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# TECHNOLOGICAL CHALLENGE TO THE SHARED ENVIRONMENT: UNITED STATES PRACTICE

By Frederic L. Kirgis, Jr.\*

## I. INTRODUCTION

In an era of expanding interest in international environmental problems,<sup>1</sup> it is essential to examine the rapidly developing state practice concerning man's startling capability, through the use of technology without any hostile intent, adversely to alter not just the immediate environment of his neighbor but common resources shared by all. The present discussion does not attempt to deal with the practice of all states, but rather considers the extent to which legally relevant expectations of restraint are being shaped by United States practice concerning the use of novel technology in the *res communis*.<sup>2</sup> The focus on United States practice reflects the belief that, within the confines of a law journal article, considerable light may be shed on world community expectations by an examination of the practice of a state which has a major interest in the field and which is a significant participant in the international law-creating process. If consistent principles can be found to underlie United States practice, a first step might be taken toward identifying areas of consensus essential both to the ultimate fashioning of viable institutions<sup>3</sup> and to the existence of some degree of environmental order before comprehensive agreements are reached.<sup>4</sup>

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<sup>1</sup> Materials relating to the United Nations Conference on the Human Environment vividly demonstrate the interest. See, e.g., G.A. Res. 2581, 24 U.N. GAOR Supp. 30, at 44, U.N. Doc. A/7630 (1969); Reports of the Preparatory Committee for the U.N. Conference on the Human Environment, U.N. Docs. A/CONF.48/PC.6 (1970), A/CONF.48/PC.9 and 13 (1971).

<sup>2</sup> "*Res communis*," as used here, is synonymous with "shared environment," and includes the atmosphere, outer space, oceans and deep seabeds. Space does not permit discussion of activities within national territories which indirectly affect the *res communis*, except to the extent that they are involved in the case law. See generally Hardy, "International Control of Marine Pollution," 11 Nat. Res. J. 296, 302-309 (1971). Concerning deep seabeds as *res communis*, see text at note 76 below.

<sup>3</sup> For discussion of the appropriate institutional machinery, see, e.g., Hardy, *loc. cit.* note 2 above, at 344-348; Jenks, "The New Science and the Law of Nations," 17 Int. and Comp. Law Q. 327, 336-339 (1968); Kennan, "To Prevent a World Wasteland," 48 Foreign Affairs 401 (1970); Schachter, "Scientific Advances in International Law Making," 55 Calif. Law Rev. 423, 426-429 (1967).

<sup>4</sup> Emerging areas of consensus may also provide a basis for an intermediate lawmaking stage between non-regulation and formal agreement, such as the U.N. Declaration on the Human Environment. See 2d & 3rd Reports of the Preparatory Committee for the U.N. Conference on the Human Environment, U.N. Docs. A/CONF.48/PC.9, at 16-17, and A/CONF.48/PC.13, at 38-41 (1971). See also Jenks, *loc. cit.* note 3 above, at 339;

The uncertainty of the occurrence and severity of ultimate harm, and the inability in many cases to identify a given state as uniquely affected by a threat to the common environment, present a significant challenge to an international legal system seeking to balance national freedom of non-belligerent action against the need to protect inclusive world interests. Imposition of pecuniary responsibility generally would not be adequate to deal with such problems.<sup>5</sup> Consequently the discussion will neglect the law's potential function as a re-allocator of costs through liability-creation, and will deal with the extent to which emerging norms of prior restraint are suggested by U.S. practice. The emphasis will be on major technology having high political visibility.<sup>6</sup>

## II. DETERMINANTS OF EXPECTATIONS CONCERNING THE ENVIRONMENT

### A. *Expectations Stemming from International Case Law*

Inquiry must begin with the *Trail Smelter Case*,<sup>7</sup> a decision involving the United States which provides the leading internationally adjudicated precedent on environmental pollution. Fumes from the Trail Smelter, a privately owned plant in Canada, were damaging agricultural property in the State of Washington. One of the questions presented was ". . . whether the Trail Smelter should be required to refrain from causing damage in the State of Washington in the future and, if so, to what extent. . . ."<sup>8</sup> The tribunal concluded that

. . . under the principles of international law, as well as of the law of the United States, no State has the right to use or permit the use of its territory in such a manner as to cause injury by fumes in or to the territory of another or the properties or persons therein, when the case is of serious consequence and the injury is established by clear and convincing evidence.<sup>9</sup>

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Schachter, *loc. cit.* note 3 above, at 426. Cf. Declaration of Principles Governing the Sea Bed and the Ocean Floor, and the Subsoil Thereof, beyond the Limits of National Jurisdiction, G.A. Res. 2749, 25 U.N. GAOR Supp. 28, at 24, U.N. Doc. A/8028 (1970); 10 Int. Legal Materials 220 (1971).

<sup>5</sup> See Hardy, *loc. cit.* note 2 above, at 300, 312, note 44; Schachter and Serwer, "Marine Pollution Problems and Remedies," 65 A.J.I.L. 84 (1971); Report of the Secretary General to the Seabed Committee, Study on International Machinery, 25 U.N. GAOR Supp. 21, at 61, 113-114, U.N. Doc. A/8021 (1970).

<sup>6</sup> In order to facilitate perception of the law's growth process, the discussion will stress the law-creating and law-reflecting rôles of the mutual expectations of national and international decision-makers. See, e.g., McDougal, "The Hydrogen Bomb Tests and the International Law of the Sea," 49 A.J.I.L. 356 (1955); M. McDougal, H. Lasswell and I. Vlasic, *Law and Public Order in Space* 115-120 (1963). For recent doctrinal expressions stressing the capacity of international law to change with events, see the dissenting opinions of Judges Koretsky and Tanaka in the *North Sea Continental Shelf Cases*, [1969] I.C.J. Rep. 155 and 172.

<sup>7</sup> *United States v. Canada*, preliminary decision, 3 Int. Arb. Awards 1911 (1938), 33 A.J.I.L. 182 (1939); final decision, 3 Int. Arb. Awards 1938, 35 A.J.I.L. 684 (1941).

<sup>8</sup> Convention with Canada for the Establishment of a Tribunal . . . , April 15, 1935, Art. III, 49 Stat. 3245 (1935-1936), T.S. No. 893; 30 A.J.I.L. Supp. 163 (1936).

<sup>9</sup> 3 Int. Arb. Awards at 1965, 35 A.J.I.L. at 716 (1941).

The *Trail Smelter Case* involved use of territory in a way that caused pollution damage in adjoining territory. The situation with which we are concerned, however, is limited neither to events occurring within the respondent state's territory nor to damage uniquely suffered within the territory of another state. These distinctions deserve brief mention, leaving aside for a moment the problems of imposing prior restraint and of establishing likelihood and extent of damage.

If the state is the actor in a public capacity, there is clearly no ground for avoidance of responsibility simply because the activities occur beyond national boundaries. As the state's participation becomes less direct, ranging from state-supported commercial activities to various forms of acquiescence in private ventures, the issue becomes increasingly difficult. It appears, however, that the policy embodied in *Trail Smelter* applies to any case in which the state has an active participation or in which its nationals are not subject to the jurisdiction of any other interested state to prescribe and enforce injunctive rules. Even if the United States had jurisdiction to prescribe on the ground that the pollution was felt in its territory,<sup>10</sup> it could not readily have enforced any rules prescribed. Canada was in a position to control the activities in question. The situation would not be fundamentally different if the pollution had emanated from a private Canadian-registered ship, aircraft or ocean floor station. The result does not depend on fictional extensions of Canadian territory, but on the need to repose responsibility in the state most capable of assuming it.<sup>11</sup>

On the second point, it might be asked whether individual states have a sufficient interest in prospective harm to the *res communis* to be effective participants in the law-creating process of assertion and counter-assertion.<sup>12</sup> There may be cases, of course, in which the maximum possible damage is so slight that no state will have a sufficient interest to merit protection. But whenever there is a significant threat of harm to the *res*

<sup>10</sup> See Restatement 2d, Foreign Relations Law of the United States §18 (1965).

<sup>11</sup> Cf. Beesley, "Rights and Responsibilities of Arctic Coastal States: The Canadian View," 3 J. Maritime Law and Commerce 1, 10 (1971). In all cases there would be some state capable of applying and enforcing injunctive rules. Cf. Convention on the High Seas, April 29, 1958, Art. 5, (1962) 2 U.S.T. 2312, T.I.A.S. No. 5200, 450 U.N.T.S. 82, 52 A.J.I.L. 842 (1958); and see Convention on the Continental Shelf, April 29, 1958, Arts. 2, 5, (1964) 1 U.S.T. 471, T.I.A.S. No. 5578, 499 U.N.T.S. 311, 52 A.J.I.L. 858 (1958); Outer Continental Shelf Lands Act, 43 U.S.C. §§1331-43 (1970), 48 A.J.I.L. Supp. 110 (1954); Declaration of Principles Governing the Sea-Bed and Ocean Floor . . . , par. 14, *loc. cit.* note 4 above; Draft Convention on International Liability for Damage Caused by Space Objects, Arts. II and III, 10 Int. Legal Materials 965 (1971). Analysis of jurisdictional difficulties lies beyond the scope of the present discussion, which is intended simply to show that the principle embodied in the *Trail Smelter* decision should not be limited to occurrences within the respondent state's territory.

<sup>12</sup> It has been questioned whether states have sufficient rights in fish in the high seas to be entitled to damages if the fish are injured. See McDougal and Schlei, "The Hydrogen Bomb Tests in Perspective: Lawful Measures for Security," 64 Yale Law J. 648, 694, note 239 (1955). Cf. Hardy, *loc. cit.* note 2 above, at 299-300; Legault, "The Freedom of the Seas: A License to Pollute?," 21 Toronto Law J. 211, 217-218 (1971).

*communis*, an international legal order lacking institutions capable of effective public representation cannot require a showing of unique interest on the part of objecting states as a prerequisite to standing. This is particularly so when the claim is preventive rather than pecuniary, since the problem of allocating compensation among claimants does not arise.

It has been asserted that the *Trail Smelter* tribunal did not "unequivocally" face the issue whether a state may carry on conduct for which it is liable in damages, since the decision referred to the desire expressed by the parties in the *compromis* to reach a final solution.<sup>13</sup> Canada did not actively contest its responsibility for the conduct of the smelter. The Canadian Government was determined, however, to protect the smelter as a continuing enterprise.<sup>14</sup> It was willing to accept a result which was equitable to interests in the United States, and this seems to explain the provision in the *compromis* referring to the parties' desire to reach a "just" (not "final") solution.<sup>15</sup> There is no indication that the tribunal understood this to signify anything other than the expression of a desire to arbitrate in good faith and to arrive at a fair result. The tribunal did not rely on the provision in its enunciation of Canada's duty, and in fact said that the duty arose "[a]part from the undertakings in the Convention. . . ."<sup>16</sup> The decision consequently is relevant to the development of expectations concerning a duty to refrain from environmentally injurious conduct.<sup>17</sup>

If the decision is viewed as the ratification of a position already taken by the parties, Canada's acquiescence in the U.S. claim has independent legal significance. The United States had asserted a right to be relieved of air pollution originating in Canadian territory. Thus if Canada's response was tantamount to an acquiescence, the law-creating process of U.S. claim and Canadian response would create roughly the same expectations as to norms of future conduct as does the tribunal's decision if considered separately. It is more convincing, however, to treat the case as a precedent established by a decision-making body external to the disputants.

This leaves for consideration the extent of actual or prospective injury necessary to support a norm of restraint, and the standard of proof of injury required. The *Trail Smelter* tribunal limited its holding to cases ". . . of serious consequence [where] the injury is established by clear and convincing evidence." In many cases the injury will be prospective

<sup>13</sup> McDougal and Schlei, *loc. cit.* note 12 above, at 694, 694-695, note 241. See also Mercer, "International Law and the French Nuclear Weapons Tests," Pt. 2, 1968 *New Zealand Law Rev.* 418, 419.

<sup>14</sup> See Read, "The Trail Smelter Dispute," 1963 *Canadian Yr. Bk. Int. Law* 213, 227-228.

<sup>15</sup> Convention with Canada, *loc. cit.* note 8 above, Art. IV.

<sup>16</sup> 3 *Int. Arb. Awards at 1965-1966*, 35 *A.J.I.L.* at 717 (1941). See L. Hydeman and W. Berman, *International Control of Nuclear Maritime Activities* 278, note 504 (1960).

<sup>17</sup> Cf. Secretary General, *Survey of International Law in Relation to the Work of Codification of the International Law Commission*, U.N. Doc. A/CN.4/1/Rev. 1, at 34 (1949) (duties exemplified by the award in the *Trail Smelter Case* encompass those "of a preventive nature").

only, and its extent could not be established in advance by clear and convincing evidence.<sup>18</sup> That is the heart of the problem: the consequences of using major new technology cannot be clearly foreseen. If restraint is postponed until there is clear and convincing evidence of serious harm, consequences affecting large areas of common resources may have ensued. In some cases the effect may be irreversible.

The *Trail Smelter* standard would extend comfortably to cases in which the likelihood (rather than the existence) of injury is established by clear and convincing evidence.<sup>19</sup> This, however, does not meet the essence of the problem mentioned above, where the likelihood of serious injury is not fully established. One may wonder whether a disinterested decision-maker thirty years after *Trail Smelter*, in a world awakened to the existence of environmental deterioration, would find the "clear and convincing" standard literally applicable when there are plausible consequences magnified far beyond those considered in that case. It would be consistent with the approach taken by the *Trail Smelter* tribunal to apply a reasonableness test, with potentially greater harm calling for abstention from conduct under a proportionately lesser showing that the harm will occur. Nevertheless, *Trail Smelter* itself does not go so far; at most, by applying essentially a reasonableness standard it points the way to such a result.

Other decisions of international tribunals are marginally relevant at best.<sup>20</sup> The *Trail Smelter Case* stands as the leading case authority, to be tested against expectations arising from the conduct and pronouncements of other decision-makers.

### B. State Practice

The question at this point is whether national decision-makers in practice involving the United States have conducted themselves in such a way as to reflect or induce expectations of restraint in the use of technology, based on perceptions of harm to the world's common resources. If a state abstains from acting in a certain way or from acting at all in a given situation, it may be for any number of reasons, not all of which have legal significance.<sup>21</sup> But it goes too far to say that abstention within the discretion of a state cannot affect the formation of new custom.<sup>22</sup> The

<sup>18</sup> Cf. L. Hydeman and W. Berman, *op. cit.* note 16 above, at 280-281; Taubenfeld, "Nuclear Testing and International Law," 16 *Southwestern Law J.* 365, 401-402 (1962).

<sup>19</sup> This was the standard applied to prospective damage from water pollution in *New York v. New Jersey*, 256 U.S. 296, 309 (1921), on which the *Trail Smelter* tribunal relied.

<sup>20</sup> See the *Lake Lanoux Arbitration* (*France v. Spain*), 12 *Int. Arb. Awards* 281, 1957 *Int. Law Rep.* 101, 53 *A.J.I.L.* 156 (1959); *Corfu Channel Case* (*United Kingdom v. Albania*), [1949] *I.C.J. Rep.* 4, 43 *A.J.I.L.* 558 (1949). In the latter case the Court took note of ". . . every State's obligation not to allow knowingly its territory to be used for acts contrary to the rights of other States." [1949] *I.C.J. Rep.* at 22. Such language does little to delineate expectations beyond the facts of the case, since it assumes rights in the complaining states.

<sup>21</sup> See, e.g., *Case of the S.S. "Lotus,"* (1927) *P.C.I.J.*, Ser. A, No. 10, at 28; C. Parry, *The Sources and Evidences of International Law* 63-64 (1965).

<sup>22</sup> See K. Wolfke, *Custom in Present International Law* 69 (1964), discussing the views of Sørensen.

International Court has relied on state restraint as evidence of the existence of an international norm restricting freedom of action.<sup>23</sup> If freedom of action might plausibly be asserted, and if purely selfish interests would normally be served by action (or by less restraint than is observed), inaction or restrained action is legally significant.<sup>24</sup>

The technologically advanced states (particularly the United States) have on several occasions taken action which has had potentially harmful consequences for common resources. In order to determine whether these preclude the emergence of any meaningful restriction, it will be necessary to examine the degree of restraint observed, the process of claim and reaction set in motion, the interests at stake and the instances in which action might have been taken but was not.<sup>25</sup>

### 1. *Nuclear Tests in the Atmosphere*

Significantly, those who have asserted the lawfulness of atmospheric nuclear tests (by states not bound by prohibitory treaty obligations) have not spoken in terms of unrestrained freedom of action. Rather, they have relied on a reasonableness standard evidenced by existing state practice. This standard stresses the minimum possible interference with such legitimate interests of non-testing states as use of shipping lanes and fishing rights.<sup>26</sup> Emphasis is given to the vital security interests of the testing state and of those reliant on it for protection.<sup>27</sup> Such a rationale would not extend to environment-endangering unilateral conduct beyond areas of overriding importance to the acting state. Even in the areas of permissible conduct, the rationale dictates the exercise of maximum self-restraint, based on the interests of other states, consistent with the acting state's execution of its vital policy.

<sup>23</sup> Nottebohm Case, [1955] I.C.J. Rep. 4, 21-22. The Court said that the practice of certain states in refraining from extending diplomatic protection to nationals who have severed the links of nationality ". . . manifests the view of these States that, in order to be capable of being invoked against another State, nationality must correspond with the factual situation."

<sup>24</sup> See the separate opinion of Judge Jessup in *Barcelona Traction, Light & Power Co.*, [1970] I.C.J. Rep. 4, 186, asserting that abstention from affording diplomatic protection to companies incorporated in the state but not otherwise linked to it, ". . . being as it were 'against interest,' has special probative value." See also H. Lauterpacht, *The Development of International Law by the International Court* 380 (1953); Virally, "The Sources of International Law," in *Manual of Public International Law* 116, 130-131 (M. Sørensen ed., 1968).

<sup>25</sup> We are dealing with events compressed into a relatively short period—roughly since World War II. Nevertheless, the use of technology has provided sufficient opportunities for challenge to permit the formation of legally relevant expectations. See generally Virally, *loc. cit.* note 24 above, at 131-132. Cf. *North Sea Continental Shelf Cases*, *loc. cit.* note 6 above, at 42-43.

<sup>26</sup> See McDougal and Schlei, *loc. cit.* note 12 above, at 682-686.

<sup>27</sup> See M. McDougal and W. Burke, *The Public Order of the Oceans* 772 (1962); McDougal and Schlei, *loc. cit.* note 12 above, at 690-695; U.S. Delegation Paper for the U.N. Conference on the Law of the Sea, "Legality of Using the High Seas in Connection with Nuclear Weapons Tests in the Pacific Ocean," 4 *Whiteman, Digest of International Law* 546-550 (1965).



It is significant, also, that atmospheric nuclear testing instigated a process of claim and counterclaim among decision-makers, many of whom have not been willing to accept even such a limited rationale. The counterclaims, culminating in the partial Test Ban Treaty, have increasingly emphasized the environmental hazard.<sup>28</sup> Although the treaty probably would not have emerged, absent a belief by the United States and the Soviet Union that they had substantially accomplished the national security goals attainable from atmospheric testing, rising fears of persistent environmental harm provided the negotiators with considerable incentive to agree.<sup>29</sup> The Test Ban Treaty reflects a growing consensus based on the judgment, shared by the United States and the Soviet Union—though not yet by France and the People's Republic of China—that the political and military benefits from further atmospheric testing are outweighed by the (uncertain) environmental as well as out-of-pocket costs.<sup>30</sup>

## 2. Waste Disposal

Much of the controversy concerning disposal at sea has centered on radioactive wastes. No state has asserted the unrestricted right to dispose of radioactive wastes in the oceans without safeguards.<sup>31</sup> It seems clear that any sizable disposal of low-level radioactive waste in the seas without protection would violate existing norms, as would *any* disposal at sea of high-level radioactive matter.<sup>32</sup>

The response of members of the international community to disposal of even low-level wastes has been instructive. Some have objected flatly to any disposal at sea.<sup>33</sup> Others have been less rigid. None are sanguine

<sup>28</sup> See G.A. Res. 1762A, 17 GAOR Supp. 17, at 3, U.N. Doc. A/5217 (1962); Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water, Aug. 5, 1963, Preamble, (1963) 2 U.S.T. 1313, T.I.A.S. No. 5433, 430 U.N.T.S. 43; 57 A.J.L.L. 1026 (1963). See also Report of Subcommittee III of the U.N. Seabed Committee, U.N. Doc. A/AC. 138/62, at 14-16 (1971) (responses to recent French tests).

<sup>29</sup> See A. Dean, *Test Ban and Disarmament: The Path of Negotiation* 83-84 (1966); H. Jacobson and E. Stein, *Diplomats, Scientists, and Politicians* 126-127, 346, 381-382, 423 (1966).

<sup>30</sup> Underground testing continues despite fears that some tests are or may be environmentally harmful. Japan and Canada protested the November, 1971, U.S. test at Amchitka Island. See *New York Times*, Nov. 7, 1971, at 64, col. 4. It appears, however, that no radiation leakage or other significant environmental harm occurred. *Ibid.*, Nov. 8, 1971, at 78, col. 1; Nov. 14, 1971, §4, at 2, col. 3.

<sup>31</sup> See, e.g., statement of the representative of the IAEA, 47 U.N. ECOSOC 196, U.N. Doc. E/SR.1629 (1969); statement of the U.S. delegate, 4 U.N. Conf. on the Law of the Sea 85, U.N. Doc. A/CONF.13/40 (1958). Art. 2 of the Convention on the High Seas requires that freedom of the seas "be exercised by all States with reasonable regard to the interests of other States in their exercise of the freedom of the high seas."

<sup>32</sup> See M. McDougal and W. Burke, *op. cit.* note 27 above, at 861-862. Cf. Brown, "International Law and Marine Pollution: Radioactive Waste and 'Other Hazardous Substances,'" 11 *Nat. Res. J.* 221, 234-235 (1971). For the distinction between high- and low-level wastes, see Ramey, "Radiation Protection—Past, Present and Future," 11 *Atomic Energy Law J.* 1, 18-24 (1969).

<sup>33</sup> See U.N. Doc. A/CONF.13/C.2/L.118, in 4 U.N. Conf. on the Law of the Sea 149, U.N. Doc. A/CONF.13/40 (1958); summary records of the 29th meeting in *ibid.* 83,

about disposal. The World Health Organization in 1961 adopted a resolution requesting “. . . urgently all the Members . . . to prohibit all discharge of radioactive waste into watercourses or the sea, to the extent that the safety of such discharge has not been proved. . . .”<sup>34</sup> It is noteworthy that the standard adopted was abstention until safety is proved. The United States opposed the W.H.O. resolution, in part on the ground that the resolution prejudged the question of whether pollution had occurred.<sup>35</sup> Yet the United States shortly thereafter acted in a manner consistent with the resolution when it acquiesced in Mexican protests against the proposed issuance of a license to dispose of low-level radioactive waste in the Gulf of Mexico. The license had been conditionally approved, and an Atomic Energy Commission hearing examiner had found that the disposal would create no danger. After the Mexican protests, however, the license was finally denied.<sup>36</sup> Thus the United States responded to a protest based on environmental grounds, and abstained from acting despite the announced and unreversed opinion of an official fact-finder that no danger to the shared environment had been shown.

Community reaction to radioactive waste disposal at sea led to the inclusion of a provision in the Convention on the High Seas obligating parties to “take measures to prevent pollution of the seas from the dumping of radioactive waste. . . .”<sup>37</sup> The meaning of “pollution” was not set forth,<sup>38</sup> and the contemplated measures were not identified. Consequently the measure of the duty is unclear. Nevertheless the provision is couched in terms of duty, and reflects a community standard calling for preventive measures to preserve the ocean environment from a perceived but uncertain harm. Such a general standard does not supply specific guidelines for conduct, but does provide a normative setting for state practice. It is relevant to an attempt to distinguish custom from mere usage when waste disposal conduct is assessed.

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85-87 (proposals by members of the Communist bloc). See also M. McDougal and W. Burke, *op. cit.* note 27 above, at 860, note 413 (Soviet Union insists that disposal at sea is unlawful).

<sup>34</sup> W.H.O. Res. WHA/14.56, 14 World Health Assembly, No. 110, Pt. I, at 24 (1961).

<sup>35</sup> 4 Whiteman, *Digest of International Law* 725-727 (1965).

<sup>36</sup> *Ibid.* 612-618. See *In the Matter of Industrial Waste Disposal Corp.*, 2 A.E.C. Rep. 70 (1962). For further discussion, see L. Hydeman and W. Berman, *op. cit.* note 16 above, at 305; M. McDougal and W. Burke, *op. cit.* note 27 above, at 861.

<sup>37</sup> Convention on the High Seas, Art. 25(1), *loc. cit.* note 11 above. (The convention came into force for the United States after it had denied the Gulf of Mexico license.) It is arguable that Art. 25(1) is a codification of pre-existing customary law. The preamble to the convention speaks of a desire to “codify” existing rules and to adopt provisions which are “generally declaratory of established principles of international law.” Compare Baxter, “Multilateral Treaties as Evidence of Customary International Law,” 41 *Brit. Yr. Bk. Int. Law* 275, 289 (1965-1966), doubting that this provision reflected observable custom. See also Baxter, “Treaties and Custom,” 129 *Hague Academy, Recueil des Cours* 25, 54 (1970).

<sup>38</sup> For the definition asserted by the United States, see 4 Whiteman, *Digest of International Law* 726 (1965).

The United States has issued no new licenses for radioactive waste disposal at sea since 1960.<sup>39</sup> Beginning in 1962, the Atomic Energy Commission has designated land sites for disposal, and sea disposals under pre-1960 licenses have been drastically reduced. Since 1967 no disposals appear to have been made in the Atlantic and only 28 containers (of low-level waste) in the Pacific.<sup>40</sup> The announced reasons for the switch to land disposal stress the expense of adequate containers for sea disposal.<sup>41</sup> The economic rationale, however, does not deprive the switch of normative significance. The fact that expensive containers are required for sea disposal is indicative of the recognition of a need for extreme caution. Economic benefits may have ensued from the change, but much of the impetus came from voiced concern on the part of the international community that sea disposal, despite the lack of a showing of present damage, involves too great a risk of eventual harm. It is virtually inconceivable that the United States could assert a right to revert to its pre-1962 level of sea disposal without evoking widespread international protests on normative grounds, nor is it likely that the United States would attempt to resume large-scale sea disposals even if it became economically advantageous to do so.

The precedent is probably limited to situations in which there is a reasonably available alternative to the potentially deleterious use of the *res communis*, as is the case in the United States with its large land mass providing sites for underground disposal. The United Kingdom and other countries in Western Europe, with relatively small territories, continue to dispose of limited quantities of low-level radioactive waste in the oceans under strict controls and pursuant to international consultations.<sup>42</sup>

Similar questions are raised by disposal of obsolete munitions at sea. The rationale given in 1970 by the United States for ocean dumping of

<sup>39</sup> H.R. Rep. No. 92-361, 92d Cong., 1st Sess. 55 (1971). For national security reasons, the United States continues to operate nuclear-powered naval vessels which occasionally emit very small amounts of radioactivity. The Navy does not permit sea disposal of solid radioactive waste from its nuclear ships. See Hearings on Ocean Waste Disposal before a Subcommittee of the Senate Committee on Commerce, 92d Cong., 1st Sess. 62-75 (1971).

<sup>40</sup> See Council on Environmental Quality, *Ocean Dumping: A National Policy* 7 (1970); Belter, "Recent Developments in the United States Low-Level Radioactive Waste-Management Program—A Preview for the 1970s," in International Atomic Energy Agency, *Symposium on Management of Low- and Intermediate-Level Radioactive Wastes* 155, 176 (1970).

<sup>41</sup> *Ibid.* 176-177. There appears to be no showing of present harm from sea disposals of radioactive waste. See 13 I.A.E.A. Bulletin, No. 1, at 26, 27 (1971); Schachter and Serwer, *loc. cit.* note 5 above, at 107.

<sup>42</sup> For U.K. practice, see West, "Operational Experience in the Handling, Treatment and Disposal of Radioactive Wastes at a Research and Development Establishment," in I.A.E.A. Symposium, *op. cit.* note 40 above, at 235, 243-245; Royal Comm'n. on Environmental Pollution, 1st Report, Cmnd. No. 4585, at 25 (1971). The Soviet Union, with its large land mass, does not dispose of radioactive waste at sea. See W. Butler, *The Soviet Union and the Law of the Sea* 187 (1971). The United States has recognized the need for a reasonable alternative before ocean disposal of municipal waste can be fully discontinued. See Hearings, *op. cit.* note 39 above, at 265, 283.

nerve gas was restricted to strictly controlled disposal of a limited quantity of a substance which could not feasibly be disposed of in any other manner.<sup>43</sup> There was no claim of right to engage in systematic disposal. Even such a circumscribed proposal evoked protests on normative grounds from the U.N. Secretary General, based on community expectations of co-operation in the preservation of ocean environmental quality.<sup>44</sup> Moreover, the U.N. Seabed Committee formally registered its concern, and appealed to all governments ". . . to refrain from using the sea-bed and ocean floor as a dumping ground for toxic, radio-active and other noxious materials which might cause serious damage to the marine environment."<sup>45</sup> The United States subsequently announced that it was suspending ocean disposal of munitions on the ground that too many environmental questions were unanswered.<sup>46</sup> Evolving U.S. practice concerning munitions disposal thus reinforces the radioactive waste precedent. In each case the clear evolution is toward a duty to abstain even though the probability of actual harm is not objectively established.

The United States has permitted disposal of municipal and industrial waste in the oceans in quantities which appear to have caused some harm.<sup>47</sup> The harm, however, has been relatively localized and apparently has thus far affected primarily the interests of the United States. At this writing, it appeared that Federal legislation would be enacted to control such disposal.<sup>48</sup> Similarly, the United States has proposed a draft ocean

<sup>43</sup> See New York Times, July 30, 1970, at 11, col. 1 (City ed.); *ibid.*, Aug. 4, 1970, at 1, col. 4.

<sup>44</sup> *Ibid.*, Aug. 8, 1970, at 8, col. 6. The protest was based in part on Art. 25(2) of the Convention on the High Seas, discussed in the text at note 138 below. See also Brown, *loc. cit.* note 32 above, at 253-254. Iceland officially protested against the disposal, and the Government of the Bahamas made similar representations to the U.K. and the U.S. See 18 Keesing's Contemporary Archives 24386 (Jan. 9-16, 1971). The U.S. Department of State had determined (as required by U.S. law) that the disposal would not violate international law. It focused primarily on the duty laid down in Art. 2 of the Convention on the High Seas to have reasonable regard for the interests of other states in exercising freedom of the seas. See Hearings on Dumping of Nerve Gas Rockets in the Ocean before a Subcommittee of the Senate Committee on Commerce, 91st Cong., 2d Sess. 65 (1970).

<sup>45</sup> Report of the Committee on the Peaceful Uses of the Sea-Bed and the Ocean Floor Beyond the Limits of National Jurisdiction, 25 U.N. GAOR Supp. 21, at 8, U.N. Doc. A/8021 (1970).

<sup>46</sup> See Hearings, *op. cit.* note 39 above, at 51-52.

<sup>47</sup> See Council on Environmental Quality, *op. cit.* note 40 above, at 12-15. The oceans have the capacity to absorb some municipal and industrial waste without harm. Thus the issue is not whether these wastes may be discharged, but whether they may be discharged in such a manner as to risk overtaxing the absorptive capacity in any given ocean area.

<sup>48</sup> H. R. 9727, 92d Cong., 1st Sess., had passed both Houses of Congress in somewhat different forms. See 117 Cong. Rec. H 8225-55, S 19629-55 (daily ed., Sept. 9, Nov. 24, 1971). The legislation also curbs U. S. disposal of high-level radioactive wastes and ecologically harmful warfare agents. Rising international expectations are reflected in the call by Sweden, Norway, Finland, Denmark and Iceland for an end to disposal of harmful chemical and industrial waste in international waters. They have announced plans to enact legislation to that effect, and Sweden has now done so. See The Times

dumping convention that would require parties to prohibit transportation of all material for ocean dumping unless a permit is obtained from a national agency applying environmental standards set forth in the convention.<sup>40</sup> U.S. practice therefore does not run counter to expectations of restraint when large-scale environmental consequences are at stake, and is turning toward an approach which, in the words of a U.S. official, is "aimed at terminating all dumping not clearly demonstrated to be safe."<sup>50</sup>

Oil tankers provide yet another means involving the United States by which ocean disposal of pollutants occurs. "Super tankers" pose ocean environmental challenges not only from the danger of shipwreck but also from discharge of oil in normal operations.<sup>51</sup> International preventive practice is developing around the nucleus of the International Convention for the Prevention of Pollution of the Sea by Oil.<sup>52</sup> The convention prohibits discharges of oil or oily mixtures, subject to exceptions for reasonable discharges under designated conditions. It provides some standards as to quantity and location of permissible discharges,<sup>53</sup> but sets forth only in very general terms the means by which discharges are to be avoided.<sup>54</sup> Yet specific precautions for the control of discharges are evolving in practice. In particular, most tanker operators, acting with the approval of the major maritime states, have adopted the "load on top" system to retain

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(London), April 28, 1971, at 1, col. 2; Washington Post, Nov. 13, 1971, at A4, col. 8. The Government of The Netherlands has responded to international protests by instructing a Dutch firm to abandon its plan to dump 600 tons of chemical waste in the North Atlantic. See The Times (London), July 23, 1971, at 1, col. 2.

<sup>40</sup> See draft Regulation of Transportation for Ocean Dumping Convention Arts. I, III, 10 Int. Legal Materials 1021 (1971).

<sup>50</sup> Statement of William Ruckelshaus, Administrator, Environmental Protection Agency, in Hearings, *op. cit.* note 39 above, at 265. To the same effect, see Dept. of State Position Paper, in Hearings on Ocean Dumping of Waste Materials before Subcommittees of the House Committee on Merchant Marine and Fisheries, 92d Cong., 1st Sess. 115, 116 (1971). The U.S. Government's Committee on International Environmental Affairs has taken the view that any ocean disposal of wastes which "threatens life or directly damages property violates international law." Dept. of State, Suggestions Developed Within the U.S. Government for Consideration by the Secretary General of the 1972 U.N. Conference on Human Environment 59 (1971).

<sup>51</sup> For a concise discussion of the challenge, see Study of Critical Environmental Problems, Man's Impact on the Global Environment 139-143 (report of M.I.T.-sponsored study group, 1970).

<sup>52</sup> May 12, 1954, (1961) 3 U.S.T. 2989, T.I.A.S. No. 4900, 327 U.N.T.S. 3, as amended April 11, 1962, (1966) 2 U.S.T. 1523, T.I.A.S. No. 6109, and Oct. 21, 1969, 9 Int. Legal Materials 1 (1970). The 1969 amendments are not yet in force. *Cf.* International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, Nov. 29, 1969, 64 A.J.I.L. 471 (1970), 9 Int. Legal Materials 25 (1970); International Convention on Civil Liability for Oil Pollution Damage, Nov. 29, 1969, 64 A.J.I.L. 481 (1970), 9 Int. Legal Materials 45 (1970).

<sup>53</sup> Under the 1969 amendments tankers could discharge oil or oily mixtures only beyond 50 miles from land, and then only in designated quantities which are thought not to cause persistent pollution. See 9 Int. Legal Materials 1, 4 (1970); IMCO Bulletin No. 13, at 7, 9 (1970). The United States has ratified the 1969 amendments. See 65 Dept. of State Bulletin 575-576 (1971).

<sup>54</sup> See Arts. VII and VIII.

on board oil washed from tanks in the cleaning process.<sup>55</sup> Oily mixtures from ballasting and washing cargo tanks are collected in special tanks, where the oil is allowed to separate from the water. The water is discharged, but the oil is retained and fresh crude oil is loaded on top of it. The residues and the fresh oil are eventually discharged at the refinery.<sup>56</sup>

Such practice, against a backdrop of a multilateral convention providing general environmental standards, would appear to justify expectations regarding the conduct of all flag states parties to the convention, and may even represent a sufficient consensus on the existence of a norm to bind non-parties. The binding effect stems from a broader normative principle embodied in the convention—that of avoiding discharge of oil<sup>57</sup>—which has been given a specific application through widely adopted practice. In view of the high visibility of the problem and of the measures taken, and the absence of protests, a binding norm could be established in a relatively short time.

### 3. *The Ocean Floor*

Ocean floor operations have consisted primarily of oil exploration and extraction. Until the Santa Barbara blowout, the U.S. Government appears not to have faced squarely the dangers to the marine environment involved in ocean bed oil exploitation.<sup>58</sup> The result was an oil spill which caused significant ocean pollution.<sup>59</sup>

The Santa Barbara incident has influenced new Federal standards and procedures to prevent ocean pollution from off-shore drilling. More stringent requirements for pre-drilling geological reports have been promulgated,<sup>60</sup> as have regulations intensifying standards for drilling pro-

<sup>55</sup> See Royal Comm'n. on Environmental Pollution, *op. cit.* note 42 above, at 26; IMCO Bulletin No. 13, at 7-8. The "load on top" system, though widely recognized as an effective and desirable anti-pollution measure, may be in technical contravention of the convention. See IMCO Bulletin No. 13, at 8. It would not contravene the convention once the 1969 amendments come into force, nor is it likely to be considered by any party to involve a substantive present violation. On the contrary, as argued in the text, it may well be mandatory for parties to the convention.

<sup>56</sup> NATO members have taken a further step by agreeing to achieve by 1975 "the elimination of intentional discharges of oil and oily wastes into the sea. . ." 63 Dept. of State Bulletin 669 (1970).

<sup>57</sup> Also relevant is the Convention on the High Seas, Art. 24, *loc. cit.* note 11 above, which calls on member states to "draw up regulations to prevent pollution of the seas by the discharge of oil by ships. . ." This is arguably a statement of customary law. See note 37 above.

<sup>58</sup> See Baldwin, "The Santa Barbara Oil Spill," 42 *Colo. Law Rev.* 33 (1970). The Federal Government issues leases for oil explorations beyond three miles from shore, under the Outer Continental Shelf Lands Act, *loc. cit.* note 11 above. The Act authorizes issuance of regulations "to provide for the prevention of waste and conservation of the natural resources of the outer Continental Shelf. . ." *Ibid.* §1334(a) (1).

<sup>59</sup> See Baldwin, *loc. cit.* note 58 above, at 52-53. At least two previous blowouts from wells in the United States' continental shelf resulted in significant pollution. See Hearings on S. 7 and S. 544 before a Subcommittee of the Senate Committee on Public Works, 91st Cong., 1st Sess., Pt. 3, at 811 (1969).

<sup>60</sup> See 30 C.F.R. §§250.34, 250.91 (1971).

cedures and equipment to prevent blowouts.<sup>61</sup> Tightened pre-leasing environmental evaluation procedures have been adopted.<sup>62</sup> Although it is too early to tell whether these measures will be fully adequate to prevent ocean damage from oil leasing activities, they are a significant step in that direction. They embody a governmental policy to restrain freedom of action in seabed areas under effective U.S. control, taken despite economic counterpressures within the United States.<sup>63</sup>

The environmental interests directly affected are primarily those of the United States, since the immediate damage has been confined largely to the U.S. coastline and coastal waters. This does not, however, deprive the response of significance to the evolution of international norms. In part the international significance is found in the context of the Geneva Conventions discussed below. But the response also has precedential value if future questions arise concerning U.S. regulation of seabed activities which are subject to its control, and which pose more direct environmental challenges to the interests of other states. It would be difficult to argue in such a case that lesser standards are appropriate.<sup>64</sup>

The United States is a party to several multilateral treaties which require that account be taken of environmental considerations in seabed operations. Article 5(1) of the Convention on the Continental Shelf may have been violated by United States failure to adopt safeguards adequate to prevent the Santa Barbara incident. It provides that: "The exploration of the continental shelf and the exploitation of its natural resources must not result in any unjustifiable interference with navigation, fishing or the conservation of the living resources of the sea. . . ." <sup>65</sup> The language is couched in mandatory terms, and may reflect a pre-existing norm.<sup>66</sup>

It is probable that the Santa Barbara spill involved "interference with . . . the conservation of the living resources of the sea," within the meaning of Article 5(1).<sup>67</sup> The major question is whether such interference is

<sup>61</sup> 30 C.F.R. §250.41 (1971).

<sup>62</sup> 43 C.F.R. §3301.4 (1971). Moreover, the lessee is now subject to potential liability for cleaning-up expenses. See Water Quality Improvement Act of 1970, 33 U.S.C.A. §1161(f) (3) (1970); 30 C.F.R. §250.43(b) (1971).

<sup>63</sup> Baldwin, *loc. cit.* note 53 above, at 59-60. The 1970 Gulf of Mexico oil discharges resulted from ventures in operation when the measures were adopted. See, generally, Nanda and Stiles, "Offshore Oil Spills: An Evaluation of Recent United States Responses," 7 San Diego Law Rev. 519, 534-536 (1970).

<sup>64</sup> Cf. Lester, "River Pollution in International Law," 57 A.J.I.L. 828, 852 (1963).

<sup>65</sup> *Loc. cit.* note 11 above.

<sup>66</sup> In the North Sea Continental Shelf Cases, *loc. cit.* note 6 above, at 39, the I.C.J., referring *inter alia* to Art. 5(1), said that the ". . . general obligation not unjustifiably to interfere with freedom of navigation, fishing, and so on" was received customary law. The conservation provision of Art. 5(1) would presumably be included within the phrase "and so on," though the Court may not have given that its considered judgment. Cf. Baxter, "Treaties and Custom," *loc. cit.* note 37 above, at 48-49.

<sup>67</sup> The primary conservation thrust of Art. 5(1) is the protection of fish stocks. See U.N. Doc. A/CN.4/SR.378, 1956 I.L.C. Yearbook (I) 272, 277. There was very little direct fish-kill, if any, from the Santa Barbara incident, though over 1,000 sea birds were killed and the danger of long-term accumulation of hydrocarbons in the aquatic food chain was greatly increased. See Baldwin, *loc. cit.* note 58 above, at 36-37; Study of

"unjustifiable." The terms of the convention, buttressed by the *travaux*, make it clear that no absolute duty of non-interference was intended.<sup>68</sup> However, the International Law Commission stated the duty rather strictly: "With regard to the conservation of the living resources of the sea, everything possible should be done to prevent damage by exploitation of the subsoil. . . ." <sup>69</sup> At the very least, it would seem "unjustifiable" to fail to adopt safeguards which take full account of the magnitude of potential harm if a reasonably foreseeable accident occurs, the availability of devices or techniques capable of preventing mishap, and the geological or other physical characteristics of the area.

Article 5(7) of the Convention on the Continental Shelf obligates the coastal state to undertake, in safety zones established around devices on the shelf, "all appropriate measures" for the protection of the living resources of the sea from harmful agents. Here again the extent of the duty is not well defined. It has been suggested that this has simply had the effect of requiring operators to observe "good oil industry practice" and to provide equipment to stem the flow if a blowout occurs.<sup>70</sup> It is probable, however, that as a result of Santa Barbara and of the consequent measures adopted by the United States, expectations are being formed regarding more stringent standards of prevention. As in the case of Article 5(1), however, precise mandatory standards do not yet exist.<sup>71</sup>

Article 24 of the Convention on the High Seas provides that "Every State shall draw up regulations to prevent pollution of the seas," not only by the discharge of oil from ships or pipelines, but also "resulting from the exploitation or exploration of the seabed and its subsoil. . . ." As elsewhere in the High Seas Convention, the meaning of "pollution" is left unclear.<sup>72</sup> The contemplated regulations need not prohibit the introduction into the sea of all pollutants, in the absence of known or

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Critical Environmental Problems, *op. cit.* note 51 above. The terms of Art. 5(1) are broad enough to encompass these effects. The *travaux*, cited above, do not rule out extension beyond direct fish-kills. It would be anomalous to construe Art. 5(1) to apply to fish-kills but not to the accumulation in edible fish of substances dangerous to man.

<sup>68</sup> Art. 5(1) also refers to non-interference with scientific research, omitting the word "unjustifiable." An attempt in the drafting stage to strike the word from the "navigation, fishing or conservation" provision was rejected. See 6 U.N. Conf. on the Law of the Sea 84-85, 90, U.N. Doc. A/CONF.13/42 (1958). See also *ibid.* 82, 88; I.L.C. Report, U.N. Doc. A/3159, 1956 I.L.C. Yearbook (II) 253, 299.

<sup>69</sup> *Ibid.*

<sup>70</sup> Hardy, *loc. cit.* note 2 above, at 331.

<sup>71</sup> The *travaux* relating to Art. 5(7) offer little help, since it was not in the I.L.C. draft.

<sup>72</sup> The Intergovernmental Oceanographic Commission of UNESCO has proposed a definition of marine pollution which could serve as a guide to interpretation, *mutatis mutandis*, in the absence of a more authoritative definition: "Introduction by man, directly or indirectly, of substances or energy into the marine environment (including estuaries) resulting in such deleterious effects as harm to living resources, hazard to human health, hindrance to marine activities including fishing, impairing the quality for use of sea water and reduction of amenities." Report on Long-Term and Expanded Programme of Oceanographic Research, U.N. Doc. A/7750, at 25 (1969). *Cf.* Report by the World Health Organization, Environmental Pollution and Its Control, U.N. Doc. E/4457, at 2 (1968).



scientifically postulated damage. To do so would be effectively to prohibit all seabed activities.<sup>73</sup> Some affirmative action is required, however, to prevent damage from ocean pollution. Protection would not be limited to the "living resources of the sea," as that phrase is used in the Convention on the Continental Shelf.<sup>74</sup> In a broad sense, the High Seas Convention reflects a community expectation that steps will be taken, in advance of proven damage, to prevent harm by pollution to man's interest in the marine environment.

Significant also is the General Assembly's 1970 Declaration of Principles Governing the Sea-Bed and the Ocean Floor, and the Subsoil Thereof, beyond the Limits of National Jurisdiction.<sup>75</sup> Regarding protection of the marine environment, it provides that:

With respect to activities in the [seabed] area and acting in conformity with the international regime to be established, States shall take appropriate measures for and shall co-operate in the adoption and implementation of international rules, standards and procedures for, *inter alia*: (a) The prevention of pollution and contamination, and other hazards to the marine environment, including the coastline, and of interference with the ecological balance of the marine environment; (b) The protection and conservation of the natural resources of the area and prevention of damage to the flora and fauna of the marine environment.

The Declaration is based on the precept that there is an area of the seabed that is *res communis*.<sup>76</sup> It is couched in mandatory terms, and was adopted without formal dissent. It looks toward the creation of an international regime, but enunciates a duty to take anti-pollution and conservation measures without conditioning the duty entirely on the acts of such an eventual regime. Taken as a whole it reads like a constitutional document, complete with carefully drawn exceptions.<sup>77</sup> Even if one were to consider it without regard to the existing conventions on the law of the sea, it might well be found to have a "quasi-legislative" character<sup>78</sup> achieved through the familiar legislative process of bargaining and compromise.<sup>79</sup>

<sup>73</sup> See Report of the Secretary General, *loc. cit.* note 5 above, at 112. Compare note 72 above.

<sup>74</sup> See I.L.C. Report, *loc. cit.* note 68 above, at 286.

<sup>75</sup> G.A. Res. 2749, par. 11, *loc. cit.* note 4 above, adopted by a vote of 108 to none, with 14 abstentions. The U.S. voted in favor. See 64 Dept. of State Bulletin 155 (1971).

<sup>76</sup> G.A. Res. 2749, *passim* and especially par. 1.

<sup>77</sup> It is considerably more legislative in tone than, for example, the Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space, G.A. Res. 1962, 18 U.N. GAOR Supp. 15, at 15, U.N. Doc. A/5515 (1963); 58 A.J.I.L. 477 (1964).

<sup>78</sup> See Falk, "On the Quasi-Legislative Competence of the General Assembly," 60 A.J.I.L. 782 (1966). Cf. D'Amato, "On Consensus," 8 Canadian Yr. Bk. Int. Law 104, 113-115 (1970). For discussion of the Declaration in the context of the existing conventions on the law of the sea, see text at note 82 below.

<sup>79</sup> See remarks by the Australian representative to the General Assembly's First Committee, U.N. Doc. A/C.1/PV.1777, at 26 (1970).

Given these circumstances, it seems clear that the Declaration—or, more accurately, the shared values it embodies—will influence the behavior of nations even before the creation of any international seabed regime, and will do so with greater force than that of a mere recommendation.<sup>80</sup> This is not to assert that it provides clear rules to be applied to all cases. For example, it is expressly applicable only to the ill-defined area “beyond the limits of national jurisdiction,” and it does not define such key terms as “pollution,” “hazards” and “marine environment.” But its restriction to areas beyond the limits of national jurisdiction is relevant primarily to the non-conservation provisions, such as those concerning the sharing of benefits from seabed exploitation. Moreover, conservation terms in the Declaration such as “ecological balance of the marine environment” have sufficient meaning to provide a standard for assertions of impermissibility in certain instances, as, for example, when scientific opinion indicates that given underwater activities are likely to interfere with the aquatic food chain. It is reasonable, therefore, to view the conservation provisions as an expression of community expectation that underwater activities, including those on the continental shelf, will be conducted with a genuine regard for at least those resources that are clearly part of the marine environment.<sup>81</sup>

It is important also to consider the Declaration in light of the conventions on the law of the sea. The term “appropriate measures” is the same as that used in Article 5(7) of the Convention on the Continental Shelf.<sup>82</sup> The reference to prevention of pollution in the seabed area meshes with Article 24 of the Convention on the High Seas.<sup>83</sup> The Declaration, however, encompasses a broader range of environmental interests to be protected. Its significance to the conventions appears to lie not primarily as an aid to their interpretation, but as a buttress to the argument that their underwater conservation provisions now reflect custom, whether or not they originally did, and however general the custom may be. The

<sup>80</sup> This is probable despite the view voiced by some representatives that the Declaration would not have binding legal effect. See U.N. Docs. A/C.1/PV.1777, at 27 (Australia); A/C.1/PV.1779, at 7 (Canada); *ibid.* 39–40 (Italy); A/C.1/PV.1788, at 28 (Belgium). Cf. statement by Mr. Amerasinghe, Chairman of the Committee on the Peaceful Uses of the Sea-Bed, U.N. Doc. A/PV.1933, at 99–100 (1970). Such views are accurate in the sense that the Declaration does not *ipso facto* become law upon adoption. Its legal effect is more subtle, but is likely to be felt even in the face of advance disclaimers. Cf. Schachter, “The Relation of Law, Politics and Action in the United Nations,” 109 Hague Academy, *Recueil des Cours* 165, 181–184 (1963); Higgins, “The United Nations and Lawmaking: The Political Organs,” 64 A.J.I.L. (Proceedings) at 37, 40–42 (1970).

<sup>81</sup> As a matter of common understanding, the marine environment would include the waters of the high seas and the seabeds. The Declaration provides that it also includes the coastline.

<sup>82</sup> See text at note 70 above. The Declaration may also provide a partial gauge of what is required to avoid “unjustifiable interference” with conservation, under Art. 5(1) of that convention. See text at note 65 above. The Declaration is relevant to the evaluation of conduct under the Continental Shelf Convention even though it asserts its coverage only for the seabed “beyond the limits of national jurisdiction.” See text following note 80 above.

<sup>83</sup> See text preceding note 72 above.

Declaration and the conventions are in fact synergistic, embodying similar values concerning environmental preservation, each strengthening the prescriptive authority of the others vis-à-vis all members of the world community.

The United States moved from participant to initiator in multinational seabed environmental practice with its proposal of detailed draft seabed treaty provisions concerning, *inter alia*, preservation of the marine environment.<sup>84</sup> The draft provisions warn that they do not necessarily represent the definitive views of the government. They are nevertheless noteworthy for their forthright statement of a duty to conduct all activities "with strict and adequate safeguards for the protection of . . . the marine environment,"<sup>85</sup> and for their contemplation of international machinery to formulate and prescribe specific rules designed to avoid marine damage.<sup>86</sup> The statement of the duty to conduct seabed activities with "strict and adequate safeguards" will inevitably play a part in the formulation of community assertions about permissible United States conduct (and of reciprocal United States assertions) before the advent of a convention on the subject. As in the case of all the seabed environmental measures we have considered, recognition of even such a general duty serves not only to counter any assertion of a right based on freedom of the seas to proceed without regard to environmental considerations, but also reinforces the normative expectation that seabed activities will not be undertaken at all without safeguards effective under the circumstances to prevent significant, reasonably foreseeable harm to the marine environment.

The United States draft treaty provisions and the U.N. Declaration are, of course, threads in a fabric of rapidly growing international concern over the effect of seabed activities on the marine environment. Additional manifestations involving the United States include consideration of the problem by the Legal Subcommittee of the U.N. Committee on Peaceful Uses of the Seabed and the Ocean Floor;<sup>87</sup> studies by the U.N. Secretariat on seabed pollution problems, including the legal aspects;<sup>88</sup> proposed consideration by the 1973 Conference on the Law of the Sea of ". . . the preservation of the marine environment (including . . . the question of

<sup>84</sup> See Draft of United Nations Convention on the International Seabed Area, 25 U.N. GAOR Supp. 21, Annex V, U.N. Doc. A/8021 (1970). Compare Draft Ocean Space Treaty (Malta), Arts. 58, 60, 72, 74, U.N. Doc. A/AC.138/53 (1971).

<sup>85</sup> U.S. Draft Art. 9. See also Draft Art. 22. "Marine environment" is not defined, an omission noted with some concern in Auburn, "The International Seabed Area," 20 Int. and Comp. Law Q. 173, 189 (1971). But see note 81 above.

<sup>86</sup> U.S. Draft Arts. 23, 68(1) (d) and (e).

<sup>87</sup> See, e.g., the Committee's Reports, 24 U.N. GAOR Supp. 22, at 31, U.N. Doc. A/7622 (1969); 1970 Report, *loc. cit.* note 45 above, at 7-11; Report of Subcommittee III, *op. cit.* note 28 above.

<sup>88</sup> See, e.g., Reports of the Secretary General: Study on International Machinery, *loc. cit.* note 5 above; The Sea: Prevention and Control of Marine Pollution, U.N. Doc. E/5003 (1971); Marine Pollution and Other Hazardous and Harmful Effects . . . , U.N. Doc. A/7924 (1970); Study on the Question of Establishing in Due Time Appropriate International Machinery. . . . , 24 U.N. GAOR Supp. 22, Annex II, U.N. Doc. A/7622 (1969).

pollution) . . . .";<sup>89</sup> sponsorship by the Intergovernmental Maritime Consultative Organization of a conference on marine pollution in 1973, and IMCO's exhortation to member states to apply effective control measures for preventing marine pollution;<sup>90</sup> and recognition of the pollution-avoidance aspect of the Treaty on the Prohibition of the Emplacement of Nuclear Weapons and other Weapons of Mass Destruction on the Sea-Bed and Ocean Floor and in the Subsoil Thereof.<sup>91</sup>

With increasing manifestations of concern come more stringent community expectations as to what interference is "justifiable" and what measures are "appropriate" under existing conventions. Their application would not necessarily be limited to oil-drilling activities. The cumulative effect of the practice and pronouncements reviewed above seems sufficient to generate expectations that protective measures will be adequate to prevent harmful consequences which may reasonably be anticipated even though they may not be fully understood. Such expectations may extend to conduct in other shared environments when the risk is comparable to that perceived in connection with seabed activities.

#### 4. Outer Space

In 1960 the United States announced its intention to place 350 million tiny needles in a short-lived orbit to determine their utility as relayers of military and other communications.<sup>92</sup> Despite opposition from such groups as the International Scientific Radio Union and the International Astronomical Union, the United States went ahead with the experiment. After an abortive first try, and after further international protests, orbit was achieved in 1963.<sup>93</sup> The protests appear to have been based in part on the assertion of a duty not to interfere with the activities of other states.<sup>94</sup>

Although the "space needles" apparently produced no lasting detrimental effect, the scientific community called for more thorough evaluation internationally before similar experiments were undertaken.<sup>95</sup> The United States indicated its willingness to enter into "appropriate international consultations before proceeding with a space activity if it had reason to believe that its activity may create a significant risk of harm."<sup>96</sup> The

<sup>89</sup> G.A. Res. 2750C, 25 U.N. GAOR Supp. 28, at 26, U.N. Doc. A/8028 (1970).

<sup>90</sup> See I.M.C.O. Res. A.176(VI), I.M.C.O. Assembly Resolutions and Other Decisions 124-25 (1969). For further discussion of proposed international action on marine pollution, see Hardy, *loc. cit.* note 2 above, at 337-344.

<sup>91</sup> See U.N. Doc. A/AC.138/SR.12, at 4 (1969) (remarks of the Soviet representative to the Seabed Committee). The treaty is not yet in force.

<sup>92</sup> See S. Doc. No. 56, 89th Cong., 1st Sess. 390, 396 (1965); R. Gardner, *In Pursuit of World Order* 216 (rev. ed., 1966).

<sup>93</sup> S. Doc. No. 56, *loc. cit.* See G. Gál, *Space Law* 146-147 (1969); Mouton, "The Impact of Science on International Law," 119 *Hague Academy, Recueil des Cours* 183, 238 (1966).

<sup>94</sup> See Darwin, "The Outer Space Treaty," 42 *Brit. Yr. Bk. Int. Law* 278, 281 (1967).

<sup>95</sup> For the formal statement of concern by the international scientific community, see *Statement on Belts of Orbiting Dipoles . . .* in S. Doc. No. 56, *op. cit.* note 92 above, at 396-397.

<sup>96</sup> Gardner, "Outer Space: Problems of Law and Power," 49 *Dept. of State Bulletin* 367, 369 (1963). *Cf.* *Treaty on Principles Governing the Activities of States in the Ex-*

space needles experiment has not been repeated. More significantly, the United States has abandoned a proposal to orbit a "space mirror," even though the National Research Council's Space Science Board found no overwhelming evidence that damage would result.<sup>97</sup> As in the case of the space needles, there appears to have been a military purpose for the experiment, this time involving the illumination of certain areas on the earth. The international scientific community feared that the reflection of sunlight could influence patterns of life on earth.<sup>98</sup>

A particularly serious challenge to the space environment has occurred in connection with high altitude nuclear explosions. The Starfish explosion by the United States in 1962 introduced a massive dose of electrons into a stable portion of the Van Allen magnetic belt. The result has been long-term disruption of natural phenomena and interference with scientific observations. This occurred despite advance assurances from American scientists that there would be no lasting influence on the earth's environment.<sup>99</sup> International response was vigorous, reflecting the conviction of many states ". . . that no interference with the natural state of the [outer space] environment in the name of scientific investigation . . . is tolerable even if no specific damage can be shown."<sup>100</sup> Nuclear explosions in space, of course, are now proscribed, at least among parties to the partial Test Ban Treaty.<sup>101</sup>

Concern about possible detrimental environmental effects of outer space activities has also focused on man's space explorations. The 1967 Outer Space Treaty contains a broad standard of environmental conduct:

States Parties to the Treaty shall pursue studies of outer space, including the Moon and other celestial bodies, and conduct exploration of them so as to avoid their harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extra-terrestrial matter and, where necessary, shall adopt appropriate measures for this purpose.<sup>102</sup>

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ploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, Jan. 27, 1967, Art. IX, (1967) 3 U.S.T. 2410, T.I.A.S. No. 6347, 61 A.J.I.L. 644 (1967) (parties have a duty to consult if they have reason to believe that their planned space activities "would cause potentially harmful interference with activities of other States Parties in the peaceful exploration and use of outer space . . ."). The treaty language is based on G.A. Res. 1962, par. 6, *loc. cit.* note 77 above, which was prompted in part by international reaction to the U.S. "space needles" experiment. See S. H. Lay and H. J. Taubenfeld, *The Law Relating to Activities of Man in Space* 189 (1970).

<sup>97</sup> See R. and H. J. Taubenfeld, *The International Implications of Weather Modification Activities* 50 (unpublished study for the Dept. of State Office of External Research, 1968).

<sup>98</sup> See Lovell, "The Pollution of Space," 79 *The Listener* 828, 830 (1968). Scientific objections to the space needles experiment were primarily concerned with the effect on astronomy. *Ibid.* 829. <sup>99</sup> *Ibid.* 829-830.

<sup>100</sup> R. and H. J. Taubenfeld, "Some International Implications of Weather Modification Activities," 23 *Int. Organization* 808, 828 (1969).

<sup>101</sup> Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and under Water, Art. I. *Loc. cit.* note 28 above.

<sup>102</sup> *Loc. cit.* note 96 above.

As in the case of explicitly formulated community standards concerning the ocean environment, the operative language is quite general. But it is not devoid of meaning.<sup>103</sup>

Two distinct environmental hazards are contemplated by the treaty: harmful contamination of outer space, including celestial bodies, and adverse changes in the environment of the earth.<sup>104</sup> Scientific attention has been directed to the former for some time. In 1964 a Consultative Group of the Committee on Space Research of the International Council of Scientific Unions (COSPAR) recommended that, for Mars and other planets where there is a chance that terrestrial life might be sustained, measures should be taken to reduce the probability of a single viable organism being aboard a landing craft to less than one in 10,000. For unsterilized fly-by the probability recommended was three in 100,000.<sup>105</sup> Conditions on the moon were thought sufficiently harsh to exclude the possibility of biological contamination of the surface, and less rigorous (as well as less specific) standards were thus recommended.<sup>106</sup> In 1966 COSPAR again considered these questions. It retained its commitment to the avoidance of planetary contamination, but refrained from enunciating standards such as those set forth by the Consultative Group in 1964. The rationale was that decisions on how to avoid contamination were best left to the nations involved.<sup>107</sup> The inference has consequently been drawn that the Outer Space Treaty does not incorporate the 1964 standards.<sup>108</sup> Such a conclusion seems inescapable.

Even though it may not be possible to postulate specific rules prescribed by the treaty, broadly recognizable standards seem to be evolving from U.S. practice. Thus it appears that the United States has accepted roughly the 1964 COSPAR standards for explorations in the vicinity of Mars, the planet most likely to sustain terrestrial life.<sup>109</sup> U.S. scientists made efforts before the first lunar landing to reduce the contamination effects of the landing, but there was some inevitable contamination from rocket exhaust and cabin leakage.<sup>110</sup> This probably was not "harmful contamination"

<sup>103</sup> Its significance with respect to U.S. lunar and interplanetary probes is explored below. In addition, it has been argued that the language would prohibit a repetition of the space needles experiment. See G. Gál, *op. cit.* note 93 above, at 154.

<sup>104</sup> See, generally, Brooks, "Legal Aspects of the Lunar Landings," 4 *Int. Lawyer* 415, 420-424 (1970); M. McDougal, H. Lasswell and I. Vlasic, *op. cit.* note 6 above, at 534-536.

<sup>105</sup> See Report of COSPAR Consultative Group on the Potentially Harmful Effects of Space Experiments, U.N. Doc. A/AC.105/20, Annex III, at 14-15 (1964); Brooks, *loc. cit.* note 104 above, at 421.

<sup>106</sup> See Report of COSPAR Consultative Group, *op. cit.* at 15-16.

<sup>107</sup> See Brooks, *loc. cit.* note 104 above, at 421.

<sup>108</sup> *Ibid.* 422.

<sup>109</sup> See Lovell, "The Dangers of Polluting the Planets," *The Times* (London), Feb. 10, 1969, at 9, col. 7; Johnson, "Pollution and Contamination in Space," in *Law and Politics in Space* 37, 45-46 (M. Cohen ed., 1964).

<sup>110</sup> See Brooks, *loc. cit.* note 104 above, at 422.

within the meaning of the treaty,<sup>111</sup> nor is it likely that contamination from more recent U.S. lunar expeditions has been "harmful."

United States practice therefore suggests that more stringent standards are applicable to exploration of planets with life-sustaining potentialities than to more hostile bodies such as the moon. It is doubtful that the 1964 COSPAR standards have attained normative status through U.S. practice,<sup>112</sup> but it does appear that the United States recognizes the need—and perhaps the duty—for rigorous sterilization procedures when the risk of biological contamination is substantial.

Relatively strenuous efforts were made to avoid adverse consequences for the earth's environment from the return of the first Apollo lunar missions. These efforts took the form of quarantine and testing procedures for astronauts and for the inanimate materials brought back with them. Nevertheless, some doubts about their adequacy were raised. It was questioned whether enough could be learned during a 21-day quarantine, and whether a sufficient degree of decontamination could be achieved, to insure against subtle and difficult-to-diagnose effects on complex biological-ecological earth systems.<sup>113</sup> Doubts have also been expressed about the propriety of venting command modules during descent toward earth, and about the manner of opening the hatch after splash-down.<sup>114</sup> United States decision-makers have not regarded these doubts as overriding. They have in fact determined that tests from Apollo missions have demonstrated the harmlessness of lunar materials, justifying discontinuance of the quarantine procedure.<sup>115</sup> It does not appear that there have been protests from foreign governments on any of these points.<sup>116</sup>

U.S. practice with respect to space activities does not extend to recognition of a requirement of abstention from all potentially harmful procedures until harmlessness is conclusively demonstrated. Nevertheless, the United States has observed a very considerable degree of caution in recent years. When the environmental risk has appeared greatly to outweigh the potential benefit, and has been brought home by forceful international

<sup>111</sup> The meaning of "harmful" has to be judged by reference to the uses to which the moon is to be put. See Brooks, *loc. cit.* These are not fully known as yet. One such use might be as a platform for astronomy, with which lingering exhaust gases could interfere. It is highly unlikely, however, that gases from lunar operations to date could affect such an eventual use.

<sup>112</sup> Soviet space probes apparently have not been conducted in accordance with the 1964 COSPAR standards. See Lovell, *loc. cit.* note 109 above, col. 6. Soviet authorities, however, have shown an awareness of the need to avoid space contamination. See G. Gál, *op. cit.* note 93 above, at 151; S. H. Lay and H. J. Taubenfeld, *op. cit.* note 96 above, at 189, note 43; U.S.S.R. Draft Treaty Concerning the Moon, Art. IV, U.N. Doc. A/C.1/L.568 (1971).

<sup>113</sup> Alexander, "Possible Contamination of Earth by Lunar or Martian Life," 222 *Nature* 432 (1969).

<sup>114</sup> See Brooks, *loc. cit.* note 104 above, at 423.

<sup>115</sup> See *New York Times*, April 29, 1971, at 43, col. 1. No viable organisms have been found in lunar materials. See Lunar Sample Preliminary Examination Team, "Preliminary Examination of Lunar Samples from Apollo 14," 173 *Science* 681, 691 (1971).

<sup>116</sup> Letter from Richard H. Campbell, Office of Space, Atmospheric and Marine Science Affairs, U.S. Department of State, to the author, June 3, 1971.

protests, as in the case of further high-altitude nuclear explosions or the proposed space mirror experiment, the United States has ultimately abstained. Moreover, its announcement in the aftermath of the space needles incident of an intention to consult internationally in advance, if it has reason to believe that its activity "may" create a significant risk of harm,<sup>117</sup> is an acknowledgment of a restraint that could enable non-participant states to influence the outcome by stressing their apprehension of environmental risks which might otherwise be brushed aside.<sup>118</sup> Recognition of the desirability of advance international consultations in the face of only a possibility that a significant risk will be created also tends to establish that such consultations are measures "appropriate" for avoidance of harmful contamination or adverse environmental change under the Outer Space Treaty.

##### 5. *Weather Modification and Analogous Practice*

Weather modification may result either from a deliberate attempt to change the weather (for example, by seeding clouds or by changing storm tracks) or inadvertently from activities conducted for other purposes (for example, the "greenhouse effect" of urbanization and industrialization). The discussion below will concentrate on deliberate weather modification and on inadvertent modification only insofar as it stems from the operation of jet aircraft.

Deliberate weather modification has aroused scientific concern focusing on the possible effects beyond the immediate geographic area in which modification is desired. The problem arises because of the complex (and not wholly understood) interaction among atmospheric processes which may often preclude effective confinement of atmospheric change to the intended area.<sup>119</sup> The more ambitious the weather modification attempt, the less predictable and more potentially serious are the unintended effects.<sup>120</sup> They may range from changes in immediate precipitation to relatively long-term climatic changes.<sup>121</sup>

<sup>117</sup> See text at note 96 above. Cf. statement of the U.S. Secretary of State, in the text at note 145 below.

<sup>118</sup> The announced criterion for consultations is broader than that in the outer space treaty. It is questionable whether the United States did much more than notify other states of its intention in advance of the space needles experiment. See E. Skolnikoff, *Science, Technology, and American Foreign Policy* 85-87 (1967). The announced willingness to consult presumably was intended as an assurance that something more than notification could thereafter be expected in comparable circumstances, though discretion was retained to determine whether an activity may create a significant risk.

<sup>119</sup> For non-technical descriptions of the pertinent atmospheric properties, see G. Trewartha, *An Introduction to Climate* 16-35 (4th ed., 1968); *Study of Critical Environmental Problems*, *op. cit.* note 51 above, at 41-46.

<sup>120</sup> See generally H. Lamb, *The Changing Climate* 154-156 (1966); National Science Foundation, *Weather and Climate Modification* 114 (1966); Roberts, "The State of the Art in Weather Modification," in *Weather Modification and the Law* 1, 16 (H. Taubenfeld ed., 1968); Wexler, "Modifying Weather on a Large Scale," 128 *Science* 1059, 1061-1063 (1958).

<sup>121</sup> There is a distinction between weather modification and climate modification. The latter involves an attempt to change long-term climatic conditions. See Wycoff,



The U.S. Department of State has acknowledged the need to abstain from intentional weather modification activities that might affect the weather of other countries, in the absence of advance agreements with them.<sup>122</sup> The announced rationale reflects the *raison d'être* for virtually any international norm limiting freedom of state action: "We won't want other nations modifying *our* weather, and so we will certainly have to accept some restraints on our freedom to modify theirs."<sup>123</sup> The harmony with the rationale for the creation and observance of custom does not establish that the norm exists. But it does suggest that the United States has not been exercising restraint entirely gratuitously, and thus lends normative significance to U.S. practice.

United States practice concerning deliberate weather modification has been consistent with a norm of restraint. Standards set for hurricane seeding projects take into account the interests of Caribbean and Atlantic islands, and reflect an understanding that hurricane seeding may produce unpredictable results.<sup>124</sup> Less ambitious modification projects sponsored by the Government have also carefully avoided any significant effects on neighboring countries.<sup>125</sup> The consistent practice, in light of the express recognition of mutual self-interest, suggests that a norm of restraint either exists or is in the process of formation. At the root of the norm is the uncertainty of the consequences, balanced against the expected utility of the activity.<sup>126</sup>

United States practice involving the use of jet aircraft has not been quite so circumspect. Tentative results from existing studies indicate that there may be some increase in cirrus (ice crystal) clouds in heavily traveled air lanes.<sup>127</sup> This could be the consequence of injections of water vapor from jet exhaust in the upper troposphere, where relative humidity is such that cloud formation is likely to result from moisture increases.<sup>128</sup> Cirrus clouds reflect both incoming solar radiation and outgoing earth radiation. They can therefore affect climate through changes in the at-

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"Evaluation of the State of the Art," in *Human Dimensions of Weather Modification* 27, 37 (W. Sewell ed., 1966).

<sup>122</sup> Department of State letter to Senator Magnuson, in Hearings on S.23 and S.2916 before the Senate Committee on Commerce, 89th Cong., 1st and 2d Sess., Pt. 2, at 321 (1965-1966). Note that the reference is to advance agreements, not simply to consultations.

<sup>123</sup> Cleveland, "The Politics of Outer Space," 52 Dept. of State Bulletin 1010 (1965) (emphasis in original).

<sup>124</sup> See Wollan, "Controlling the Potential Hazards of Government-Sponsored Technology," 36 G.W. Law Rev. 1105, 1117-1118 (1968); R. and H. Taubenfeld, *loc. cit.* note 100 above, at 811, note 7.

<sup>125</sup> See Hearings on S.23 and S.2916, *op. cit.* note 122 above, Pt. 1, at 237; *ibid.*, Pt. 2, at 405.

<sup>126</sup> Cf. M. McDougal and W. Burke, *op. cit.* note 27 above, at 792-793, noting the uncertain rôle of oceans in determining climate, and concluding that intentional interference with climatic conditions "would appear to be one activity which will be regarded as requiring the explicit agreement among states adversely affected." See also M. McDougal, H. Lasswell and I. Vlasic, *op. cit.* note 6 above, at 631.

<sup>127</sup> See Study of Critical Environmental Problems, *op. cit.* note 51 above, at 67.

<sup>128</sup> *Ibid.* 66.

mospheric heat balance.<sup>129</sup> Although nothing appears to suggest that current subsonic jet operations have yet had a significant effect on climate, scientists are concerned about future effects if there is a substantial increase in jet activity.

The United States, of course, is far from the only nation to operate commercial jet aircraft in the upper troposphere. The widespread international participation negates the existence of a general norm proscribing this commercial use of advanced technology in the *res communis* simply because it may ultimately have unintended and uncertain environmental side effects.<sup>130</sup>

This does not mean that all unintended environmental effects of commercial aviation have been ignored. For example, a significant step was taken by the Federal Aviation Administration in 1970 toward prohibiting sonic booms for commercial flights over the United States. This was done at a time when the United States' supersonic transport prototype production was still being funded by the Federal Government and when the prospect of supersonic operations involving United States territory and U.S. flag carriers seemed considerably more realistic than it did some months later. In the view of the F.A.A., "A restriction on sonic boom producing flights over populated areas is supported at this time by the inconclusive results of research concerning the effects of the sonic boom on the surface environment."<sup>131</sup> The "restriction" proposed was actually a prohibition, dictated by the uncertainty of the environmental effect of the sonic boom.<sup>132</sup>

Significant also is the Congressional refusal to provide further funds for SST development. The environmental motivations are not as easily isolated as in the case of measures designed to prohibit sonic booms, but it is clear that such considerations played a part and that members of the Congress were fully aware of the international environmental implications involved in going ahead. It does appear that the risk of climatic change (possibly global in scope) from sustained SST use in the stratosphere is substantially greater than from subsonic commercial operations in the troposphere.<sup>133</sup> This was brought out in Congressional committee hearings and was a major issue in the floor debates.<sup>134</sup>

<sup>129</sup> *Ibid.* 91-92, 99. Cf. 2 National Academy of Sciences-National Research Council, *Weather and Climate Modification: Problems and Prospects* 61 (1966); Report to the Chief, United States Weather Bureau, *Weather and Climate Modification* 7 (1965). An artificial increase in cirrus cloudiness might also stimulate local precipitation. See *Study of Critical Environmental Problems, op. cit.*, at 100.

<sup>130</sup> Compare the use of super-tankers at sea. See text at note 51 above.

<sup>131</sup> F. A. A. Notice of Proposed Rule Making, 35 Fed. Reg. 6189-6190 (1970).

<sup>132</sup> Other nations have also proposed to ban the sonic boom. See *The Times* (London), Sept. 15, 1970, at 1, col. 8; *New York Times*, Feb. 4, 1970, at 86, col. 5. If enough nations do so, a general principle relating to the boom might arise. Whether or not this occurs, the proposed U.S. restriction is particularly significant because of the rationale given for it.

<sup>133</sup> See *Study of Critical Environmental Problems, op. cit.* note 51 above, at 67-74, 100-107. The problem arises largely because the SST would introduce water vapor and particulate matter into the normally dry and cloudless stratosphere, where stable

Steps taken by the United States to restrict sonic booms and to halt governmental funding for the SST are domestic public acts involving internationally relevant policy. These decisions are consistent with U.S. practice in the area of intentional weather modification. They are capable of influencing expectations regarding United States use of new technology in the common environment—particularly in an environment not previously utilized extensively by man—when responsible scientific opinion is able to point out potentially severe environmental effects, even though the precise consequences are uncertain.<sup>135</sup>

### 6. Other Treaty Practice

The Antarctic Treaty prohibits the disposal of radioactive wastes in the Antarctic area, and foreshadowed the Nuclear Test Ban Treaty by prohibiting nuclear explosions in the area.<sup>136</sup> It is noteworthy that the prohibition of radioactive waste disposal and of nuclear explosions was inserted to meet the real but unverified environmental concerns of Southern Hemisphere nations.<sup>137</sup> A norm calling for abstention in a near-virgin environment was included in response to assertions which lacked a clear

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climatic conditions would impede the relatively rapid diffusion which occurs in the troposphere. The result could be temperature changes, increased cirrus cloudiness, and climate modification. Moreover, there is concern that SST water vapor and nitric oxides would decompose some stratospheric ozone, permitting increased solar ultraviolet radiation to reach the earth. See Report to the Secretary of the Interior of the Special Study Group on Noise and Sonic Boom in Relation to Man 50-52 (1968); Harrison, "Stratospheric Ozone with Added Water Vapor: Influence of High-Altitude Aircraft," 170 *Science* 734 (1970); Johnston, "Reduction of Stratospheric Ozone by Nitrogen Oxide Catalysts from Supersonic Transport Exhaust," 173 *ibid.* 517 (1971); Newell, "Water Vapour Pollution in the Stratosphere by the Supersonic Transporter?", 226 *Nature* 70 (1970). But see 2 National Academy of Sciences-National Research Council, *op. cit.* note 129 above, at 98-100; Chatham, "Will the SST Change the Weather?", 8 *Astronautics & Aeronautics* at 8 (Jan. 1970).

<sup>134</sup> See, e.g., Hearings on Economic Analysis and the Efficiency of Government before a Subcommittee of the Joint Economic Committee, 91st Cong., 2d Sess., Pt. 4, at 1000-1006 (1970); Hearings on Dept. of Transportation and Related Agencies Appropriations for 1971 before a Subcommittee of the Senate Committee on Appropriations, 91st Cong., 2d Sess., Pt. 2, at 1480-1486, 1586-1591 (1970); Senate debate, 117 Cong. Rec. S2461-62, 2636-37, 2702, 3092-97, 3504, 3629-32, 3820-57 *passim* (daily ed., March 4, 9, 12, 23, 24, 1971).

<sup>135</sup> Cf. Virally, *loc. cit.* note 24 above, at 130.

<sup>136</sup> Dec. 1, 1959, Art. V(1), (1961) 1 U.S.T. 794; T.I.A.S. No. 4780; 402 U.N.T.S. 71; 54 A.J.I.L. 477 (1960). The treaty does contain a caveat reserving the rights of any state under international law regarding the high seas within the Antarctic area. In view of the recognized restrictions on the right to conduct nuclear tests even before the Test Ban Treaty (see text at notes 26-27 above), the caveat would have only a limited effect on the nuclear explosion prohibition. This point is of more than academic importance, since not all parties to the Antarctic Treaty are parties to the Test Ban Treaty. Cf. Antarctic Treaty, Art. V(2). It is doubtful that there is a right to dispose of radioactive waste in the high seas of the Antarctic area, since other, less sensitive, disposal sites are available. Cf. text at notes 31-42 above.

<sup>137</sup> See H. Taubenfeld, "A Treaty for Antarctica" (International Conciliation No. 531), at pp. 243, 284-285 (1961).

showing of present or future environmental harm, but which evidenced a not wholly unwarranted concern on the part of interested states.

Noteworthy also is Article 25(2) of the Convention on the High Seas.<sup>138</sup> It provides that

All States shall cooperate with the competent international organizations in taking measures for the prevention of pollution of the seas or air space above, resulting from any activities with radioactive materials or other harmful agents.

It has been suggested that Article 25(2) provides no more than an admonishment to co-operate.<sup>139</sup> But the terms are clearly those of obligation rather than of admonishment, and this seems to be the general understanding of them.<sup>140</sup> Even in the absence of specific measures promulgated by "competent international organizations," the Secretary General took the position that the United States' disposal of nerve gas at sea in 1970 was contrary to its duty to co-operate imposed by Article 25(2).<sup>141</sup>

Finally, the Convention on Fishing and Conservation of Living Resources of the High Seas imposes a duty on member states

. . . to adopt, or to co-operate with other States in adopting, such measures for their respective nationals as may be necessary for the conservation of the living resources of the high seas.<sup>142</sup>

This appears to have been directed primarily at the problem of over-exploitation rather than pollution,<sup>143</sup> but the objective of conservation of resources is similar to that embodied in the other conventions on the law of the sea. Each reflects community expectations of restraint sufficient to avoid impairment of the utility of ocean resources to the community at large.

### III. SYNTHESIS

The discussion has dealt with a number of instances which provide specific precedents for the normative evaluation of future conduct. It has also emphasized principles which may be drawn from existing U.S. practice. It is important to go further in order to identify the extent to which the precedents and principles may lend order to claims and counterclaims regarding issues for which no direct or closely analogous precedent exists.

The clearest norm—and the most general—evident from U.S. practice concerns the impermissibility of undertaking new technological activities in the shared environment without regard for environmental preservation.

<sup>138</sup> *Loc. cit.* note 11 above.

<sup>139</sup> M. McDougal and W. Burke, *op. cit.* note 27 above, at 867.

<sup>140</sup> See Schachter and Serwer, *loc. cit.* note 5 above, at 95, 98, 104.

<sup>141</sup> See note 44 above; Brown, *loc. cit.* note 32 above, at 253-254. It is arguable also that Art. 25(2) obligates parties to implement the General Assembly's Declaration of Principles Governing the Sea-Bed, *loc. cit.* note 4 above, with respect to activities involving "harmful agents" on the seabed. See text at notes 75-83 above.

<sup>142</sup> April 29, 1958, Art. 1(2), (1966) 1 U.S.T. 138, T.I.A.S. No. 5969, 559 U.N.T.S. 285; 52 A.J.I.L. 851 (1958). See also *ibid.*, Art. 2.

<sup>143</sup> See I.L.C. Report, U.N. Doc. A/2934, 1955 I.L.C. Yearbook (II) 19, 28-29; 5 U.N. Conf. on the Law of the Sea 10, 98, U.N. Doc. A/CONF.13/41 (1958).

U.S. practice since the early years of nuclear weapons testing shows recognition of the need to consider environmental consequences to the *res communis* and acquiescence in the assertion of a duty to do so. This has sometimes culminated in loosely formulated treaty obligations, but even in the absence of treaty the cumulative effect has been to create the expectation that the United States will take environmental hazards into account. As the awareness of environmental danger has intensified, so have the preventive measures acknowledged by the United States to be appropriate. The result is an increasing level of international expectation regarding required precautions.

In addition, United States practice concerning space experiments, weather modification and munitions disposal at sea suggests the evolution of a duty to consult internationally before carrying out novel activities in the shared environment.<sup>144</sup> Moreover, the Secretary of State has declared that

. . . perhaps it is time for the international community to begin moving toward a consensus that nations have a right to be consulted before actions are taken which could affect their environment or the international environment at large. This implies, of course, that nations contemplating such actions would be expected to consult in advance other states which could be affected.<sup>145</sup>

This statement is noteworthy in several respects: it uses the language of rights and obligations; it applies not just to the environment of individual states, but to the environment at large; and it contemplates a duty to consult states which merely "could" be affected. The very suggestion by a United States Secretary of State that the international community move toward consensus in requiring consultations, much of the burden of which would fall on the United States, constitutes a significant step in the direction of a new binding norm.

On the question of abstention from potentially harmful conduct, it is possible to characterize practice involving the United States in cost-benefit terms. All technological developments may be considered to involve potential marginal benefits and costs not only for the developer but for the world community. Marginal benefits and costs represent the increment beyond the total benefits and costs already imparted by existing technology. Ideally the international legal system would be able to measure the marginal benefits to the world community of any new technological development, set them off against the marginal costs (including the potential cost to the shared environment), and would give normative approval only to those projects for which the marginal benefits outweigh the costs. But marginal benefits and costs obviously would not be susceptible of precise measurement in most cases. Nor does U.S. practice suggest that any such

<sup>144</sup> See text at notes 96 and 122 above. The United States consulted "concerned" nations before the 1970 nerve gas disposal at sea, though it did so only 19 days before the disposal. See Brown, *loc. cit.* note 32 above, at 252. Not all states consulted were opposed to the disposal. See, e.g., 18 Keesing's Contemporary Archives 24386 (Jan. 9-16, 1971).

<sup>145</sup> Rogers, "U.S. Foreign Policy in a Technological Age," 64 Dept. of State Bulletin 198, 200-201 (1971).

precise measurement has been attempted. U.S. practice does suggest, however, that a very rough and inexact marginal cost-benefit rule of thumb may be utilized to evaluate the legitimacy of conduct in certain cases. The rule of thumb provides a rationale for much of the U.S. practice, although its usefulness as an authoritative standard for the resolution of concrete cases for which no precedent exists is probably limited at present to relatively extreme situations.<sup>146</sup> Its rôle will be apparent from a brief examination of cost-benefit criteria suggested by existing practice.

The views of national decision-makers concerning the legitimacy of proposed action in the common environment by another state will take account of any perceived marginal benefits not only to the decision-maker's state, but to the world community at large. Thus, for example, assertions based on environmental doubts about the use of oil super tankers have recognized their utility to the world community and have not challenged the right to use them. The assertions have instead focused on measures to reduce the risks from their use. Similarly, there is general recognition of "spillover" technological benefits for the world community from outer space activities,<sup>147</sup> and non-participant states have not strongly asserted any obligation to refrain from such activities except when a particular proposal has appeared to pose a severe challenge (high marginal cost) to the space environment.

More difficult is the problem of the weight given to marginal benefits which appear to accrue primarily to the acting state. It cannot be said that the precedents permit such parochial benefits to be entirely discounted in the normative process, at least insofar as they concern national interests deemed by the acting state to be vital. Atmospheric nuclear weapon testing by states not bound by prohibitory treaty obligation has withstood normative attack so long as the perceived national security benefits from continued testing have remained substantial. Similar considerations, though not quite so overtly military in nature, surround the "space race" and inhibit the development of prohibitory norms. It is significant, however, that the United States has recognized the need for rather elaborate precautions against planetary and terrestrial contamination from space activities, and on at least one occasion, when marginal cost appeared to exceed a rather slight marginal benefit (the space mirror experiment), the United States canceled its planned action.

To say that national security considerations must be taken into account is not to say that they are determinative. Nothing in United States practice has gone that far. When the environment-endangering activity is not vital for national security, as eventually became the case for the United States and the Soviet Union regarding atmospheric testing and as is the

<sup>146</sup> As with cost-benefit theories in economics, much of the utility of such a formulation lies in sharpening the issues rather than in definitively resolving them. Cf. J. Buchanan, *The Public Finances* 141-142 (rev. ed., 1965).

<sup>147</sup> For a summary of some of the shared technological benefits, see Sloop and Adams, "The Aerospace Stimulus to Technological Advance," in *1 Space Exploration and Applications* 36, U.N. Doc. A/CONF.34/2, Vol. I (1969). Other papers presented at the same conference, in *ibid.*, Vols. I and II, discuss the benefits in some detail.

case with respect to ocean dumping of obsolete munitions, any remaining national security interest is clearly not conclusive. Nevertheless, it must be conceded that the significance ascribed to the activity by the acting state must be given considerable weight if the activity has a reasonable connection with national security and does not violate other recognized international norms.

On the cost side, it is clear that proven environmental damage must be considered in assessing the legitimacy of acts involving the common environment.<sup>148</sup> The real question involves unproven but reasonably feared environmental damage. United States practice, after having indicated some reluctance to consider unproven damage, has now evolved into a rather clear recognition of a duty to take account of it, and even to abstain from proposed action if the damage could be serious and if available safeguards do not give substantial assurance of safety. Instances include U.S. acquiescence in Mexican protests against disposal of radioactive waste in the Gulf of Mexico; abandonment of U.S. licensing for sea disposal of radioactive wastes; announcement of the intention to abstain from further sea disposal of obsolete munitions; restraint in the field of weather modification, in the absence of agreement from countries likely to be affected; and the announced rationale for the proposed prohibition of the sonic boom over the United States. In none of these cases has actual or potential environmental damage been clearly established, though in each case reasonably held apprehensions of harm exist and have been made known to U.S. decision-makers.

Advance recognition of unproven environmental harm has been particularly evident in connection with activities proposed to be undertaken in environments newly accessible (or newly of sustained interest) to man. This has developed into loosely formulated, but nevertheless significant, treaty obligations dealing with the continental shelf, outer space and Antarctica. It may also become a treaty obligation in the case of the deep seabed. Significantly, even in the absence of such a treaty involving the seabed, community expectations have been articulated in the General Assembly's declaration of a duty to take measures for the preservation of the marine environment. It is apparent that technology users are expected to give special weight to potential environmental costs of activities which probe into unknown or inadequately understood surroundings.

Marginal cost appraisal must consider the availability of reasonable alternatives to direct use of the shared environment. Some activities, such as space explorations, cannot be conducted elsewhere. Others, such as disposal of waste, could be. Thus, expectations of abstention regarding substantial U.S. disposal of radioactive wastes at sea may exist without necessarily extending to controlled disposals by countries lacking sufficient territory for safe underground burial. It cannot confidently be said, however, that this caveat will continue to exist. Pressures for outright treaty prohibition will be great. Even in the absence of explicit treaty prohibition, the virtually complete United States acquiescence in assertions deny-

<sup>148</sup> See the Trail Smelter Case, *loc. cit.* note 7 above.

ing the legitimacy of sea disposal is likely to engender rising expectations of abstention applicable to smaller states.

#### IV. CONCLUSION: UTILITY OF THE COST-BENEFIT APPROACH

Practice involving the United States has carried beyond the limiting *Trail Smelter* standard of "clear and convincing evidence" of injury. No such standard of persuasion must be met before expectations of abstention arise. It is difficult to draw from U.S. practice a precise standard, but the trend is toward reversing the burden of persuasion (*i.e.* toward requiring a showing that marginal benefits will exceed marginal costs) when novel technology is involved.<sup>149</sup> Clearly, this applies not only to activities directly undertaken by the state or conducted within its territory, but also to activities conducted in the shared environment by those subject to its control.

As has been indicated, however, substantive principles distilled from U.S. practice will not serve to provide unimpeachable answers to contested legitimacy of proposed action in many cases for which no direct precedent exists.<sup>150</sup> Nevertheless they provide a basis for rational assertion and counter-assertion when environmental interests are at stake. They may thus assist in the development of specific rules, such as that which appears to be evolving in connection with the dumping of obsolete munitions at sea, and in the negotiated settlement of disputes as new claims to use the common environment arise.<sup>151</sup>

No one would contend that custom, even if it were well developed, could provide an adequate basis for international regulation of technology.<sup>152</sup> But the necessary international institutions cannot be built in a vacuum.

<sup>149</sup> See the instances mentioned in the text following note 148 above, and the U.S. position regarding ocean dumping of municipal and industrial wastes, in the text at note 50 above. *Cf.* Second Annual Report of the Council on Environmental Quality 259-260 (1971). Similar perspectives seem to be developing within the O.E.C.D. See *The Observer* (London), Oct. 17, 1971, at 2, col. 1. But see S. H. Lay and H. J. Taubenfeld, *op. cit.* note 96 above, at 191 (*re* space activities).

<sup>150</sup> General standards, however, have been thought dispositive of concrete issues in extreme cases in other fields. See, *e.g.*, I. Brownlie, *International Law and the Use of Force by States* 111 (1963) (broad pre-1939 norm that offensive use of force was illegal).

<sup>151</sup> It will be instructive to see whether these principles harden into a specific norm regarding sustained use of supersonic commercial aircraft in the stratosphere. In the absence of further scientific assurances of environmental safety, the potential marginal costs (in terms of possible alteration of natural conditions, from activity in an environment heretofore relatively free from the sustained presence of man) seem clearly to outweigh the marginal benefits. See note 133 above.

<sup>152</sup> The inability of existing international norms to provide a cohesive regulatory system for the use of the fruits of technology lies behind such extensions of domestic jurisdiction as the Canadian Arctic Waters Pollution Prevention Act. See documents collected in 9 *Int. Legal Materials* 543-552, 598-615 (1970); Bilder, "The Canadian Arctic Waters Pollution Prevention Act: New Stresses on the Law of the Sea," 69 *Mich. Law Rev.* 1 (1970); Hardy, *loc. cit.* note 2 above, at 328-330; Macdonald, Morris and Johnston, "The Canadian Initiative To Establish a Maritime Zone for Environmental Protection: Its Significance for Multilateral Development of International Law," 21 *Toronto Law J.* 247 (1971).



One would hope that an identification of principles which run through the practice of such a technology-rich nation as the United States may be useful to the vital process of developing workable rules by and for the new institutions. To the extent that those who create and shape them are able to draw on a consensus of existing expectations based on the give-and-take of international affairs, the institutions stand an improved chance of success.