

## SUSTAINABILITY IN INTERNATIONAL LAW

S. Wood, *Osgoode Hall Law School, York University, Canada*

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### Summary

The idea of "sustainability" has been expressed in three relatively distinct ways in modern international law.

1. *Sustainability as Optimal Living Resource Exploitation.* Until around 1970 sustainability had a narrow connotation in international law as a technical objective for fisheries management. In this sense, sustainability means ensuring maximum harvests year after year by exploiting a resource as heavily as possible without exceeding its biological regenerative capacity (*i.e.*, obtaining the *maximum sustainable yield* (MSY)). Although subject to controversy, particularly regarding the role of social and economic considerations in determining harvest levels, MSY has been the predominant management objective of international fisheries agreements since the mid twentieth century.

2. *Sustainability as Respect for Ecological Limits.* Around 1970 sustainability came to be associated in international law with the broader idea that Earth's ecological systems impose inherent limits upon human activity and economic growth that must be respected if human society is to persist and flourish. Sustainability in this sense typically involves the propositions that human society and ecological systems are fundamentally interconnected; that ecological systems impose inherent and unavoidable limits on human activity; that historical and current patterns of economic development flout these ecological limits; and that human activity must be brought into line with ecological limits if human societies are to survive and flourish. This vision of sustainability is reflected in numerous

international declarations such as the 1972 Stockholm Declaration and the 1982 World Charter for Nature, and in emerging international law principles such as the ecosystem approach. It is, however, highly controversial and has never achieved the prominence or widespread endorsement enjoyed by the other two themes of sustainability in international law.

3. *Sustainability as Sustainable Development.* The theme of sustainable development entered the mainstream of international law in the 1980s and has dominated thinking about sustainability in international law since at least the 1992 Earth Summit. It has brought environmental concerns into the political and legal mainstream to an unprecedented degree. It has pervaded all fields of international law and diplomacy. It has been endorsed in hundreds of international treaties and declarations and by international institutions ranging from the World Bank to the UN Commission for Sustainable Development. Nonetheless it is controversial and ill-defined. It represents a compromise between the industrial democracies of the "North" and the developing countries of the "South," and between the advocates of environmental protection and economic growth everywhere. While its meaning is highly contested, sustainable development represents a subtle shift from the idea of respecting unavoidable *limits*, found in earlier formulations of sustainability, to one of *balancing* a set of environmental, social and economic priorities each of which has an equal claim to validity. Faced with the tensions and ambiguity in the concept, international lawyers have attempted to flesh out its meaning by turning to numerous co-evolving principles of international law such as the precautionary principle, the polluter pays principle, and so on. Whether these efforts will succeed in resolving the debates surrounding the idea of sustainable development remains to be seen.

At the opening of the twenty-first century these three visions of sustainability face formidable obstacles. The majority of marine and freshwater fish stocks are being harvested at or beyond levels that can be sustained biologically and numerous major fisheries have collapsed. The idea of respect for ecological limits is as controversial today as it was in the 1970s. The bright promise of sustainable development has been replaced with disillusionment and frustration as governments face the realization that the world is probably farther from the goal of sustainable development than it was in 1992 at Rio. Nonetheless the idea of sustainable development probably represents one of the twentieth century's enduring legacies to future generations. The task in the coming years will be to ensure that it is a positive legacy.

## 1. Introduction

### 1.1 Overview of the Subject

This Article examines the concept of sustainability in international law. Sustainability has emerged as one of the defining preoccupations of human affairs at the opening of the twenty-first century. It has proven to be simultaneously as alluring and as challenging to international lawyers as it has to scientists, politicians, businesspeople and others. It provides a powerful symbol around which diverse interests can converge, but at the same time it eludes concrete definition, encompasses conflicting agendas and promises to generate continuing debate and controversy.

There is a tendency today to associate sustainability almost exclusively with the idea of sustainable development. This is understandable, given the heavy emphasis on sustainable development since the

1992 United Nations Conference on Environment and Development (UNCED, also known as the Earth Summit). Nonetheless the idea of sustainability has had a varied history in modern international law. The current vogue for the term "sustainable development" tends to gloss over the tensions and transformations in modern international law's treatment of sustainability.

It is possible to identify at least three closely related but fairly distinct senses in which "sustainability" has been understood and pursued in modern international law. Although the idea of sustainable development dominates thinking about sustainability in international law at the opening of the twenty-first century, the other versions of sustainability were prominent in earlier periods and are still influential in certain areas of international law. All three coexist in contemporary international law, interacting and overlapping with the others but representing three relatively distinct currents of thought. The three approaches to sustainability discussed in this Article are:

1. *Sustainability as Optimal Living Resource Exploitation;*
2. *Sustainability as Respect for Ecological Limits;* and
3. *Sustainability as Sustainable Development.*

The first theme, sustainability as optimal resource exploitation, supplied the dominant idea of sustainability in international law throughout most of the twentieth century (see Section 3). From the early twentieth century until around 1970, sustainability had a narrow connotation in international law as a technical objective for the management of fisheries and certain other renewable natural resources. Used in this sense, sustainability refers to the goal of ensuring maximum harvests on an ongoing basis by exploiting a resource as heavily as possible without exceeding its biological regenerative capacity. This idea is most often expressed as obtaining the *maximum sustainable yield* (MSY) from living resources. (See "*Natural Resource Perspectives on Sustainability*," EOLSS online, 2002) Although subject to controversy, particularly regarding the role of social and economic considerations in determining harvest levels, MSY has been the predominant management objective of international fisheries agreements since the mid twentieth century. It is found in many prominent international treaties concerning marine living resources.

Starting around 1970, sustainability came to be associated in international law with broader concerns about human-nature interaction, and in particular with the idea that the Earth's ecological systems impose inherent limits upon human activity and economic growth that must be respected if human society is to persist and flourish (see section 4). At this time the second theme of sustainability, respect for ecological limits, emerged into the mainstream of international law. Sustainability in this sense typically involves several closely related propositions: that human society and ecological systems are fundamentally interconnected; that ecological systems impose inherent and unavoidable limits on human activity; that historical and current patterns of economic development flout these ecological limits; and that human activity must be brought into line with ecological limits if human societies are to survive and flourish. This vision of sustainability was propelled onto the main stage of international law by the United Nations Conference on the Human Environment in Stockholm in 1972. It was and remains highly controversial, particularly among representatives of developing countries who view the idea of "limits to growth" as a "Northern" concern that could be used to limit their ability to pursue their own development paths. The idea of sustainability as respect for ecological limits is found in the numerous "soft," non-binding international declarations and action plans and in emerging principles of customary international law such as the ecosystem approach, but

has not achieved the prominence of the other two themes of sustainability in international law.

The 1980s saw the ascendancy of a new idea in international law, sustainable development (see Section 5). The theme of sustainability as sustainable development entered the mainstream of international law around the time of the World Commission on Environment and Development (WCED, or the Brundtland Commission) and has dominated thinking about sustainability in international law since at least UNCED in 1992. It has pervaded all fields of international law and diplomacy and has been incorporated as a goal or guiding principle in hundreds of international treaties and declarations. Sustainable development is often described in general terms as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It is a controversial and notoriously ill-defined principle in international law. It represents an historic compromise between environment and development: not simply a compromise between the affluent industrial democracies of the global "North" and the developing countries of the global "South," but also a compromise between advocates of environmental protection and proponents of economic growth and market liberalization everywhere.

The sustainable development compromise proved attractive to governments, environmental groups and industry in developed and developing countries alike. It brought environmental concerns into the political and legal mainstream to an unprecedented degree. By calling for the integration of environmental concerns into all areas of decision making, sustainable development heralded the emergence of environmental protection as a central concern of the international legal system as a whole rather than a narrow issue consigned to a specialized subfield. At the same time, this historic compromise allowed governments and industry to embrace the goal of environmental protection without necessarily accepting any fundamental challenge to the institutions of industrial society or the desirability of sustained economic growth. Sustainable development differs from earlier formulations of sustainability in that it shifts from a rhetoric of respecting biological or ecological *limits* to one of *balancing* a set of environmental, social and economic priorities each of which has an equal claim to validity. In some cases, in fact, the need for poverty alleviation or sustained economic growth is seen as a limit on the pursuit of environmental protection.

In recent years international lawyers and diplomats have expended a great deal of energy attempting to give concrete meaning and specific institutional expression to the idea of sustainable development by establishing international bodies and programs devoted to sustainable development, concluding treaties that address particular aspects of sustainable development and fleshing out numerous principles of international law often associated with sustainable development, such as the precautionary principle, the polluter pays principle, and so on. Whether these efforts can resolve the tensions and debates surrounding the idea of sustainable development remains to be seen.

By way of conclusion, Section 6 looks to the future of sustainability in international law. The remainder of this Introduction describes the scope of the Article (Section 1.2) and provides a brief introduction to international law for readers who are not familiar with the field (Section 1.3).

## **1.2 Scope of the Article**

This Article provides an overview of the major ways in which the idea of sustainability has been developed and used in modern international law as a normative principle to govern activities

affecting the environment and development. Readers should keep in mind two important limitations on the scope of the Article.

First, it considers only *international* law, as represented by such things as treaties, customary international law rules, decisions of international tribunals, and statements of international organizations and conferences. Domestic laws are excluded from the scope of the Article.

Second, it emphasizes *multilateral* legal arrangements. Bilateral legal arrangements are excluded unless they have had an important influence on multilateral legal relations, because the number of bilateral treaties and other arrangements is too great to deal with adequately in this short space. In addition, due to space constraints this Article does not attempt to examine European Community law in any detail, although this represents a very important regional legal system.

### **1.3 What is International Law?**

International law is typically defined as the legal principles and rules binding on members of the international community in their relations with each other. It establishes a framework within which the members of the international community may cooperate, establish norms of behavior, and resolve their differences. This definition of international law raises two questions: (1) which rules and principles count as "law" in the international system, and (2) who are the "members of the international community"? The standard answers to these two questions are, briefly, that (1) only those obligations arising from a very short list of recognized "sources" of international law count as "law", and (2) the "international community" is made up of nation-states. International lawyers widely acknowledge that both of these standard answers are inadequate and unrealistic in today's world.

#### **1.3.1 What Counts as "Law"?**

The question of what counts as international "law" (*i.e.*, which norms are "legally binding") begs the thorny issue of how or why international law is binding in the first place, especially in the absence of an international sovereign with authority to enforce commands. International lawyers have typically supplied two principal answers to this question. According to *legal positivist* theories, international law is binding by virtue of states' consent to be bound by it. In this view the binding force of international law is supplied by states' expressed consent to treaties or implied consent to international customs. This view attempts to anchor international law in the concrete realities of international politics. According to theories in a *natural law* tradition, on the other hand, international law is binding because it embodies universally valid principles of justice or follows from the very nature of international society. In this view, certain basic rules such as fundamental human rights, prohibitions against genocide and torture, and the sovereign equality and independence of states may be binding regardless of whether particular states have consented to them. This view attempts to anchor international law in the utopian ideal of an international society.

Both these arguments coexist in international law, although modern international law tends to give priority to the first (that states are bound only by obligations to which they have consented). As a result, in any given situation international lawyers and diplomats may justify or oppose a rule or principle by reference either to the hard realities of state consent or the universal ideals of

international community. This tension has never been and probably never will be fully resolved in international law. Indeed, it is arguably a source of flexibility and resilience, helping international law to adapt and persist.

In fact most international lawyers tend to worry less about how or why international law is binding than about the need get on with what they see as the pressing practical job of building and improving agreements, rules and institutions to facilitate international cooperation and foster human progress. Modern international law therefore by and large sidesteps or assumes away the thorny issue of what makes it binding, instead simply identifying a list of recognized "sources" of law that can be used to determine the applicable international law in particular circumstances. The 1946 Statute of the International Court of Justice (ICJ), which is generally recognized as authoritative in this regard, lists three sources of international law: international treaties, international custom, and "general principles of law recognized by civilized nations." The decisions of courts and tribunals (such as the ICJ, national courts, war crimes tribunals, trade dispute settlement panels and so on) and writings of eminent scholars may be used as subsidiary means to determine whether a rule or principle falls into one of these three categories, but they do not count as independent "sources" of law themselves.

It will be useful to consider each of the three sources briefly in turn. *Treaties* (also often called conventions, agreements, covenants, pacts, protocols, etc.), like contracts between private parties, are express written agreements that states conclude with each other with the intent to be bound by their agreement. They may be bilateral or multilateral, regional or global, and may create binding obligations on just about any subject. Examples include the United Nations Charter, the Convention on Biological Diversity and the Kyoto Protocol on climate change. Treaties are negotiated by diplomats, often through lengthy international conferences, and come into force only when formally ratified by the states that are party to them. Most multilateral treaties specify the number of ratifications needed to bring them into force.

*Custom* consists of those generally accepted customary rules that states observe consistently out of a sense of legal obligation. It has two components: state practice, which must be extensive and consistent; and *opinio juris*, i.e., the fact that the practice follows from a sense of legal obligation rather than political expediency. Once a custom is established, it is binding on all states regardless of whether they participated in its creation. A customary rule is not, however, binding on a state that has persistently objected to it. Because each state has the capability to opt out of customary law by persistent objection, states that do not object are usually taken to have given their implied consent to the rule. Since custom need not be in written form its content can be highly controversial, especially as practices and ideas change. Thus the existence and content of some customs are widely agreed (such as states' obligation not to cause transboundary environmental harm or their exclusive jurisdiction over the sea and its resources out to 200 nautical miles), while others are vague and contested (such as the precautionary principle). Some customary rules, such as prohibitions against genocide and aggression and perhaps certain environmental obligations, may be so basic that no state may opt out of them no matter how much it may object, although the identity and content of such *peremptory norms* in the environmental area are highly contested.

*General principles of law recognized by civilized nations* make up a debated and unsettled source of international law that is used to fill some of the gaps left by treaties and custom. They may include legal rules accepted as valid in all "civilized" states, procedural or evidentiary rules of domestic law

applicable to ordinary private disputes that may be applied by analogy to interstate relations, and general "natural law" principles of justice or equity. Some writers have suggested that sustainable development, for instance, may be a general principle of law, and the International Court of Justice has indicated some willingness to treat it as such; but the legal status and content of the principle are far from clear.

In theory, if a rule or principle falls within one of these three enumerated "sources" it counts as international law; otherwise it does not. In practice, this list of sources of law is almost universally recognized as inadequate to reflect the realities of contemporary international law because it fails to recognize as "law" a wide range of pronouncements, principles and arrangements that play important roles in contemporary international affairs, including:

1. Declarations and resolutions of international conferences such as the 1992 Rio Declaration;
2. Resolutions, decisions, guidelines and other statements issued by international organizations such as the United Nations General Assembly, the United Nations Environment Programme (UNEP) or the World Bank, and
3. Statements and reports of non-governmental organizations (NGOs) such as the World Conservation Union (IUCN) or the World Business Council for Sustainable Development (WBCSD).

Many such instruments are known as "*soft law*" because they do not qualify formally as sources of international law, yet they are recognized as having significant normative weight in international affairs. Practitioners and commentators in fields such as environmental protection, human rights and sustainable development regularly ignore the traditional categories of international law, relying heavily on informal sources such as conference declarations, action plans, expert reports, and statements of NGOs as authority for legal principles and rules. As a result these fields blur the lines of what counts as international law.

### 1.3.2 Who Are the "Members of the International Community"?

The next question is who counts as a member of the international community—who are the creators and subjects of international law? Again, the traditional answer is straightforward: the international community is made up exclusively of nation states. Only states may make or employ international law or be subject to its obligations. This begs the question, what counts as a state? According to international law, a state must possess a permanent population, a defined territory, an independent and effective government and the capacity to enter into relations with other states. There is often doubt as to what these criteria mean in practice, especially the requirement of an effective and independent government. For example, at what point does a conflict-ridden political subdivision of a disintegrating state become its own state? Moreover, attainment of the criteria of statehood is not by itself sufficient for admission to membership in the community of states. In addition, a prospective state must be recognized as such by other states. There is no central organ with authority to determine these issues. Rather, individual states decide for themselves whether to maintain full international relations with the claimant entity. An entity may exhibit all the indicia of statehood, but it will only be treated as a state in international law to the extent that an adequate but undefined number of states recognize it as such.

Some inroads have been made into this statist conception of international law since the Second World

War, first with the recognition that international organizations have legal "personality" (*i.e.*, standing to bring claims and assume rights and obligations in international law), second with the recognition of individuals as holders of human rights in international law, and more recently with the recognition of the rights of corporations and other investors to pursue international claims against states under some free trade agreements. Nonetheless the statist view continues to predominate: only states may be members of the United Nations, enter into international treaties or bring disputes before the International Court of Justice. In most cases, individuals or firms that have been harmed by a foreign government's conduct must convince their home state to bring an international law claim on their behalf.

Again, this traditional approach is widely acknowledged by international lawyers as inadequate to reflect the current realities of international affairs. It excludes from the development and application of international law a range of actors who either play active roles in setting international agendas and negotiating or implementing international agreements, or have a direct stake in such arrangements and the practices they seek to regulate. For example, this traditional view tends to treat individuals, minority groups and indigenous peoples as potential victims of government misconduct rather than autonomous actors in international affairs. Moreover, it tends to overlook the role played by international organizations and non-state actors such as transnational corporations (TNCs) and NGOs in shaping international law, the quality of life and the condition of the environment. In recent years, for example, multilateral conferences and intergovernmental organizations have been progressively opened to participation by civil society organizations and other NGOs. The new relationship with NGOs is exemplified by the 1992 Rio Earth Summit, where representatives of more than 1400 NGOs participated in and had a major impact on the negotiations. (See "Introduction to Sustainable Development" in *An Insight into the Encyclopedia of Life Support Systems*, 2002)

As with the question of the "sources" of law, the lines defining membership in the international community are blurred, particularly in the areas of development, human rights, international trade and environmental protection. Some international agreements governing foreign investment or human rights give private parties standing to challenge the actions of foreign governments directly in international fora. Many international legal scholars and practitioners call for recognition of actors other than states as legitimate participants in the making and implementation of international law, or acknowledge such participation in practice without much concern for the formalities of international law. The result is that contemporary international law is a complex hybrid of "soft" and "hard" law created and applied through the activities of a variety of actors in addition to states. The traditional rules restricting the sources of international law and members of the international community continue to exist, yet they are widely recognized as anachronisms which are, at best, minor inconveniences to pragmatic law-making, or at worst serious obstacles to the development of a progressive international legal system.

## **2. Origins of Sustainability in International Law**

International law's current definition of sustainability as "sustainable development" is most often traced to the 1987 Brundtland Report of the WCED. As is often the case with new ideas, many proponents of sustainability seek to bolster the concept by giving it a longer pedigree. This tendency is particularly pronounced in the legal profession, where precedent and tradition are major sources of

the legitimacy of rules and standards. Some legal writers thus trace the idea of sustainability to legal systems of earlier centuries or even antiquity. Possibly the most ambitious attempt to establish such a pedigree in an international legal document is the opinion of Judge Weeramantry, Vice-President of the ICJ, in the *Gabcikovo-Nagymaros Dam* case (*Hungary v. Slovakia*) (1997). In that case Slovakia brought a claim before the ICJ against Hungary for failing to uphold its end of a treaty to build an international hydroelectric project. Hungary defended its abandonment of the project on the basis of "ecological necessity," claiming that the project would cause irreparable environmental harm. While the Court acknowledged that ecological necessity could be an excuse for a breach of treaty, it found that Hungary had not established such necessity. In his separate concurring opinion, Judge Weeramantry traced the idea of sustainability to the legal systems of ancient irrigation-based civilizations including those of Sri Lanka, sub-Saharan Africa, Iran, China, and the Inca Empire. He argued that sustainable development, far from being a recent innovation, is "one of the most ancient ideas in the human heritage" and has been consciously practiced in various legal systems throughout millennia.

Most legal scholars make more modest claims about the origins of sustainability in international law, however. As discussed in the next Section, the most widely accepted claims locate the origins of modern international legal conceptions of sustainability in disputes over fisheries and seals around the turn of the twentieth century. Most prominently, the decimation of the Bering Sea fur seals in the late 1800s gave rise to the first, and possibly most successful, formal international treaty dedicated primarily to the conservation of a marine living resource. In the decades that followed, sustainability began to appear as an express goal of many international conventions relating to exploitation of marine living resources such as fisheries, seals and whales.

Whether the idea of sustainability in international law originated in the early twentieth century, in antiquity, or at some other time, is not particularly important for this Article. What is significant is the tendency of international legal experts to seek a pedigree for the idea of sustainability—a foundation lending the authority of precedent and providing a starting-point for the progressive unfolding and refinement of a bold new legal principle.

### **3. Sustainability as Optimal Exploitation of Living Resources**

#### **3.1 Introduction**

For centuries most Europeans assumed that the living resources of the high seas were inexhaustible, unlike those of the land or inland waters, which could be depleted. The assumption of the inexhaustibility of the sea was reflected in the legal doctrine of freedom of fishing on the high seas, according to which the nationals of all states have an equal and unfettered right to fish in waters beyond the narrow coastal strip known as the territorial sea. This doctrine remains a central pillar of international fisheries law, although it has been qualified significantly in recent years, on one hand by the extension of exclusive coastal state jurisdiction to 200 nautical miles in the 1970s and on the other hand by recognition of the need for conservation of marine living resources of the remaining high seas areas.

It was not until the late nineteenth century, with the development of intensive modern fishing

techniques, that governments and international lawyers began to appreciate seriously the threat of exhausting the living resources of the high seas. By the end of the century, intensive sealing had devastated the fur seal populations in the South Atlantic and North Pacific oceans and the advent of steam trawling had led to rapid decline of the traditionally rich fisheries of the North Sea. These crises led to the first efforts at international cooperation to ensure the survival and continued exploitation of valuable marine living resources.

After heavy sealing had wiped out fur seal populations in the south Atlantic, large fleets of schooners from several countries began to devastate the fur seals of the North Pacific in the second half of the nineteenth century. The United States, alarmed by the precipitous decline of seal herds frequenting island rookeries in Alaska, began to assert exclusive control over the fur seal fisheries of the Bering Sea, seizing a number of Canadian sealing vessels on the high seas and prompting an international crisis.

In 1892, USA and Britain (on behalf of Canada) agreed to submit their dispute to international arbitration. The tribunal, rejecting the American claim of exclusive authority outside its three-mile territorial sea, emphasized the need for joint conservation efforts by both parties and devised a detailed conservation scheme for American and Canadian sealing in the Bering Sea. Disputes continued until 1911, however, when Great Britain, the USA, Russia and Japan concluded a groundbreaking treaty for joint regulation of the Bering Sea fur seals (the North Pacific Fur Seal Convention of 1911). This treaty was the first international agreement aimed primarily at joint conservation of a marine living resource and is widely hailed as the most successful such arrangement. The Convention prohibited all pelagic (open-sea) sealing in a vast area of the North Pacific Ocean, restricting exploitation to land-based sealing on the herds' island rookeries. Under this Convention and its successors, the North Pacific fur seal populations rebounded rapidly and were protected from exploitation on the high seas for more than seventy years.

The North Pacific Fur Seal Convention made no express reference to "sustainability," but it can fairly be viewed as an influential early attempt at sustainable utilization of a natural resource. In the decades that followed, international agreements relating to ocean resources, particularly those involving USA or Canada, began to refer expressly to sustainability as a goal for marine living resource management. For example, the International Pacific Halibut Commission, established by Canada and USA in 1923 and continued by conventions in 1930, 1937 and 1953, pursued the goal of ensuring the maximum sustained productivity of the high seas halibut fishery.

Although expressed in different ways, these early references to sustainability were interpreted fairly consistently as calling for management of a fishery so as to obtain the maximum catches that could be sustained biologically year after year. This biological objective was championed most forcefully by USA and Canada and soon came to dominate fisheries management around the world. As a result, by the middle part of the century, "sustainability" was firmly established in the lexicon of international fisheries law, with a fairly specific and widely understood meaning: the goal of maximizing sustainable harvests from a fishery.

### **3.2 Sustainability as Maximum Sustainable Yield (MSY)**

This biological objective of maximizing sustainable catches is most often expressed, in technical

terms, by the concept of *maximum sustainable yield*, or MSY. MSY was not invented by diplomats and lawyers; rather, it was borrowed from fisheries biology. Put simply, the MSY is the largest harvest level that can be sustained perpetually in a given fishery. According to a standard (yet admittedly oversimplified) biological model (see Figure 1), there is a predictable average relationship between the size of a fish population (or "stock") and its rate of growth. Over a certain range of population sizes (between points  $S - S_{msy}$  in Fig. 1), the rate of growth increases as the population increases. After the population reaches a certain size, however, the growth rate levels off and thereafter begins to decrease as the stock size increases, so that (in the absence external pressures) the population eventually increases to an equilibrium ( $S'$ ) where population growth is zero. At the other extreme, if the stock decreases below its minimum viable population level ( $S$ ) it will continue to decline to extinction.

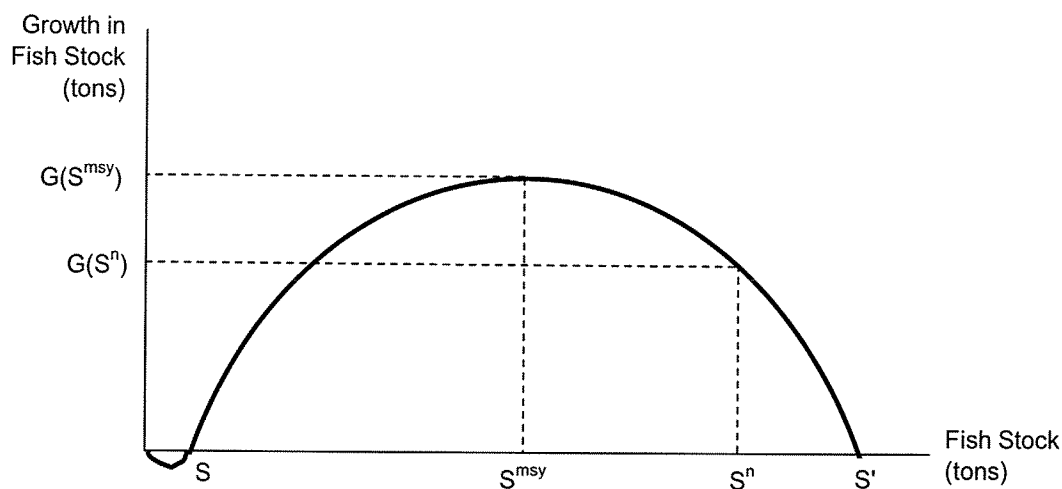


Figure 1. Fish Growth-Population Relationship and Maximum Sustainable Yield

After Tietenberg T. (1996) *Environmental and Natural Resource Economics*, 4th ed., 614 pp. New York: HarperCollins. At pp. 272-74.

For any population size ( $S_n$ ) along this stock-growth curve, there is a corresponding *sustainable yield*, which occurs when the harvest is equal to the growth rate ( $G(S_n)$ ) of the population. This level of harvest can theoretically be maintained forever, because only the growth in population will be consumed and the total population, and growth rate, will remain constant. The *maximum sustainable yield* (MSY) occurs at an intermediate population level ( $S_{msy}$ ), where the stock's growth rate ( $G(S_{msy})$ ) is highest. MSY represents the catch level that is equal to the maximum growth rate of the population. It represents the maximum harvest level that can be sustained year after year without exceeding the biological regenerative capacity of the harvested population. It is important to note that MSY is a strictly biological concept. Economic or social conditions affecting the fishery are irrelevant to determination of MSY. (See "*Natural Resource Perspectives on Sustainability*," EOLSS on-line, 2002).

### 3.3 The MSY Era in International Law

#### 3.3.1 MSY's Rise to Prominence

Although the objectives of fisheries management have always been the subject of serious controversy among scientists, fishermen and policymakers, the biological objective of maximizing the sustainable yield was incorporated as the stated objective of most international fisheries organizations established in the post-World War II period. It remained the predominant conservation and management objective of international fisheries arrangements through the 1970s, although it was frequently ignored in decision-making and seldom achieved in practice.

The decades after World War II saw the establishment of a wave of regional and global organizations for conservation and management of fisheries and marine mammals. In almost all cases, these bodies were established in response to evidence of overexploitation of the resources to which they related as fishing techniques became more efficient and fishing effort intensified. Most of the treaties establishing these bodies adopted a biological sustainability objective for the management of the resource in question. The stated objective of the treaties establishing the International Commission for the Northwest Atlantic Fisheries (ICNAF) (1949), the Inter-American Tropical Tuna Commission (1949) and the International Commission for the Conservation of Atlantic Tunas (1966), for instance, was to maintain fish stocks at levels that would permit the "maximum sustained catch" year after year. Other agreements, such as those for the Northeast (1952) and Northwest (1956) Pacific high seas fisheries and the Canada-U.S. Great Lakes fisheries (1954), had as their objective the "maximum sustained productivity" of the fisheries in question. Yet other agreements, such as the 1953 Canada-U.S. Pacific Halibut Convention, were aimed at developing and maintaining fish stocks at levels that would permit the "maximum sustained yield."

All these terms were typically understood to refer to the biological objective of MSY. This objective was summarized succinctly in relation to seals in the 1957 Interim Convention on the Conservation of the North Pacific Fur Seals (a successor to the original 1911 North Pacific Fur Seal Convention): to "make possible the maximum sustainable productivity of the fur seal resources so that the fur seal population can be brought to and maintained at the levels which will provide the greatest harvest year by year" (Article 2(1)(a)).

The global preeminence of MSY was confirmed at the 1958 Geneva Conference on the Law of the Sea. The Conference adopted the Convention on Fishing and Conservation of the Living Resources of the High Seas (1958) which, while not widely ratified, was important to the meaning of sustainability in international law for two reasons. First, the Convention confirmed, more or less uncritically, a biological objective for marine living resource management. It declared that the principal objective of conservation of the living resources of the high seas was to achieve the "optimum sustainable yield from those resources so as to secure a maximum supply of food and other marine products" (Article 2). According to contemporaneous reports, the term "optimum sustainable yield" was used interchangeably with "maximum sustainable yield" in the preparatory work for the Conference, and the terms were generally considered synonymous.

Secondly, the Convention reaffirmed the traditional legal doctrine of freedom of fishing on the high seas, but explicitly subjected it to a duty to conserve marine living resources (Article 2). This duty of conservation is now widely considered to be part of customary international law, binding on all states regardless of whether they are parties to the 1958 Convention.

The major exception to the trend to adopt an MSY objective for marine living resources in the post-war era was the International Whaling Commission (IWC), a global organization established in 1946 which later became the center of a huge controversy over whale harvesting. The 1946 International Convention for the Regulation of Whaling authorized the IWC to make regulations that "provide for the conservation, development and optimum utilization of the whale resources" (Article 5(2)). From the beginning, IWC members did not interpret "optimum utilization" as requiring management for maximum sustainable yield, but as permitting consideration of a range of economic, social and other objectives. Some IWC member governments and scientific advisors urged setting catch limits at levels capable of restoring overexploited whale stocks to MSY levels. The IWC sometimes paid lip service to this objective but more often ignored it, frequently setting catch limits far above MSY levels and eventually going to the other extreme in 1982 when, under the pressure of the U.S.-led anti-whaling lobby, it adopted a worldwide ban on commercial whaling which took effect in 1985-86.

### 3.3.2 Early Results and Controversies

Although the objective of MSY dominated international marine living resource management from mid-century onward, its widespread espousal did not prevent the continued decline of many heavily exploited fish stocks. This was mainly because governments were unwilling to confer on international fisheries commissions the authority and resources they needed to perform their functions and many fishing nations were unwilling or unable to make their fishing fleets observe international conservation and management rules. Many fishing nations were systematically promoting the expansion of their fishing capacity during this period. Similarly, the 1958 High Seas Fishing Convention turned out to be largely irrelevant to the most pressing international fisheries problems because it failed to resolve either how to avoid overexploitation of open-access high seas fisheries or how to allocate the benefits of fishing among nations. These perceived failures of international cooperation led ultimately to the widespread unilateral expansion of coastal state fisheries jurisdiction in the 1970s.

In addition, the pursuit of MSY generated substantial controversy in this period, particularly concerning the appropriateness of MSY as a management objective. First, many fisheries scientists criticized managing for the MSY as biologically unsound because the abundance, productivity and possible yields of a fish stock fluctuate constantly in response to natural forces, events affecting other related fish stocks and fishing patterns. As a result there is no single, constant value for MSY. While it may be possible to determine an average MSY over time, this does not necessarily reflect the actual stock abundance at any given time and may lead to massive over- or under-exploitation. Moreover, calculation of MSY is uncertain at the best of times due to incomplete understanding of marine ecosystem dynamics and the difficulty of obtaining reliable data about stock conditions.

A second debate over the appropriateness of MSY as a management objective concerned the role of economic and social considerations in international fisheries management. MSY is a purely biological objective, but governments are often more concerned with the economic and social conditions of the fishery than with ensuring the maximum supply of fish products. Economists pointed out very early that the biological optimum for the fishery (MSY) is not the same as the economic optimum because the MSY does not maximize the net benefits of the fishery. It provides for the maximum physical output, but does not take into account the cost of fishing. Typically, the economically efficient level of fishing effort (the level at which net benefits of the fishery are

maximized) is lower than that associated with the MSY. Making the extra effort to catch the MSY often means lower catches per unit effort, smaller or lower quality fish, and lower net benefits for fishermen. This is not always the case, however: if fishermen discount the value of future catches sufficiently (which economic theory predicts they will do in open-access fisheries, where fishermen place little or no value on fish left in the ocean for others to catch), the economically efficient effort level may exceed the MSY and may, in extreme cases, result in collapse of the fish stock (see Figure 2). There has thus been a tension between biological management objectives and socio-economic priorities since the early days of modern fisheries.

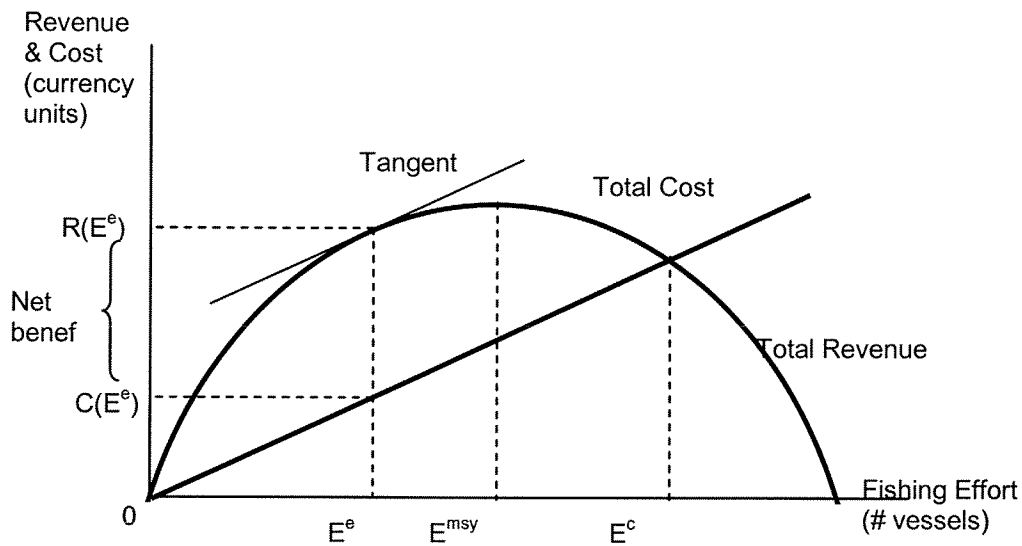


Figure 2. Economically Efficient Yield from a Fishery

The economically efficient yield occurs where the net benefit from the fishery (the vertical distance between revenue and costs) is greatest. This occurs at fishing effort level  $E^e$ , where a tangent to the revenue curve would be parallel to the cost line (i.e., where marginal benefit = marginal cost). When considering a single time period ("static efficiency"), the efficient level of effort is usually less than that associated with the MSY ( $E^{msy}$ ), resulting in lower sustained catches, a higher fish population and greater net benefits. But this is not necessarily true when the time dimension ("dynamic efficiency") is considered. Fish left in the ocean are often valued less than those caught today. The effect of discounting future benefits (and costs) is to increase the efficient level of effort and, by implication, decrease the fish population. It is possible, and in certain circumstances likely, that the efficient effort level will exceed the effort corresponding to the MSY, and the fish population will be reduced below that required to produce the MSY (indeed, this will necessarily occur whenever there is a positive discount rate and the marginal costs of catching one more fish are zero). If future costs and benefits are discounted infinitely (i.e., no value is placed on future catches), the efficient effort level reaches the point at which net benefits are zero ( $E^c$ ). It is even possible, in theory at least, for a dynamically efficient management scheme to lead to extinction of the stock, although the high cost of catching the last remaining fish would usually preclude this result. Note that every effort level in Fig. 2 corresponds to a population level in Fig. 1, except that increases in population are measured from right to left in Fig. 2. After Tietenberg T. (1996) *Environmental and Natural Resource Economics*, 4th ed., 614 pp. New York: HarperCollins. At pp. 274-78.

### 3.4 The UN Law of the Sea Convention and the Displacement of MSY

Eventually international law recognized formally what was already true in practice: that MSY was not the sole criterion for international fisheries management. This was apparent in the landmark 1982 United Nations Convention on the Law of the Sea (UNCLOS), which was concluded after ten years of multilateral negotiations. UNCLOS is most famous for its formal acknowledgement of the "great sea grab" of the 1970s, in which the vast majority of coastal states had unilaterally claimed sovereign authority over a 200-mile exclusive economic zone. UNCLOS also reflected changed thinking about biological sustainability as the exclusive goal of marine living resource conservation and management. It expressly authorizes states to depart from the MSY, requiring them to adopt fisheries management measures that are "designed to maintain or restore populations of harvested species at levels which can produce the maximum sustainable yield, as qualified by relevant environmental and economic factors, ... and taking into account fishing patterns, the interdependence of stocks and any generally recommended international minimum standards" (Articles 61(3), 119(1)(a)).

The effect of this language is that UNCLOS does not require states to manage either coastal or high seas fisheries for the MSY. Instead they have wide latitude to modify this objective in light of any economic, social, political or environmental factors they see fit, including the needs of fishing communities and developing countries. The requirement to maintain populations at levels "capable of producing" the MSY is satisfied by a range of stock sizes, from the MSY population at one extreme to the maximum population size at the other. Although the MSY population might appear to be a floor below which states may not allow fish stocks to decline, even this is expressly "qualified by" economic or environmental factors. States may set allowable catches higher or lower than the MSY—indeed, at any level, including zero. The Convention therefore represented a major departure from the prevailing orthodoxy of biological sustainability in international fisheries law.

This change was reinforced by another provision of UNCLOS that requires coastal states to promote the objective of "optimum utilization" of living resources when allowing foreign fishing in the EEZ (Article 62(1)) and when managing highly migratory species (Article 64(1)). As with the International Whaling Commission, "optimum utilization" was expressly understood by the drafters of UNCLOS to permit consideration of a broad range of objectives other than MSY. "Optimum utilization" was also adopted as the express objective of a number of international fisheries agreements established or renegotiated in the late 1970s and early 1980s in the wake of the extension of exclusive coastal state jurisdiction. The goal of the Northwest Atlantic Fisheries Organization (established by a 1978 treaty), for instance, is to contribute to "optimum utilization, rational management and conservation" of the fishery resources of the Northwest Atlantic, unlike its predecessor ICNAF's goal of producing the "maximum sustained catches."

It is important to note that these developments in the 1970s and 1980s did not completely displace MSY from its prominent role in international fisheries law. MSY remains a central reference point and, in many cases, the principal management objective of international fisheries management arrangements.

### 3.5 Recent Trends

In the 1990s several new ideas and controversies found their way into international fisheries law,

reflecting broader debates about sustainability. Many of these developments are reflected in the 1995 UN Agreement on Straddling and Highly Migratory Fish Stocks (the UN Fish Agreement), the most important multilateral fisheries treaty since UNCLOS. The UN Fish Agreement grew directly out of Agenda 21 (see Section 5.2.1) and was intended to fill some of the main gaps in international fisheries management left by UNCLOS, particularly those relating to highly migratory species and fish stocks that straddle the boundaries of states' EEZs.

The UN Fish Agreement reflects two recent trends in international fisheries law: the incorporation of environmental considerations into the heart of international fisheries management (Section 3.5.1), and the pursuit of a broad, vague goal of "sustainable utilization" of resources (Section 3.5.2).

### **3.5.1 The Greening of International Fisheries Law**

The Agreement has been hailed as introducing a truly environmental dimension into international fisheries law for the first time. This can be seen on several fronts. First, the Agreement aims to constrain harvesting within safe biological limits by setting a minimum "floor" below which states must not let fish populations decline. While it confirms that states may consider a range of socioeconomic and other concerns in making fisheries management decisions, it requires states to ensure that stock abundance does not drop below the MSY population level and requires them to take action to restore stocks that have fallen below that level (Article 6; Annex II, Articles 5, 7). It also calls for the long-term sustainability of the fish stocks themselves, shifting the focus onto the health of the fish stocks and marine ecosystems rather than the size of harvests (Article 5(a)).

Second, the Agreement incorporates a strong version of the precautionary principle (see also Section 5.3.2). Uncertainty about the health of many fish stocks, the functioning of marine ecosystems and the impacts of human activities, combined with evidence of declines in stock abundance, have led to many calls for the application of the precautionary approach to international fisheries management. The 1995 Agreement heeds these calls by requiring states to apply the precautionary approach widely and defining the approach in strong terms ("The absence of adequate scientific information shall not be used as a reason for postponing or failing to take conservation and management measures") (Article 6(1), (2)). An increasing number of other international agreements and declarations relating to fisheries and other living resources also adopt the precautionary principle. The UN Fish Agreement operationalizes the precautionary principle by, among other things, requiring states to take uncertainty relating to fish stocks, fishing mortality, impacts of fishing activities on other species and oceanic, environmental and socioeconomic conditions into account in fisheries management, develop cautionary conservation measures for new fisheries and maintain those measures until sufficient data exist to determine the impact of the fishery on long-term stock sustainability, and take emergency measures when natural phenomena adversely impact stock status or fishing seriously threatens stock sustainability (Article 6(3)-(7)).

Third, the Agreement adopts an ecosystem approach to fisheries management. Traditionally fisheries have been managed on a "single-species" basis that has been much criticized for ignoring interactions with non-target species and impacts on marine ecosystems. The 1995 Agreement, by contrast, treats ecosystem integrity, marine biodiversity and environmental protection as fisheries management goals and as ends in themselves. It calls on states to assess the impacts of fishing, other human activities and environmental factors at the ecosystem level and adopt conservation and management measures

for species belonging to the same ecosystem or associated with or dependent upon the target stocks (Article 5). This is not the first time a treaty has promoted an ecosystem approach to living resource management (see Section 4.3), but it is the first time the approach has been adopted in such a broadly supported general fisheries agreement. Whether this approach will be reflected in changes to actual fisheries management practices remains to be seen.

### 3.5.2 The Ascendancy of the "Sustainable Utilization" Paradigm

The second major recent trend in international fisheries law reflected in the 1995 Agreement is the widespread adoption of "sustainable utilization," "sustainable use" or "sustainable management" as the main goal of fisheries management and conservation. Most international fisheries agreements concluded since the early 1990s refer to some version of this goal. "Sustainable utilization" of fisheries also featured prominently in Agenda 21 (Agenda 21, Chapter 17) and in numerous FAO declarations and guidelines in the 1990s. The rise of "sustainable utilization" parallels, and is closely connected with, the ascendancy of "sustainable development" in international affairs more broadly (see Section 5). This formulation of sustainability as "sustainable use" is exemplified by the 1995 Agreement, which calls repeatedly for the sustainable utilization, use or management of straddling and highly migratory fish stocks.

The meaning of "sustainable use" is potentially as broad and vague as the term "sustainable development" itself and is often used without definition and apparently interchangeably with such terms as "wise", "rational" or "appropriate" utilization of resources. One of the most comprehensive attempts to operationalize the concept of sustainable use came in 1994, when the IUCN issued guidelines on Ecological Sustainability of Nonconsumptive and Consumptive Uses of Wild Species. The Guidelines confirmed that our "understanding of sustainability has changed over the past 30 years; and 'sustainable use' has been interpreted in a number of ways". While acknowledging that sustainability may involve economic and social factors, the Guidelines adopted a solely ecological approach, defining as sustainable a use that does not reduce the future use potential or impair the long-term viability of the target species or other species, and is compatible with maintenance of the long-term viability of supporting and dependent ecosystems. It is important to note, however, that the IUCN Guidelines are not legally binding and are at odds with numerous international treaties and declarations that treat "sustainable use" as having economic and social, as well as ecological, dimensions.

Finally, while the concept of MSY was developed and applied primarily in the fisheries context, the goal of "sustainable utilization" has been applied to a wide range of renewable resources in recent years, including forests and timber, lakes and rivers, biological diversity, carbon sinks and reservoirs and the marine environment generally.

### 3.6 Conclusion

Neither the extension of exclusive national jurisdiction to 200 nautical miles nor the broadening of fisheries management goals to encompass economic and social along with biological objectives through the adoption of open-ended principles of "optimum" or "sustainable" utilization have resolved the persistent problems of the world's fisheries. Extended coastal state jurisdiction involved a massive shift in the allocation of fishery resources from distant water fishing nations to coastal

states, but the potential benefits of coastal state control have largely been lost through mismanagement, overcapacity and overfishing. At the same time the pursuit of "optimum" or "sustainable" utilization in addition to or in place of MSY has not avoided the overexploitation or collapse of many fisheries and economic dislocation of fishing communities around the world. Nor has it resolved other perennial problems of fisheries management such as scientific uncertainty, data deficiencies and the difficulty of monitoring and enforcement in the face of strong incentives for noncompliance by individual states and fishers.

#### **4. Sustainability as Respect for Ecological Limits**

##### **4.1 Sustainability as a General Concern with Human-Nature Interaction**

The conceptualization of sustainability as a technical criterion for rational resource exploitation coincided roughly with the emergence of resource conservation as a public policy issue in North America and Europe at the end of the nineteenth century. It eventually attracted broad consensus across ideological and socio-economic divides, gaining acceptance among developed, developing, communist and capitalist states alike. Not so with the second theme of sustainability, which emerged in the 1970s. Starting around 1970, sustainability came to be associated in international law with broader concerns about human-nature interaction, including pollution, urbanization and energy consumption. In this period the dominant understanding of sustainability changed from a technical objective for living resource exploitation to a general principle of ecological constraints on human activities. Both ideas of sustainability share a concern with *limits*: the goal of maximum sustainable yield reflects a concern to keep harvests within the limits of the harvested population's biological capacity for regeneration, while the idea of sustainability that emerged in the 1970s reflects a broader concern to keep human societies within the limits of the environment's capacity to support them.

The idea of sustainability as respect for ecological limits emerged out of the modern environmental movement of the 1960s, which was based predominantly in the advanced industrialized democracies. It encountered strong opposition from developing states and Eastern bloc countries and has never achieved the broad acceptance enjoyed by the resource conservationist ideals of sustainable yields or sustainable resource utilization. Representatives of developing countries viewed the idea of "limits to growth" as a "Northern" concern that could be used to limit their ability to eradicate poverty and pursue their own development paths. As a result, while the idea of sustainability as respect for ecological limits is reflected to varying degrees in numerous "soft," non-binding international declarations and action plans, along with certain controversial legal principles such as the ecosystem approach, it has never achieved the prominence of the other two themes of sustainability in international law.

##### **4.2 Emergence of Sustainability as "Limits to Growth"**

###### **4.2.1 The 1972 Stockholm Conference**

References to environmental carrying capacity, impending resource exhaustion, overpopulation and limits to economic growth began to appear in international legal instruments in the late 1960s, but the idea of sustainability as respect for ecological limits was propelled onto the main stage of

