the SBSTTA study discussed in Chapter 2 or discussed in detail in any of the literature to date[1].

Six additional sources of law would appear to merit further consideration. They are:

[1] There was limited discussion on the potential role of regional organisations, at least in the context of high seas MPAs at the IUCN, WWF WCPA Experts Workshop on High Seas Marine Protected Areas held in Malaga Spain in January 2003 in which the writer participated. See K Gjerde and C Breide, *Towards a Strategy for High Seas Marine Protected Areas: Proceedings of the IUCN, WCPA and WWF Experts Workshop on High Seas Marine Protected Areas* (2003). The potential role of regional organizations was also discussed at the Cairns High Seas Workshop on Governance of High Seas Biodiversity Conservation in which the author also participated.

- The 1992 Convention for the Protection of the Marine Environment of the North-East Atlantic[2]
- The 1986 Convention for the Protection of the Natural Resources and Environment of the South Pacific Region;[3]
- The 1980 Convention on the Conservation of Antarctic Marine Living Resources[4];
- The 1991 Protocol on Environmental Protection to the Antarctic Treaty;[5]
- The 1980 Convention on Future Multilateral Co-operation in North-East Atlantic Fisheries;[6] and
- The 1972 Convention for the Protection of the World Cultural and Natural Heritage;[7]

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[2] Convention for the Protection of the Marine Environment of the North-East Atlantic, opened for signature 22 September 1992, 32 ILM (1992) (entered into force 25 March 1998), hereinafter OSPAR Convention.

3 Convention for the Protection of the Natural Resources and Environment of the South Pacific Region, opened for signature 24 November, 1986, (1990) ATS 31 (entered into force 22 August 1990), hereinafter Noumea Convention.

4 Convention on the Conservation of Antarctic Marine Living Resources, opened for signature 20 May 1980, 19 ILM (1980) (entered into force 7 April 1982), hereinafter CCAMLR.

5 Protocol on Environmental Protection to the Antarctic Treaty, opened for signature 4 October 1991, 30 ILM (1991) (entered into force 14 January 1998), hereinafter the Madrid Protocol.

[6] Convention on Future Multilateral Co-operation in North-East Atlantic Fisheries, opened for signature 18 November 1980, Cmnd. 8474 297.(entered into force 17 March 1982), hereinafter the NEAF Convention.

7 Convention for the Protection of the World Cultural and Natural Heritage, opened for signature 16 November 1972, 11 I.L.M. (1972) 1358, (entered into force 17 December 1975), hereinafter World Heritage Convention.

CONVENTION FOR THE PROTECTION OF THE MARINE ENVIRONMENT OF THE NORTH-EAST ATLANTIC

There are at least four known hydrothermal vent fields in the OSPAR maritime area.[8] These are the Menez Gwen, Lucky Strike, Saldanha and Rainbow vent fields.[9]

Under article 2(1)(a) of the OSPAR Convention contracting parties are obliged to:

> "take all possible steps to prevent and eliminate pollution and [obliges parties to] take the necessary measures to protect the maritime area against the adverse effects of human activities so as to safeguard human health and to conserve marine ecosystems and, when practicable, restore marine areas which have been adversely affected."

To this end, under article 2(1)(b) contracting parties are obliged, individually and jointly, to adopt programs and measures and to harmonise their policies and strategies. In that context the parties are also obliged to apply the precautionary principle and the polluter pays principle. Annex V of the OSPAR Convention, deals specifically with the protection and conservation of the ecosystems and biological diversity (defined in similar terms to the CBD) of the maritime areas to which the OSPAR Convention applies. Annex V and the accompanying *Sintra Statement*,[10] provide a strategy for implementation of Annex V, including provisions requiring an assessment of the species and habitats that may need protection, as well as human

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[8] Under Article 1 the OSPAR Convention applies to a significant portion of the Maritime area of the North East Atlantic and Arctic Oceans, including the internal waters and the territorial seas of the Contracting Parties. It also applies to the sea beyond and adjacent to the territorial sea under the jurisdiction of the coastal State to the extent recognised by international law, and to the high seas, including the bed of all those waters and its sub-soil within certain defined limits.

[9] S Gubbay et al, *The Offshore Directory, Review of a selection of habitats, communities and species of the north-east Atlantic* (2002).

[10] *Sintra Statement, Ministerial Statement of Ministers meeting within the framework of the OSPAR Commission for the Protection of the Marine Environment of the North East Atlantic*, 23 July, 1998, reproduced at http://www.ospar.org/eng/html/welcome.html last accessed 16 July, 2004.

activities that are likely to have an adverse effect on such species and habitats.[11] Following the *Sintra Statement* the parties to OSPAR have committed to promoting

> "the establishment of a network of marine protected areas to ensure the sustainable use and protection and conservation of marine biological diversity and ecosystems".[12]

Work is now being carried out by parties to the OSPAR Convention and other interested parties such as WWF to design mechanisms to implement these obligations. The most significant of these is development of an overall framework for MPAs within the context of the OSPAR Convention.[13] Possible MPA candidate sites within the maritime area of the OSPAR Convention that have been identified so far include the Lucky Strike[14]and Rainbow fields.[15] Could measures be adopted under these provisions to regulate activities at hydrothermal vents such as bioprospecting MSR, mining and tourism? Arguably yes, given that it has been suggested such activities pose a threat to the hydrothermal vent ecosystem. A range of activities including bioprospecting at these hydrothermal vent sites could be regulated in the context of a system of MPAs.

The obvious problem with any such measures, however, will be that they could not apply to nationals of non State parties to the OSPAR Convention on the high seas.

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[11] Gubbay, above n 9.
12 Above n 10.
13 D K Leary, 'Recent developments in international law relating to activities around hydrothermal vent ecosystems' (2001) 10(2) *InterRidge News* 23.
14 S Christiansen, 'Lucky Strike-A potential MPA, WWF North-East Atlantic Program briefing note available from http://www.ngo.grida.no/wwfneap/overview/overset.htm accessed 30 May 2003.
[15] S Christiansen and K Gjerde, 'Rainbow-A Potential MPA', WWF North-East Atlantic Program briefing note available at http://www.ngo.grida.no/wwfneap/overview/overset.htm accessed 30 May, 2003.

NOUMEA CONVENTION

The Noumea Convention aims to contribute to the care and responsible management of the special hydrological, geological and ecological characteristics of the South Pacific Region. It also recognises the threats to the marine and coastal environment, their ecological equilibrium, resources and legitimate uses posed by pollution and by the insufficient integration of an environmental dimension [sic] into the development process.[16]

Within the Convention Area,[17] Papua New Guinea, New Zealand, Fiji, Solomon Islands and Tonga, are all at various stages of considering development of resources (especially mineral resources) associated with hydrothermal vents within their territorial sea and/or EEZ. Two of these nations, New Zealand and Papua New Guinea, have already granted exploration licences in relation to such mineral resources.

Under the Noumea Convention the State parties have assumed a number of significant obligations which arguably provide the legal basis for action to conserve,

16 Noumea Convention, Preamble.
17 Article 2 of the Noumea Convention defines the Convention Area as the 200 nautical mile zones established in accordance with international law (ie the EEZ) of American Samoa, Australia (East Coast and Islands eastward including Macquarie Island), Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Guam, Kiribati, Marshall Islands, Nauru, New Caledonia and Dependencies, New Zealand, Niue, Northern Mariana Islands, Palau, Papua New Guinea, Pitcairn Islands, Toeklau, Tonga, Tuvalu, Vanuatu, Wallis and Futuna and Western Samoa. The Convention Area also extends to include the areas of the high seas which are enclosed from all sides by the 200 nautical mile EEZs of these States. This is a large area of the ocean.

sustainably manage and use the resources of hydrothermal vent fields found within the Convention Area. At a general level under Article 4 of the Noumea Convention the parties are obliged to endeavour to conclude bilateral or multilateral agreements, including regional or sub-regional agreements, for the protection, development and management of the marine and coastal environments of the Convention Area. Similarly, under Article 5 the parties are obliged, either individually or jointly, to take all appropriate measures in conformity with international law and the provisions of the Noumea Convention to prevent, reduce and control pollution of the Convention Area, from any source, and to ensure sound environmental management and development of natural resources.

Article 8 specifically addresses pollution from seabed activities, obliging all parties to take:

> "all appropriate measures to prevent, reduce and control pollution in the Convention Area, resulting directly or indirectly from exploration and exploitation of the sea-bed and its subsoil."

The provisions of Article 8 are re-enforced by Article 13, which obliges parties to take:

> "all appropriate measures to prevent, reduce, and control environmental damage in the Convention Area, in particular coastal erosion caused by coastal engineering, mining activities, sand removal, land reclamation and dredging."

The Noumea Convention also recognises specially protected areas as a tool for biodiversity conservation. Thus Article 14 provides:

> "The Parties shall, individually or jointly, take all appropriate measures to protect and preserve rare or fragile ecosystems, depleted, threatened or endangered flora and fauna as well as their habitat in the Convention Area. To this end, the Parties shall, as appropriate, establish protected areas, such as parks and reserves, and prohibit or regulate any activity likely to have adverse

> effects on the species, ecosystem or biological processes that such areas are designed to protect."

In addition, Article 16 contains provisions requiring assessment of the environmental impact of "major projects" on the marine environment so that appropriate measures can be taken to prevent any substantial pollution of, or significant and harmful changes within the Convention Area.

While these provisions arguably provide some basis to act at the regional level, the obligations are subject to a number of qualifications. For example, the general obligation to reduce and control pollution under Article 5(1) is to be performed subject to the individual State's capabilities. Even more significantly, Article 4(6)

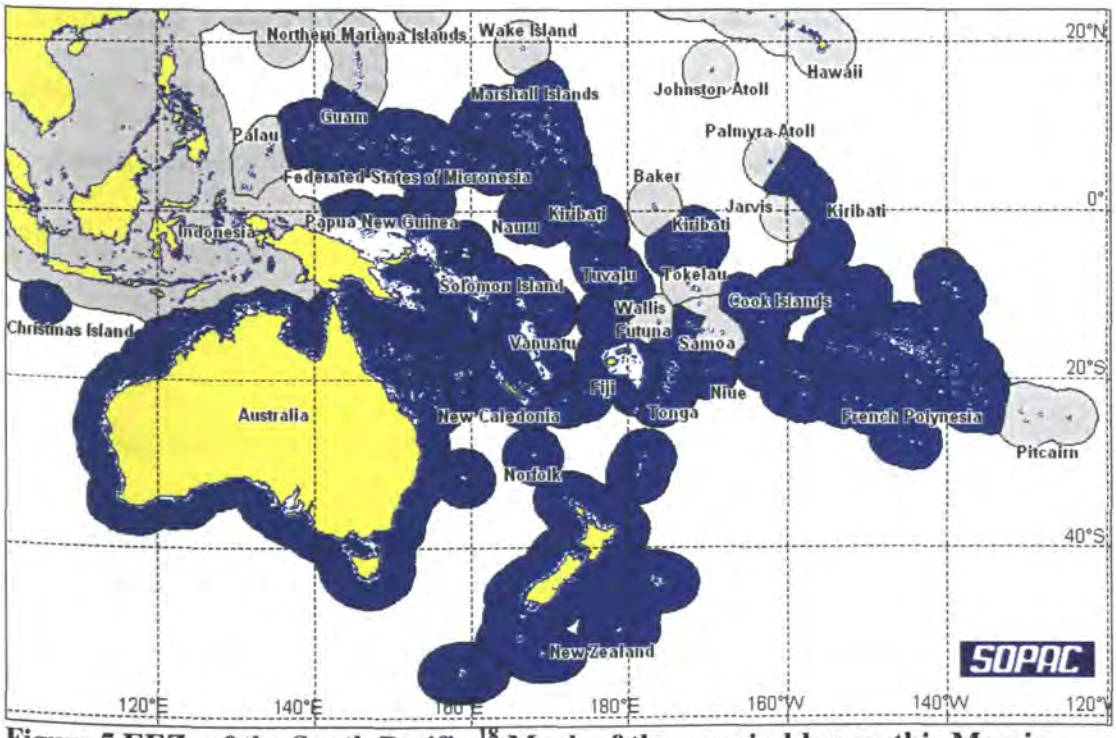

Figure 5 EEZs of the South Pacific.[18] Much of the area in blue on this Map is covered by the Noumea Convention

[18] Exclusive Economic Zones of the South Pacific from SOPAC web site http://www.sopac.org.fj/Secretariat/MemberCountries/index.html accessed 11 June, 2003.

provides that nothing in the Convention shall affect the sovereign rights of States to exploit, develop and manage their own natural resources pursuant to their own policies, taking into account their duty to protect and preserve the environment. Nonetheless, at a regional level the Noumea Convention might provide the legal basis for measures to regulate access to hydrothermal vents. Having the political will or economic means to act, of course, is a different matter, especially given the potential economic significance to these countries of such resources.

THE ANTARCTIC TREATY SYSTEM

As noted earlier in Chapter 1, so far few hydrothermal vent sites have been confirmed in the vicinity of Antarctica or within Antarctic waters. Nonetheless, the possibility of the discovery of such sites cannot be ruled out. In such circumstances the provisions of a number of treaties within the Antarctic Treaty system may offer a means of regulating or coordinating access to and activities in relation to hydrothermal vents. For present purposes the most relevant instruments are CCAMLR and the Madrid Protocol.

CCAMLR

Under Article I(1) CCAMLR applies to:

> "the Antarctic marine living resources of the area south of 60° South latitude and to the Antarctic marine living resources of the area between that latitude and the Antarctic Convergence which form part of the Antarctic marine ecosystem."

Article II (2) defines Antarctic marine living resources as

> "the population of fin fish, molluscs, crustaceans and all other species of living organisms, including birds, found south of the Antarctic Convergence".

Arguably species of molluscs and crustaceans associated with hydrothermal vents would fall within this definition. So too, other species, including bacteria and archaea found at hydrothermal vents, fall within the definition as "other species of living organisms." These species, if they exist within the area defined in Article I(1), would also form part of the Antarctic marine ecosystem, which is defined in Article I(3) as

> "The complex of relationships of Antarctic marine living resources with each other and with their physical environment."

Prima facie therefore CCAMLR would apply to hydrothermal vents in areas covered by that treaty.

Article II(1) of CCAMLR states that the objective of CCAMLR is the conservation of Antarctic marine living resources. Conservation is defined under article II(2) as including 'rational use' of Antarctic marine living resources. As such, harvesting of marine living resources and any associated activities must be conducted in accordance with a number of principles of conservation set out in Article II (3) of CCAMLR.[19]

[19] Those principles include: prevention of decrease in the size of any harvested population to levels below those which ensure its stable recruitment; maintenance of the ecological relationships between harvested, dependent and related populations of Antarctic marine living resources and the restoration of depleted populations to defined levels; and prevention of changes or minimisation of the risk of changes in the marine ecosystem, which are not potentially reversible over two or three decades, taking into account the state of available knowledge of the direct and indirect impact of harvesting, the effects of the introduction of alien species, the effects of associated activities on the marine ecosystem and the effects of environmental changes, with the aim of making possible the sustained conservation of Antarctic marine living resources.

To give effect to these principles CCAMLR established the Commission for the Conservation of Antarctic Marine Living Resources. Amongst other powers conferred on the Commission, Article IX(1)(f) grants power to the Commission to formulate, adopt and revise conservation measures on the basis of the best scientific evidence available, subject to compliance with the Agreed Measures for the Conservation of Antarctic Fauna and Flora adopted by the Consultative Parties to the Antarctic Treaty.[20] Pursuant to article XXI of CCAMLR each contracting party is obliged to take appropriate measures within its competence to ensure compliance with the provisions of CCAMLR and measures adopted by the Commission pursuant to Article IX. If hydrothermal vents were to be found within the area covered by CCAMLR then arguably the provisions of this treaty could be applied to regulate human activities that may have an environmental impact on the hydrothermal vent ecosystems.

However, like the continental shelf regime under LOSC discussed in Chapter 2, there may be a number of problems presented by the terminology used in this convention. For example, in the context of hydrothermal vent species, do terms such as

[20] Pursuant to Article IX(2) these conservation measures can include:designation of the quantity of any species which may be harvested in the area to which CCAMLR applies; the designation of regions and sub-regions based on the distribution of populations of Antarctic marine living resources; the designation of the quantity which may be harvested from the populations of regions and sub-regions; the designation of protected species; the designation of the size, age and, as appropriate, sex of species which may be harvested; the designation of open and closed seasons for harvesting; the designation of the opening and closing of areas, regions or sub-regions for the purposes of scientific study or conservation, including special areas for protection and scientific study; regulation of the effort employed and methods of harvesting, including fishing gear, with a view, inter alia, to avoiding undue concentration of harvesting in any region or sub-region; the taking of such other conservation measures as the Commission considers necessary for the fulfilment of the objectives of CCAMLR, including measures concerning the effects of harvesting and associated activities on components of the marine ecosystem other than harvested populations.

'harvesting', 'harvested population', and 'fishing gear' have any real meaning? More significantly, given that so little is known about the hydrothermal vent ecosystem and the life span of individual hydrothermal vent fields, is it possible to identify 'changes in the marine ecosystem which are not potentially reversible over two or three decades' as required by the principles of Conservation under Article II(3) of CCAMLR?

Similarly, questions would remain about the applicability of such measures to non-party States on the high seas. However, unlike fisheries measures, most of the States active in hydrothermal vent research and bioprospecting are parties to CCAMLR. This includes countries such as South Korea, France, Australia, Germany, United Kingdom, Japan, USA and New Zealand. None of the flag of convenience states such as Panama or Uruguay are involved in such activities. Diving to hydrothermal vents and carrying out research is an activity involving high technology and high cost. In that respect it is very different to other activities in Antarctic waters such as IUU fishing. CCAMLR therefore may offer a further source of law and an institution that could be used to regulate activities at hydrothermal vents.

MADRID PROTOCOL

Measures adopted under CCMLAR could be re-inforced by similar measures adopted in accordance with the provisions of the Madrid Protocol. The Madrid Protocol serves

as a framework convention which provides the basic features of the regime for environmental protection in Antarctica.[21]

Article 3(1) of the Madrid Protocol provides:

> "The protection of the Antarctic environment and dependent and associated ecosystems and the intrinsic value of Antarctica, including its wilderness and aesthetic values and its value as an area for the conduct of scientific research, in particular research essential to understanding the global environment, shall be fundamental considerations in the planning and conduct of all activities in the Antarctic Treaty area."

To this end Article 3(2) requires that activities in the Antarctic Treaty area shall be planned and conducted so as to limit adverse impacts on the Antarctic environment and dependent and associated ecosystems. As such, pursuant to article 3(2)(b), activities in the Antarctic Treaty Area must be planned and conducted so as to avoid inter alia:

- significant changes in atmospheric, terrestrial (including aquatic), glacial or marine environments;
- detrimental changes in the distribution, abundance or productivity of species or populations of species of fauna and flora; or
- degradation of, or substantial risk to areas of biological, scientific, historic, aesthetic or wilderness significance.

[21] C Redgwell, 'Environmental Protection in Antarctica: The 1991 Protocol' (1994) 43 *International and Comparative Law Quarterly* 599, 606.

Significantly, Article 3(2)(c) also requires all activities to be "planned and conducted on the basis of information sufficient to allow prior assessments of, and informed judgements about their possible impacts on the Antarctic Environment." These principles apply to all activities in Antarctica.[22] To the extent that specific activities are not regulated by the Annexes to the Protocol, these fundamental principles provide a benchmark against which all activity must be assessed.

One significant innovation of the Madrid Protocol is the environmental impact assessment regime established for activities undertaken in Antarctica including scientific research. This regime would apply to all MSR conducted in Antarctic waters. This is considered in detail in Chapter 8 in the context of its potential role as a model for the regulation of MSR in areas beyond national jurisdiction.

In addition to the environmental impact assessment regime, Annex V to the Madrid Protocol provides a mechanism for the establishment of protected areas and the regulation of activities in particular areas, which could also be used to regulate access to hydrothermal vents. Thus article 2 of Annex V provides that any area "including any marine area, may be designated as an Antarctic Specially Protected Area[23] or an Antarctic Specially Managed Area".[24]

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[22] C M Harris and J Meadows, 'Environmental Management in Antarctica: Instruments and Institutions' (1992) 25 *Marine Pollution Bulletin* 239, 244.
[23] Hereinafter ASPA.
[24] Hereinafter ASMA.

Activities in both these types of areas are prohibited, restricted or managed in accordance with Management Plans adopted under the provisions of Annex V. ASPA's can be designated to protect outstanding environmental, scientific, historic, aesthetic or wilderness values, any combination of those values, or ongoing or planned scientific research under Annex V Article 3(1). Article 3 of Annex V specifically requires parties to identify within a systematic environmental-geographical framework specific categories of areas to be established as ASPA's. Categories that are relevant to hydrothermal vents include:

- representative examples of major terrestrial and marine ecosystems (Annex V article 3(2)(b));
- the only known habitat of any species (Annex V article 3(2)(d));
- areas of particular interest to on-going or planned scientific research (Annex V article 3(2)(e); and
- examples of outstanding geological or geomorphological features (Annex V, article 3(2)(f)).

Entry into any ASPA is prohibited except with a permit granted only after vetting of the reasons for entry to the particular ASPA.

Under Annex V article 4(1) ASMA's can be established in relation to areas, including marine areas, where activities are being conducted or may be conducted in the future, so as to assist in the planning and co-ordination of activities, avoid possible conflicts, improve co-operation between parties or minimise environmental impacts. ASMA's

may also include areas where activities pose risks of mutual interference or cumulative environmental impacts (article 4(2)(a)).

Antarctica as a Model for Regulating Bioprospecting on the High Seas?

So far no measures have been implemented to specifically regulate bioprospecting in Antarctica or within Antarctic waters.[25] However, the legal instruments discussed above arguably could be utilised in designing a regime to regulate bioprospecting in Antarctica. The similarities between Antarctica and the deep ocean floor of the high seas are striking. Both are harsh environments. The ecosystems of both are heavily dependent on one form of life: in the case of Antarctica it is Krill; for hydrothermal vents it is bacteria and archaea. Both occur in areas beyond any one nation's jurisdiction. Both are of interest to science and both have resources that many wish to exploit. Any future regime to be developed for the high seas could draw on the experience of Antarctica. Developments in relation to regulating bioprospecting in Antarctica should be watched closely as they may provide an example for regulating activities in other parts of the high seas including at hydrothermal vents.

NEAF CONVENTION

Many Regional Fisheries Management Organisations[26] have a mandate for sustainable fisheries management and some have the capacity to close areas to

[25] D Rothwell, 'Bioprospecting in the Southern Ocean under International Law, powerpoint presentation, *Bioprospecting in Antarctica, an Academic Workshop*, Gateway Antarctica, University of Canterbury, Christchurch, New Zealand, 7-8 April, 2003, www.anta.canterbury.ac.nz accessed 30 May 2003.

[26] Hereinafter RFMOs.

fisheries. [27] The NEAF Convention is one example of an RFMO that could potentially be applied to hydrothermal vent sites on the high seas, including those potentially associated with Seamounts.[28]

The NEAF Convention applies to portions of the North-East Atlantic and Arctic oceans defined as the "Convention Area".[29] The NEAF Convention aims to promote

> "the conservation and optimum utilisation of the fishery resources of the North-East Atlantic Area within a framework appropriate to the regime of extended coastal state jurisdiction over fisheries, and accordingly to encourage international co-operation and consultation with respect to these resources".[30]

Pursuant to Article 1(2) the NEAF Convention applies to all fishery resources of the Convention Area with the exception of sea mammals, and sedentary species.[31] In addition where highly migratory species and anadromous fish stocks are dealt with by other international agreements they are also not regarded as fishery resources for the purposes of the NEAF Convention.

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[27] K Gjerde and C Breide, *Towards a Strategy for High Seas Marine Protected Areas: Proceedings of the IUCN, WCPA and WWF Experts Workshop on High Seas Marine Protected Areas* (2003), 19.
[28] See discussion on hydrothermal vents and seamounts in Chapter 1..
[29] Article 1 of the NEAF Convention defines the Convention Area as waters:
"(a) within those parts of the Atlantic and Arctic Oceans and their dependent seas which lie north of 36° north latitude and between 42° west longitude and 51 ° east longitude, but excluding
  (i) the Baltic Sea and the Belts lying to the south and east of lines drawn from Hasenore Head to Gniben Point, from Korshage to Spodsbierg and from Gilbierg Head to Kullen, and
  (ii) the Mediterranean Sea and its dependent seas as far as the point of intersection of the parallel of 36° latitude and the meridian of 5°36' west longitude
(b) within that part of the Atlantic Ocean north of 59° north latitude and between 44° west longitude and 42° west longitude."
[30] Preamble, NEAF Convention.
[31] Sedentary species are defined in Article 1(2) of the NEAF Convention in exactly the same terms as LOSC.

The NEAF Convention establishes the North-East Atlantic Fisheries Commission.[32] Significantly under Article 5(1) the Commission has the mandate to make recommendations concering fisheries conducted beyond the areas under fisheries jurisdiction of Contracting Parties.[33] Thus the NEAF Convention provides a mechanism for regulating fisheries activities of vessels flagged by Contracting Parties operating in High Seas areas within the Convention Area. The types of measures the Commission may make recommendations in relation to include

- the regulation of fishing gear and appliances (including the size of mesh of fishing nets);
- the regulation of the size limits of fish that may be retained on board vessels, or landed or exposed or offered for sale;
- the establishment of closed seasons and of closed areas;
- the improvement and increase of fishery resources, which may include artificial propagation, the transplantation of organisms and the transplantation of young;
- the establishment of total allowable catches and their allocation to Contracting Parties; and
- the regulation of the amount of fishing effort and its allocation to Contracting Parties.[34]

[32] Hereinafter referred to as the "Commission". See article 3(1), NEAF Convention.
[33] The Contracting Parties are Denmark (in respect of Faroe Islands and Greenland), Estonia, Iceland, Norway, Poland and the Russian Federation. See http://www.neaf.org accessed 8 November 2005.

[34] Article 7, NEAF Convention.

The Commission has adopted a range of such recommendations. For present purposes though the most significant recommendation is Recommendation IV adopted at the 23rd Annual Meeting of the Commission titled "NEAFC Recommendation for the Protection of Vulnerable Deep-water Habitats by Denmark (In Respect of the Faroe Islands and Greenland) Estonia, the European Community, Iceland, Norway and Poland".[35] This recommendation prohibits bottom trawling and fishing with static gear such as gill-nets and long-lines in three areas:

- The Hecate and Faraday seamounts, and a section of the Reykjanes Ridge (which is a portion of the mid-Atlantic Ridge);
- The Altair seamounts; and
- The Antialtair seamounts.

This prohibition is in force from 1 January 2005 to 31 December 2007.

So far fishing has not been identified as a threat to hydrothermal vent ecosystems, although it has been identified as a major threat to other vulnerable deep-water habitats such as those associated with seamounts.[36] However, what NEAF Convention Recommendation 23/IV suggests is that if a hydrothermal vent field were to be identified in association with seamounts in the Convention Area then a similar recommendation could be adopted to restrict access to such sites. Alternately

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[35] *NEAFC Recommendation for the Protection of Vulnerable Deep-water Habitats by Denmark (In Respect of the Faroe Islands and Greenland) Estonia, the European Community, Iceland, Norway and Poland* available from http://www.neaf.org accessed 8 November 2005. Hereinafter referred to as NEAF Convention Recommendation 23/IV.

[36] For discussion of the threats posed to seamount habitats and associated fauna by fishing and especially bottom trawling see K Gjerde and C Breide above n 27 and WWF/IUCN/WCPA, *The status of the natural resources on the high-seas* (2001).

hydrothermal vent sites associated with seamounts might benefit indirectly where areas with other vulnerable fauna associated with seamounts are closed to fishing.

Although a detailed discussion of other mechanisms associated with the NEAF Convention are outside the scope of this chapter, it is also significant to note that the Contracting Parties have adopted a scheme to promote compliance by Non-Contracting Party vessels with Recommendations established by the Commission.[37]

However, like CCAMLR there is some uncertainty surrounding the application of the NEAF Convention to hydrothermal vent ecosystems and associated species. Firstly obvious questions arise as to whether the definition of "fishery resources" under the NEAF Convention applies to species associated with hydrothermal vents. Is it correct to refer to hydrothermal vent species as "fishery resources"? Species such as tubeworms and microbes etc are obviously not "fished" as such. However, there is the possibility that some species of fish and or skates associated with hydrothermal vents may be subject to fishing in the future as advances in technology permit fishing at greater depths. The Commission is currently considering possible management measures for several deep-sea species.[38] Subject to further scientific research on the biodiversity of the deep-sea, at some point in the future it may be appropriate to extend similar management measures to fish and skate species associated with

[37] See North-East Atlantic Fisheries Commission, *Scheme to promote compliance by non-Contracting Party vessels with Recommendations established by NEAFC*, available from http:/www.neafc.org accessed 8 November 2005.

[38] A list of deep-sea species currently under consideration for management measures can be obtained from http://www.neafc.org/fisheries/deep-sea_species_list.htm accessed 8 November 2005.

hydrothermal vents, especially where such hydrothermal vent fields are also associated with seamounts.

A further issue associated with the potential application of the NEAF Convention is the fact that it could not regulate MSR in areas beyond national jurisdiction. This is due primarily to the fact, as noted in earlier parts of this thesis, that MSR is a High Seas freedom. This is re-enforced by the provisions of Article 10 of the NEAF Convention which provides that in adopting recommendations the Commission

> "shall determine whether, and under which conditions, those recommendations shall apply to fishing operations conducted solely for the purposes of scientific investigation carried out according to relevant principles and rules of international law."[39]

Similalry it is questionable if the Commission could adopt any measures to regulate bioprospecting or tourism in deep-sea areas in the Convetion Area. Also it clearly has no mandate in relation to regulation of deep-sea mining in areas beyond national jurisidiction as this is within the mandate of the International Seabed Authority.[40]

Despite these difficulties the NEAF Convention does offer a further potential means for partially providing for the sustainable management of hydrothermal vents beyond national jurisdiction. Further research could canvas the extent to which other RFMOs could potentially apply or act as models for designing management regimes for hydrothermal vents beyond national jurisdiction.

[39] Article 10, NEAF Convention.
[40] On this last issue see discussion in Chapters 2 and 9.

WORLD HERITAGE CONVENTION

The World Heritage Convention seeks to establish

> "an effective system of collective protection of the cultural and natural heritage of outstanding universal value, organised on a permanent basis and in accordance with modern [sic] scientific methods".[41]

The provisions of the World Heritage Convention arguably apply to hydrothermal vents found within the territorial waters of State parties to this convention.

Under Article 2 natural heritage is defined as:

> "natural features consisting of physical and biological formations or groups of such formations, which are of outstanding universal value from the aesthetic or scientific point of view;
>
> geological and physiographical formations and precisely delineated areas which constitute the habitat of threatened species of animals and plants of outstanding universal value from the point of view of science or conservation;
>
> natural sites or precisely delineated areas of outstanding universal value from the point of view of science, conservation or natural beauty"[42]

Hydrothermal vents fall within this definition. Both the geological structures and their associated biological communities fall within the first part of the definition in article 2. As discussed in Chapter 1 they are both impressive structures in their own right and they are of immense value to science. It is perhaps not possible to say whether they are composed of threatened species within the terms of the second leg of the definition, although, given the high rates of endemism and the existence of threats as outlined in Chapter 1, this is at least arguable. As with the first leg of the definition they clearly are of outstanding universal value from the point of view of science.

[41] Preamble, World Heritage Convention.
[42] World Heritage Convention, article 2.

Assuming that individual hydrothermal vent sites within a country's territorial waters fall within the definition of natural heritage the provision of the World Heritage Convention would apply.

While the provisions of the World Heritage Convention would only apply to hydrothermal vents within areas of national jurisdiction, it also provides mechanisms to assist States in taking measures to preserve and manage such sites. For example the mechanisms under articles 13 and 15 provide for international assistance and establish the World Heritage Fund. These could be useful in assisting States (especially developing States) in establishing mechanisms for the sustainable management of hydrothermal vents.

CONCLUSION

While the main framework treaties LOSC and the CBD inadequately provide for the sustainable management of hydrothermal vents beyond national jurisdiction, there is considerable scope for the international community to take action within the context of existing institutions in several areas of the world. Pending further action by the international community within the forums associated with the CBD and LOSC, the treaties discussed in this chapter may provide means of partially addressing the issues associated with hydrothermal vents.

This chapter has outlined a number of possible options beyond the CBD and LOSC that might be explored. Further research could consider how existing mechanisms and institutions associated with these treaties could have a role to play in the sustainable

management of hydrothermal vents in areas to which such treaties apply. So while Glowka's original hypothesis as to a lacuna in international law is correct with respect to the operation of the CBD and LOSC, treaties outside these two global treaties, and in particular, some regional treaties, do provide sources of law that could arguably provide for the sustainable management of hydothermal vents in some areas of the world.