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Antarctic Environmental Security: Status and Challenges

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Antarctica represents one of the most pristine and environmentally sensitive habitats in the world and hosts a variety of threatened species. The sparse and periodic human habitation and limited range of human activities to date has reinforced the innate environmental value of this remote area. With the steady increase in human activities in Antarctica and external threats such as climate change, the need for effective environmental protection has become even more urgent. The law and policy framework for environmental protection in Antarctica has evolved through the constellation of international law instruments in the Antarctic Treaty System (ATS). This chapter discusses the development of some key principles and approaches in the global environmental law framework, including the principle of sustainable development, ecosystem-based management, the precautionary principle, and environmental impact assessment, and their application to Antarctica, particularly the marine environment including the Southern Ocean. It analyzes how these principles and approaches have been incorporated in Antarctic governance regimes through the ATS and points to future challenges for the Antarctic environmental protection regime.

Global Law and Policy Framework for Environmental Protection

The Principle of Sustainable Development

Developments in international environmental law and policy over recent decades have promoted an integrated approach to environmental protection, which aligns environmental protection objectives with social and economic goals. The relationship between environmental protection and economic development was recognized in the 1972 Stockholm Declaration on the Human Environment, but it was not until the 1980s that a series of environmental declarations and reports initiated by the International Union for Conservation of Nature and the General Assembly of the United Nations (UNGA) attempted to synthesize these two factors in the concept of sustainable development (Stockholm Report 1972, 1,4; IUCN, WWF, and UNEP 1980; Resolution 37/7 1982, 17). In its 1987 report, *Our Common Future* (i.e., the Brundtland Report), the World Commission on Environment and Development defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987, 43). On a practical level, sustainable development entailed finding a balance between economic and social development goals and the protection of the environment for present and future generations (44–45). The Brundtland Report's findings on oceans, which have particular resonance for the poles, demonstrated that the ecological resilience of the oceans was under threat from "over exploitation, pollution and land based development" (263). Noting the underlying unity of the oceans and the interdependence of marine ecosystems, it emphasized the need for global and regional co-operation in oceans management if sustainable development was to be realized (264–65). For the high seas, as with other parts of the planet that fell outside national jurisdiction, the Brundtland Report concluded that sustainable development could only be secured through "international cooperation and agreed regimes for surveillance, development and management in the common interest" (261). The report assessed that the sum of the multiple conventions and programs in place did not represent an adequate management regime either for ocean space

within national jurisdiction or for extraterritorial ocean space (265; see also Curtis 1993, 188).

In the early 1990s, the Preparatory Commission meetings for the United Nations Conference on Environment and Development (UNCED) began to analyze the practical implications of sustainable development and to devise an action plan for implementing sustainable development across the whole spectrum of human interactions with the environment. Of the products of UNCED, the Rio Declaration and Agenda 21 have the most relevance for the subsequent development of environmental protection at the poles and elsewhere (United Nations 1993; Rio Declaration 1992). The Rio Declaration contains twenty-seven basic principles to guide states and the international community in their efforts to achieve sustainable development (Grubb et al. 1993, xv). These principles reiterated some of the basic tenets of the Stockholm Declaration and incorporated new concepts such as the precautionary approach and the common but differentiated responsibility of developed and developing states in a series of carefully worded political compromises (86). Agenda 21 was a wide-ranging action plan that addressed the integration of environment and development concerns from different angles and recommended global, regional, and national measures to achieve sustainable development in particular program areas (Robinson 1992, xxvi). Chapter 17 of Agenda 21 was devoted to the protection of the oceans (United Nations 1993, 238).

The World Summit on Sustainable Development (WSSD), held in Johannesburg in 2002, reaffirmed the commitment of the international community to the principle of sustainable development. The fundamental theme of many of the recommendations contained in the WSSD Plan of Implementation (WSSD Plan) was a call for states to make existing global and regional instruments work more effectively to protect the environment and its biodiversity, rather than a call for the creation of new multilateral instruments or institutions. In relation to the oceans, the WSSD Plan notes that oceans form an integrated and essential component of the earth's ecosystem, which is critical for global food security and economic prosperity (United Nations 2002). The key to ensuring sustainable development of the oceans is identified as the effective coordination and co-operation of relevant bodies at the global and regional levels (United Nations 2002, annex para. 30). The 1982 United Nations Convention on the Law of

the Sea (UNCLOS 1982) is endorsed as providing the overall framework for oceans activities. The oceans chapter of Agenda 21 and the Jakarta Mandate on Marine and Coastal Biodiversity (COP CBD 1995), adopted by the parties to the 1992 Convention on Biological Diversity (CBD 1992), are recognized as providing the program of action for achieving the related objectives of sustainable development of oceans and the conservation of marine biodiversity (United Nations 2002, para. 30(a–b), para. 32(b)). Some of the actions recommended in the WSSD Plan include the maintenance of the productivity and biodiversity of important marine areas within and beyond national jurisdiction, the development and application of the ecosystem approach in fisheries conservation and management by 2010, the elimination of destructive fisheries practices, the establishment of marine protected areas, including representative networks of such areas, by 2012, and time/area closures for the protection of nursery fishing grounds (para. 30(d), para. 32(a), para. 32(c)). The plan emphasizes the critical importance of coordination and co-operation measures in oceans management, encouraging states to develop regional and international programs for halting the loss of marine biodiversity (para. 32(d)).

Member states of the UN reaffirmed their commitment to sustainable development at the Rio+20 Conference in 2012. In the outcomes document from that conference, *The Future We Want*, they acknowledged "the need to further mainstream sustainable development at all levels, integrating economic, social and environmental aspects and recognizing their interlinkages, so as to achieve sustainable development in all its dimensions" (Resolution 66/288 2012, clause 3).

In 2015, member states of the UN adopted the 2030 Agenda for Sustainable Development and its seventeen Sustainable Development Goals (SDGs) (Resolution 70/1 2015). The SDGs entered into force on 1 January 2016 and are to be implemented over the ensuing fifteen years. SDGs 13, 14, and 15 on climate change, oceans and biodiversity, and forests and desertification, respectively, are especially relevant to environmental protection at the poles. SDG 13 exhorts states to take urgent action to combat climate change and its impacts, and includes among its targets the following:

13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

13.2 Integrate climate change measures into national policies, strategies, and planning

13.3 Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning

SDG 14 on the oceans exhorts states to conserve and sustainably use the oceans, seas, and marine resources, and includes the following:

14.1 By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution

14.2 By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans

14.3 Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels

14.4 By 2020, effectively regulate harvesting and end overfishing, illegal, unreported, and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics

14.5 By 2020, conserve at least 10 percent of coastal and marine areas, consistent with national and international law and based on the best available scientific information

Finally, the biodiversity component of SDG 15 exhorts states to halt biodiversity loss:

15.5 Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species

15.9 By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts

These global goals and their associated targets provide additional impetus for the ongoing environmental protection initiatives being taken in Antarctica through the ATS.

Ecosystem-Based Management

The concept of ecosystem-based management has developed in parallel with the principle of sustainable development. This concept promotes a more integrated approach to conservation and management of the environment, considering species, habitats, and their interconnections rather than concentrating on the protection of single species. An early signpost to the subsequent development of ecosystem-based management in the marine environment can be found in article 194(5) of UNCLOS, which imposes obligations on states' parties to protect and preserve rare or fragile ecosystems as well as the habitat of depleted, threatened, or endangered species and other forms of marine life. The 1992 Rio Declaration provides in principle 7 that "States shall cooperate in a spirit of global partnership to conserve, protect and restore the health and integrity of the Earth's ecosystem." The action program emerging from Agenda 21 also reflected a movement toward ecosystem-based management of the marine environment in chapter 17 on the oceans, with references to the

"protection and restoration of endangered marine species" and the "preservation of their habitats and other ecologically sensitive areas" (United Nations 1993, 252).

The CBD further developed the ecosystem-based management approach to environmental protection through the concept of biodiversity. Biological diversity is a comprehensive term defined in article 2 of the CBD as "the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part" and including "diversity within species, between species and of ecosystems." In the context of the marine environment, the concept of biodiversity was allied to the notion of large marine ecosystems forming an interconnecting web of marine living resources and their habitats (Joyner 1995, 637). This comprehensive approach added new dimensions to the protection of the marine environment, which previously had been largely based on pollution control and the conservation of single species (637). The conservation of marine biodiversity entailed protection of a range of components of biodiversity in the marine environment including species, habitats, ecosystems, and genetic material (646). This inclusive form of protection also considered the social, economic, and political factors affecting the various components of marine biodiversity (644). The framework provisions of the CBD provide some guidance for the contracting parties in implementing biodiversity protection measures, including article 7 on identifying the components of biodiversity within their national jurisdictions and article 14 on environmental impact assessment (EIA). These framework provisions have been supplemented by the ongoing decisions of the Conference of the Parties (COP). The CBD COP occurs biennially and is advised by the scientific advisory body for the convention, the Subsidiary Body on Scientific, Technical and Technological Advice. The contracting parties also concluded the Jakarta Mandate on Marine and Coastal Biodiversity in 1995 (COP CBD 1995, note 16). At the COP CBD meeting in Bratislava in 1998, the contracting parties adopted a decision (IV/5) on conservation and sustainable use of marine and coastal biological diversity, including a multi-year program of work on marine and coastal biological diversity (COP CBD 1998). The work program was founded on six basic principles, including the ecosystem approach, the precautionary principle, and

the importance of science. The five key program elements of the Jakarta Mandate Work Programme are

- integrated marine and coastal area management (IMCAM)
- marine and coastal living resources (MCLR)
- marine and coastal protected areas (MCPA)
- mariculture
- alien species and genotypes (COP CBD 1998, para. 14)

Many decisions taken under each of these programs over the past twenty years relate directly to ecosystem-based management of the marine environment and are implemented through the contracting parties. These include the identification of ecologically and biologically significant areas in marine environments within and beyond national jurisdiction (COP CBD 2008, annex) and the development of Voluntary Guidelines for the Consideration of Biodiversity in EIAs and SEAs for marine areas (Secretariat of the Convention of Biological Diversity 2015).

The Precautionary Principle

The UNCED process had the effect of catalyzing the formation of a body of emerging international environmental law principles, including the precautionary principle or approach. Although different versions of the precautionary approach had been contained in other regional and global instruments prior to UNCED, its inclusion in principle 15 of the Rio Declaration was a major step in its emergence as a principle of customary international law (Birnie and Boyle 2002, 116; Birnie 1997, 51; Kaye 2001, 171–72; Freestone 1994, 216). The principle 15 formulation of the precautionary approach specifies that "where there are threats of serious or irreversible damage to the environment, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation" (Rio Declaration 1992). For the poles and their marine areas, the precautionary principle is particularly relevant because of the still-developing state of scientific knowledge on the poles and most aspects of their marine environments. This developing state of

scientific knowledge arguably imposes an even greater responsibility on states to adopt precautionary strategies to protect this part of the global environment. The introduction to chapter 17 of Agenda 21 also emphasizes the need for fresh approaches to marine and coastal management at the various levels of oceans governance, specifying that such approaches should be "integrated in content" and "precautionary and anticipatory in ambit" (United Nations 1993, 238).

Many of the international environmental law principles contained in the oceans chapter of Agenda 21, including the precautionary principle or approach, were directly incorporated into subsequent international law instruments applicable to the marine environment and its resources, such as the 1995 UN Fish Stocks Agreement. A key benefit of the UN Fish Stocks Agreement was its translation of these general conservation principles into practical recommendations for co-operative action by states, either directly or through sub-regional or regional fisheries-management organizations. Article 6 of the agreement contains a very comprehensive description of how the precautionary approach can be interpreted and applied in the conservation of straddling and highly migratory fish stocks. The measures prescribed, although consistent with a precautionary approach, can also be related to other conservation norms, including sustainable development, use of best scientific evidence, EIA, and ecosystem-based management. The article 6(2) formulation of the precautionary approach in the UN Fish Stocks Agreement sets the threshold for the application of the approach a little lower than that specified in the Rio Declaration. States are urged to "be more cautious when information is uncertain, unreliable or inadequate," and article 6 further provides that "the absence of adequate scientific information is not to be used as a reason for postponing or failing to take conservation and management measures." The remaining provisions in article 6 specify a range of measures to implement the precautionary approach. States are required to improve decision making for fishery resource conservation and management by obtaining and sharing the best scientific information available and implementing improved techniques for dealing with risk and uncertainty (Agreement Relating to Fish Stocks 1995, art. 6.3(a)). On the basis of the best scientific evidence available, states must determine stock-specific reference points that constrain harvesting of fish stocks within safe biological limits that

will allow the stocks to produce their maximum sustainable yield. These precautionary reference points are also to be used to develop management strategies to prevent stocks falling below sustainable levels (art. 6.3(b), annex 2). The precautionary principle or approach has also been incorporated into different aspects of the Antarctic governance regimes discussed in later sections of this chapter.

Environmental Impact Assessment

The process of EIA is one of the fundamental means by which states can implement a range of international environmental law principles and approaches. EIA plays a fundamental role in discharging states' obligations to prevent trans-boundary harm, adopt a precautionary approach, and promote sustainable development (Craik 2008, 54, 77, 224). The well-established process of EIA, with its recognized stages of screening, scoping, and public consultation, is critical to minimizing adverse human impacts on these areas and developing suitable mitigation measures for the duration of such activities and beyond. EIA can alert states to the potential for trans-boundary harm from certain activities in marine areas, and in many cases requires states to notify and consult other states where risks to marine areas under their jurisdiction emerge. EIA is an integral component of a precautionary approach to human activities with the potential for adverse effects on the marine environment. Undertaking prior EIA and ongoing monitoring of activities with the potential for adverse effects on the marine environment is also vital in incorporating environmental concerns into the development process and facilitating sustainable development. The fundamental importance of EIA as an environmental protection obligation is recognized in a range of binding and non-binding international instruments, including article 206 of UNCLOS, article 41 of the CBD, and principle 17 of the Rio Declaration. The customary international law status of the obligation on states to conduct EIA of activities with the potential to significantly affect the environment, including its marine components, has been steadily emerging in the recent jurisprudence of the International Court of Justice (ICJ) and the International Tribunal for the Law of the Sea (ITLOS). In the *Gabčíkovo-Nagymaros* case, the court considered assessment, notification, and consultation—effectively the elements of an EIA process—to be a necessary step in a state's

implementation of the duty to prevent trans-boundary harm and the concept of sustainable development (case concerning Gabčíkovo-Nagymaros Project 1997, 7 para. 141; Boyle 1997, 18; Craik 2008, 114). In the *Pulp Mills* case, the ICJ found that

> it may now be considered a requirement under general international law to undertake an environmental impact assessment where there is a risk that the proposed industrial activity may have a significant adverse impact in a trans-boundary context, in particular, on a shared resource (*Case Concerning Pulp Mills* 2006, 113 para. 204).

In the *MOX Plant* case, ITLOS ordered the parties, Ireland and the United Kingdom, to improve their trans-boundary environmental co-operation, including by carrying out an adequate assessment of the potential impacts of a nuclear fuel reprocessing plant in Cumbria on the marine environment of the Irish Sea (ITLOS 2001, para. 82; Boyle 2007, 377). The advisory opinion of the Seabed Disputes Chamber of the ITLOS on the *Responsibilities and Obligations of States Sponsoring Persons and Entities with Respect to Activities in the Area* also acknowledged the customary international law status of the obligation to conduct EIA of activities with the potential for significant impacts on the marine environment, including for areas beyond national jurisdiction, specifically the deep seabed beyond national jurisdiction (ITLOS 2011).

International Environmental Law Principles and Antarctic Governance Regimes

Ecosystem-Based Management in the Antarctic

The parties to the Antarctic Treaty (United Nations 1961) have co-operated in the development of a comprehensive environmental protection regime that applies to the terrestrial and marine areas of the Antarctic Treaty area south of 60 degrees south latitude and, in the case of the Convention on the Conservation of Antarctic Marine Living Resources (United Nations 1980), marine areas south of the Antarctic Convergence. The 1991 Madrid Protocol was the first comprehensive environmental protection instrument

to apply to the whole of the Antarctic Treaty area, including the land mass and sea (Madrid Protocol 1991, art. 2). Although the protocol was adopted prior to the negotiation of the CBD, it does contain elements that reflect a similar integrated approach to the protection of the Antarctic environment. The interdependence of Antarctic ecosystems is recognized in article 2, which commits the parties to the comprehensive protection of the Antarctic environment and dependent and associated ecosystems. The Committee for Environmental Protection (CEP) was created under the protocol (art. 11). It provides advice to the parties on implementation of the protocol, but key decisions on environmental protection are still the province of the Antarctic Treaty Consultative Meeting (ATCM), which occurs annually (art. 12; Cordonnery 1998, 29). Parties are required to undertake regular and effective monitoring of the impact of ongoing activities on the Antarctic marine environment and dependent and associated ecosystems (Madrid Protocol 1991, art. 3(2)(d); Bastmeijer and Roura 2008, 191). They must also submit annual reports on their implementation of the protocol to the CEP (Madrid Protocol 1991, art. 17; Vidas 2000, 55). The collaborative nature of activities in the Antarctic Treaty area is emphasized in article 6 of the protocol, which requires parties

- to cooperate in programs to protect the marine environment
- to undertake joint expeditions and share facilities
- to avoid the cumulative effect of multiple human activities in any location
- to assist each other with environmental impact assessments of proposed activities. (Madrid Protocol 1991, art. 6)

The principal objective of the CAMLR Convention is to conserve and manage all marine living resources, except whales and seals, in the area south of 60 degrees south latitude and in the area between 60 degrees south latitude and the Antarctic Convergence.[1] The vast majority of this area lies beyond national jurisdiction except for offshore maritime zones adjacent to the territorial claims of some Antarctic Treaty partners on

the Antarctic continent and waters within the offshore maritime zones of some sub-Antarctic islands in the Southern Ocean claimed by Australia, France, South Africa, and the United Kingdom.[2] The Commission on the Conservation of Antarctic Marine Living Resources (CCAMLR) conservation and management responsibilities extend beyond fish species to molluscs, crustaceans, and birds found south of the Antarctic Convergence (United Nations 1980, art. 1(2)). The convention explicitly adopts a precautionary and ecosystem-based approach to the management of marine living resources, one that recognizes the complex interconnections between all parts of the Antarctic ecosystem (art. 2(3); Miller, Sabourenkov, and Ramm 2004, 319; Kaye 2001, 368). Its conservation and management objectives were ambitious portents of environmental protection principles endorsed by the international community over a decade later in the oceans chapter of Agenda 21. Article 2(3) of the convention sets out the various elements of CCAMLR's conservation and management approach, which allows for rational use of marine living resources in accordance with strict conservation principles. The three key conservation principles that apply to harvesting of marine living resources and associated activities are

a) prevention of decrease in the size of any harvested population to levels below those which ensure its stable recruitment. For this purpose, its size should not be allowed to fall below a level close to that which ensures the greatest net annual increment;

b) maintenance of the ecological relationships between harvested, dependent, and related populations of Antarctic marine living resources and the restoration of depleted populations to the levels defined in sub-paragraph (a) above; and

c) prevention of changes or minimization of the risk of changes in the marine ecosystem which are not potentially reversible over three or two decades, taking into account the state of available knowledge of the direct and indirect impact of harvesting, the effect of the introduction of alien species, the effects of associated activities on the

> marine ecosystem and of the effects of environmental changes, with the aim of making possible the sustained conservation of Antarctic marine living resources. (United Nations 1980, art. 2(3))

The CCAMLR members have adopted a variety of innovative measures to implement the convention's ecosystem-based approach to conservation. These include banning destructive fisheries practices, such as bottom trawling for particular fish species in the CCAMLR area, mandating measures to reduce incidental seabird mortality caused by baited hooks in longline fishing, monitoring the effects of fishing on non-target species by collection of data on CCAMLR member state fishing vessels, and prohibiting fishing for certain species by CCAMLR member state fishing vessels where the risk to by-catch species is thought to be too great (Miller, Sabourenkov, and Ramm 2004, 323–44).

Marine protected areas (MPAs) may also be designated by CCAMLR for the purposes of scientific study or conservation (United Nations 1980, art. 9(2)(f)(g)). CCAMLR Conservation Measure 91-04 (2011) provides a general framework for establishing CCAMLR MPAs. MPAs must be adopted based on best available scientific evidence and consistent with UNCLOS, for the achievement of the following objectives:

- The protection of representative examples of marine ecosystems, biodiversity, and habitats at an appropriate scale to maintain their viability and integrity in the long term.
- The protection of key ecosystem processes habitats and species, including populations and life history stages.
- The establishment of scientific reference areas for monitoring natural variability and long-term change or for monitoring the effects of harvesting and other human activities on marine living resources and on the ecosystems of which they form part.

- The protection of areas vulnerable to impact by human activities, including unique, rare, or highly biodiverse habitats and features.
- The protection of areas critical to the functioning of local ecosystems.
- The protection of areas to maintain resilience or the ability to adapt to the effects of climate change. (CCAMLR 2011)

As a first step in creating a network of MPAs in the CAMLR Convention area, CCAMLR established an MPA covering the South Orkney Island's southern shelf in 2009 (CCAMLR 2009). This was followed by the creation in 2016 of the world's largest MPA beyond national jurisdiction in the Ross Sea, covering a total area of 1.55 million square kilometres (CCAMLR 2016). Over the past eight years, CCAMLR has been considering other extensive proposals for MPAs in the Antarctic Treaty area, including a proposal by Australia, France, and the European Union for an MPA to protect 1.2 million square kilometres of East Antarctic waters (CCAMLR 2018, 24–27 paras. 6.17–6.28). Their proposal would allow for exploratory and research activities within the MPA if they were consistent with the maintenance of the MPA's objectives. As yet, consensus has not been reached on the designation of any of these areas (24–27 paras. 6.17–6.28).

Environmental Impact Assessment in Antarctica

Prior EIA of human activities with the potential for significant impacts on the species, habitats, and ecosystems of the Antarctic continent and the surrounding marine areas is an important component of the Antarctic governance regime. The general obligation to conduct EIA of such activities appears in a variety of global and regional instruments applicable to Antarctic marine areas, including UNCLOS, the UN Fish Stocks Agreement, and the CBD. In addition, the Madrid Protocol provides a multi-level system of EIA for activities conducted by parties in the Antarctic Treaty area. There are also detailed EIA provisions applicable to fisheries activities in the marine areas of the Antarctic in CCAMLR. The interaction of these global, regional, and sector-specific regimes, as well as their relationship to national law and policy on environmental assessment,

is complex. This section examines how overarching provisions in UNCLOS and other global instruments such as the CBD apply to EIA in Antarctica and its surrounding marine areas. The development of EIA regimes for sectoral activities such as fisheries at the global and regional level and their relevance for Antarctica will also be discussed. The evolution of more detailed EIA instruments and policies for Antarctica will be reviewed, as will regional instruments specific to particular sectors of activity or sub-regions in the poles. A detailed analysis of national approaches to EIA in Antarctica is beyond the scope of this chapter, but linkages between the global, regional, and sectoral environmental assessment regimes and national environmental assessment will be identified. The overall efficacy of EIA in the marine areas of Antarctica will be discussed from a number of perspectives: whether all sectoral activities are covered by the current mix of global, regional, and sectoral environmental assessment instruments and arrangements applicable to Antarctica; whether trans-boundary impacts of activities are adequately covered by global, regional, and sectoral environmental assessment instruments and arrangements for Antarctica; and whether activities affecting marine areas beyond national jurisdiction are covered by such regimes.

EIA in the Antarctic

The test applied for screening activities for EIA under the Madrid Protocol is more complex and multi-layered than the EIA provisions of many other international instruments. The screening process has three levels: the preliminary assessment level, the initial environmental evaluation (IEE) level, and the comprehensive environmental evaluation (CEE) level. A preliminary assessment is carried out at the national level for all activities subject to the protocol with less than a minor or transitory impact (Madrid Protocol 1991, annex 1 art. 1(1)). If an activity has no more than a minor or transitory impact, an IEE must be carried out, and if it has more than a minor or transitory impact, a CEE must be carried out (annex 1 arts. 2(1), 3(1)). All activities, both governmental and non-governmental, in the Antarctic Treaty area are subject to these provisions, except for fishing, sealing, whaling, and emergency operations (art. 8(1)).

An IEE under the Madrid Protocol must contain:

- a description of the proposed activity, including its purpose, location, duration, and intensity; and
- consideration of alternatives to the proposed activity and any impacts that the activity may have, including consideration of cumulative impacts in light of existing and known planned activities. (annex 1 art. 2(2))

Activities having more than a minor or transitory impact are subject to a more in-depth assessment in keeping with the pristine and sensitive nature of the Antarctic environment and the lack of scientific understanding of potential impacts. A CEE has a more extensive list of components, including

- a description of the proposed activity, including its purpose, location, duration, and intensity, and possible alternatives to the activity, including the alternative of not proceeding and the consequences of those alternatives;
- an estimation of the nature, extent, duration, and intensity of the likely direct impacts of the proposed activity;
- a description of the initial environmental reference state with which predicted changes are to be compared and a prediction of the future environment reference state in the absence of the proposed activity;
- a description of the methods and data used to forecast the impacts of the proposed activity;
- consideration of cumulative impacts of the proposed activity in light of existing activities and other known planned activities; and
- identification of measures, including monitoring programs that could be taken to minimize or mitigate impacts of the proposed activity and to detect unforeseen impacts and that

could provide early warning of any adverse effects of the activity. (annex 1 art. 3(2))

In undertaking environmental assessment of activities in the Antarctic Treaty area, the Antarctic Treaty Consultative Meeting has prescribed that particular values, identified in article 3(1) of the Madrid Protocol, be taken into account. These include

> 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. (Secretariat of the Antarctic Treaty 1996, 26 para. 135)

Post-project monitoring is a discretionary component under the provisions relating to IEE but is a compulsory component under the provisions relating to CEE of activities having more than a minor or transitory impact on the environment. Article 5 of annex 1 to the Madrid Protocol provides that

> Procedures shall be put in place, including appropriate monitoring of key environmental indicators, to assess and verify the impact of any activity that proceeds following the completion of a CEE.
>
> The procedures referred to in paragraph 1 above . . . shall be designed to provide a regular and verifiable record of the impacts of the activity in order to:
>
> d) enable assessments to be made of the extent to which such impacts are consistent with the protocol; and
>
> e) provide information useful for minimizing or mitigating impacts, and where appropriate, information on the

need for suspension, cancellation, or modification of the activity.

Any significant information obtained, or procedures put in place, as a result of monitoring must be circulated to parties to the Madrid Protocol, forwarded to the CEP and made publicly available. The responsibility for monitoring under these provisions, however, still falls on parties individually with no prescribed enforcement or auditing role for the CEP or the ATCM. The Antarctic Treaty parties have agreed on a range of supplementary guidelines that assist them in implementing the Madrid Protocol, including non-binding guidelines on EIA (Secretariat of the Antarctic Treaty, n.d.). These guidelines elaborate EIA requirements under the protocol specifying the physical, chemical, and biological elements that need to be taken into account in conducting an EIA, the environmental baseline information to be gathered, the direct and cumulative impacts of the proposed activity to be evaluated, the potential alternatives that need to be considered, monitoring programs, mitigation and remediation measures, and the gaps in knowledge to be identified (Secretariat of the Antarctic Treaty, n.d.). The guidelines also provide practical information on the content and format of an environmental impact statement.

In addition to the Madrid Protocol, some environmental assessment of fisheries impacts on Antarctic marine areas takes place under the CCAMLR regime. An important aspect of the implementation of the CCAMLR conservation objectives has been the assessment of new fisheries to be undertaken in the convention area, such as those for Patagonian toothfish (Constable et al. 2000, 785–6). Preliminary assessment of new fisheries allows the Scientific Committee of CCAMLR to introduce measures that satisfy the conservation objectives of CCAMLR while permitting reasonable levels of fishing (786). This involves the submission of information to the Scientific Committee on the state of fish stocks in the areas proposed to be fished and subsequent survey activities before fishing is allowed to proceed. Measures for new fisheries have included catch limits to avoid over-exploitation of localized stocks and ongoing surveys of recruitment and growth of stocks in newly fished areas (786).

Notwithstanding the integrated nature of the EIA regime contained in the Madrid Protocol, there are some significant deficiencies in its coverage

of current and potential activities in the marine areas of the Antarctic. In the two decades since its entry into force, there have been no CEEs of activities in the marine areas of the Antarctic Treaty area (Secretariat of the Antarctic Treaty 2021; Hemmings and Kriwoken 2010, 194–95). As the number of cruising and other vessels traversing these areas has increased significantly over this period, this would appear to be a significant omission in the protocol's coverage. Hemmings and Kriwoken have also expressed concern that no activities subject to CEEs have been substantially modified or prevented from proceeding despite the potential for serious adverse impacts on the sensitive Antarctic environment (2010, 187).

Conclusion

This chapter has reviewed the development of four interrelated international environmental law principles or approaches that have become embedded in global environmental practice and management over the past four decades, and examples of implementation in the Antarctic and its surrounding marine areas. The principle of sustainable development draws together the twin goals of environmental protection and economic development and aspires to create a balance between the two. The related approach of ecosystem-based management recognizes the links and interactions between species and their habitats and the need to conserve and manage the various components of natural environments in a more integrated manner. The precautionary principle emphasizes the need for a risk-based approach to certain activities where the threats to the natural environment and human health are as yet uncertain. The established process of EIA is fundamental to implementing all three of these principles or approaches. Environmental protection is a central feature of the Antarctic governance regime, and the four principles and approaches discussed in this chapter are integral to the environmental objectives of key instruments within the ATS, particularly the Madrid Protocol and CCAMLR. The protection of the Antarctic environment has been a prominent feature in the evolution of the ATS. It has developed in a more integrated way owing to the existence of a treaty system that considers the whole of the Antarctic region, and which is empowered to introduce conservation and management measures on a more holistic basis. While slow to emerge in a consensus-based, decision-making regime, the implementation of the

ecosystem-based management approach in the conservation and management of the Antarctic's marine living resources is now becoming evident in measures such as the designation of the Ross Sea Marine Protected Area. With the threats posed by climate change, the associated impacts of ocean acidification, and increased human activities in Antarctica, the ongoing implementation of international environmental law principles and approaches will continue to be challenging in this remote but critical region.

NOTES

1 The Antarctic Convergence is also known as the Antarctic Polar Front and is situated at about 50 degrees south latitude, where the colder, fresher waters flowing north from the Antarctic meet the warmer, saltier waters flowing south from the Atlantic and Pacific Oceans. Whales and seals are covered by the 1946 International Convention for the Regulation of Whaling and the 1972 Convention for the Conservation of Antarctic Seals (United Nations 1980, art. 1(1)).

2 These islands include Heard and McDonald Islands belonging to Australia, Kerguelen and Crozet Islands belonging to France, Prince Edward and Marion Islands belonging to South Africa, and South Sandwich Islands and Shag Rocks belonging to the United Kingdom. These islands have been exempted from the application of CCAMLR (Rayfuse 2000, 261).

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