POLLUTION OF THE SEA

While man no longer believes in alchemy, he has not entirely abandoned the notion that the sea has mystical abilities to transmute garbage into the gold of valuable resources. Fortunately, the notion that waste products will not adversely affect man or the marine environment is yielding to concern about the real possibility of significant marine pollution.[1]

Today the sea is being used increasingly not only for recreation[2] and as a source of minerals and other products,[3] but also as a source of food.[4] Indeed, because of the growth of world population and the relative decline in agricultural production in many countries,[5] the sea may provide the primary source of food in the future.[6] Therefore, the importance of the sea requires adequate regulation and control of the introduction of harmful pollutants.

In discussing legal devices to control pollution of the sea, two analytical approaches are possible. One approach, often followed in studies of pollution of international rivers and basins[7] and to a lesser extent in studies of

---

[1] For a nontechnical book on the threat man poses to the marine environment, see W. MARX, THE FRAIL OCEAN (1967).

[2] In California, for example, "[t]he demand for marine recreation . . . has been increasing, and will probably continue to increase, at a rate greater than the rate of population growth." UNIVERSITY OF CALIFORNIA, CALIFORNIA AND THE USE OF THE OCEAN, A PLANNING STUDY OF MARINE RESOURCES 5–5 (1965).

[3] Rakestrau, *Mineral Resources of the Ocean,* in WORLD POPULATION AND FUTURE RESOURCES 161 (P. Hatt ed. 1952).

[4] Several nations at present depend on fish as a primary source of protein. In Asia, especially Japan and Thailand, and in the Arctic, 80 percent of the meat protein is supplied by fish. McKernan, *Fisheries and Oceanography,* in OCEAN SCIENCES 203 (E. Long ed. 1964).

[5] Over 50 percent of the present population of the world is under- or malnourished. But a recent study is moderately optimistic about the theoretical capacity of agriculturally backward nations to produce enough food in the future. It does recognize, however, that production "depend[s] primarily upon the establishment of progressive and stable governments that are willing and able to mobilize their own resources and make effective use of foreign aid." FOOD & AGRIC. ORGANIZATION, POSSIBILITIES OF INCREASING WORLD FOOD PRODUCTION 222 (FFHC Basic Study No. 10, 1963). *See also* FOOD & AGRIC. ORGANIZATION, POPULATION AND FOOD SUPPLY (FFHC Basic Study No. 7, 1962); FOOD & AGRIC. ORGANIZATION, SIX BILLIONS TO FEED (World Food Problems No. 4, 1962).

[6] "There is a rich source of food in the sea for the rapidly increasing world population. Seafoods have a great potential . . . for the world's basic food supply . . . .

"Almost two-thirds of the people of the world live in the developing nations. In many of these countries, the per capita diets are deficient in both quantity and nutritional value. The nutrient most commonly lacking in these diets is animal protein. Fish could supply an inexpensive, yet nutritionally complete animal protein. At present and increasingly in the near future, the world needs to fully utilize all its marine and fresh water food resources." Green, *The Potential and Problems of Food Harvest from the Oceans,* 30 J. MILK FOOD TECHNOLOGY 366 (1967).

[7] Lester, *River Pollution in International Law,* 57 AM. J. INT'L L. 828 (1963); Van Alstyne, *International Law and Interstate River Disputes,* 48 CALIF. L. REV. 596 (1960).

marine pollution,[8] focuses on the theoretical legal rights, duties, and obligations of nations arising from potential pollution situations.[9] This approach is excellent in the abstract and is useful in establishing a general theory of international liability for pollution, but it is less helpful in devising controls for specific pollutants which are often amenable only to individual regulation and control.[10] Because of this defect, the approach adopted in this chapter is to discuss the specific pollutants affecting the marine environment and their control. These pollutants are oil, radioactive waste, and the various wastes resulting from industrial, municipal, and agricultural activities carried out on land. This last category includes pollutants (sewage, industrial waste, and waste heat) directly introduced into the sea and pollutants (primarily pesticides)[11] flowing indirectly into the sea from the land.

The law of the sea and the scope of domestic maritime jurisdiction are also compelling reasons for discussing control of marine pollution in terms of the individual pollutants. The sea has been "divided" by custom and by treaty into three, often overlapping, zones.[12] The degree of control a state may exercise differs in each of the zones. Because a coastal state is so intimately connected with the territorial sea, it may assert almost complete jurisdiction over it, if not include it within national boundaries.[13] In most cases, therefore, a coastal state may exercise control over all activities in the territorial sea, subject to certain exceptions such as the right of innocent passage.[14] Adjacent to the territorial sea is a belt in which a coastal state has only a limited ability to assert jurisdiction in certain situations. These situations include the prevention of customs, fiscal, immigration, or sanitary vio-

[8] Manner, *Water Pollution in International Law,* in UNITED NATIONS ECONOMIC COMM'N FOR EUROPE, CONFERENCE ON WATER POLLUTION PROBLEMS IN EUROPE 446 (U.N. Doc. ECE/Water Poll./Conf./12, 1960) [hereinafter cited as Manner, *Water Pollution*]; Manner, *Some International Legal Aspects of the Enclosed Seas, Especially the Baltic Sea, with Regard to Their Protection Against Pollutive Agents,* in 1 INT'L ATOMIC ENERGY AGENCY (IAEA), PROCEEDINGS OF THE SCIENTIFIC CONFERENCE ON THE DISPOSAL OF RADIOACTIVE WASTES, MONACO 591 (1960).

[9] Potential situations include pollution by one coastal nation of the territorial waters and contiguous zone of another state; pollution by one state of the fishing grounds of a nonadjacent state; and pollution which originates on the high sea and which pollutes the territorial waters of a coastal state.

[10] Although Manner adopted the theoretical approach, he recognized that "in the absence of specific rules it may . . . be difficult to determine in practice what kind of pollution should be regarded as prohibited . . . ." Manner, *Water Pollution* 470.

[11] Although sewage, industrial waste, and waste heat also flow indirectly into the sea, pesticides are perhaps the most lethal in this category.

[12] *See* Convention on the Territorial Sea and the Contiguous Zone, adopted by the United Nations Conference on the Law of the Sea, April 27, 1958 (U.N. Doc. A/Conf. 13/L. 52). [The proceedings and conventions of the Conference on the Law of the Sea are contained in UNITED NATIONS CONFERENCE ON THE LAW OF THE SEA, OFFICIAL RECORDS (7 vol.) (U.N. Doc. A/Conf. 13) (1958). Hereinafter conventions adopted by the Conference will be cited to the appropriate volume and page of the OFFICIAL RECORDS.] *See also* Convention on the High Seas, adopted by the United Nations Conference on the Law of the Sea, April 26, 1958, 2 OFFICIAL RECORDS 135.

[13] For theories on the nature of the territorial sea, see 1 D. O'CONNELL, INTERNATIONAL LAW 533–35 (1965).

[14] *See* M. MCDOUGAL & W. BURKE, THE PUBLIC ORDER OF THE OCEANS 174–304 (1962) [hereinafter cited as MCDOUGAL & BURKE].

lations.[15] The high sea beyond these two zones is categorized in one of two ways. It is *res communis*—it belongs to all nations—or *res nullius*—it belongs to none. Under both theories, however, no state may assert sovereignty and jurisdiction over the high sea or may "proscribe its use to other states."[16]

The zones of the sea are of more than theoretical interest, especially in respect to the control of marine pollution. National and international methods of solution are dictated by the nature of each pollutant and its point of origin. A state may be less able, for example, to control unilaterally pollution originating on the high sea than it is to control pollution stemming from domestic industrial activities, because jurisdiction is more difficult to assert in the former case than in the latter. A state cannot devise adequate legal measures without taking into consideration individual pollutants. Some pollutants emanate only from vessels at sea, others flow indirectly into the sea via rivers, and still others are directly discharged into the sea. Regulations must be attuned to the precise nature and point of origin of each pollutive agent.

I. Definition of Pollution

Before discussing the legal controls, it is first necessary to define marine pollution in general terms, for the "concept of pollution is obviously the starting point of any legislation and an essential consideration both for those who must comply with the legal provisions and for the administrative authorities which have to enforce them."[17] Definitions of pollution may vary from any alteration of the natural water quality to injury to beneficial uses. Marine pollution may be best defined as any alteration of the marine environment which causes harm to man or which detrimentally alters any of the products, resources, or marine life beneficially used by man. Beneficial uses should be given a broad interpretation to include not only such uses as commercial fishing but also aesthetic values.[18]

---

[15] Article 24 of the Convention on the Territorial Sea and the Contiguous Zone provides in part:

"1. In a zone of the high seas contiguous to its territorial sea, the coastal State may exercise the control necessary to:

a) Prevent infringement of its customs, fiscal, immigration or sanitary regulations within its territory or territorial sea;

b) Punish infringement of the above regulations committed within its territory or territorial sea."

2 Official Records 135. *See also* McDougal & Burke 565–729.

[16] C. Colombos, The International Law of the Sea 48 (1967).

[17] J. Litwin, Control of River Pollution by Industry 27 (1965).

[18] In California, for example,

"Beneficial use of the water resources of the state is that use of water that is, in general, productive of public benefit, which promotes the peace, health, safety, and welfare of the people of the state.

1. Beneficial uses of the waters of the state that may be protected against damage resulting from quality degradation include but are not necessarily limited to:

a. domestic and municipal supply;

b. agricultural supply;

c. industrial supply (including power generation);

d. propagation, sustenance and harvest of fish, aquatic life (including shell fish) and wildlife;

There are three reasons which compel definition of marine pollution only in terms of injury to beneficial uses. First, pollutants which are unavoidable byproducts of modern industrialization must be safely disposed of to prevent harm to man. One means of disposal is to use the sea's great assimilative capacity for wastes. Use of the sea as a receptacle for wastes will doubtless alter the natural marine environment. But in view of the benefit derived from disposing of wastes in the sea, mere alteration of the environment should not be the primary concern of pollution legislation. Rather, pollution legislation can only usefully serve to prevent those alterations which are injurious to beneficial uses. If the maximum permissible level of waste introduction were at a point lower than the threat or occurrence of injury to beneficial uses, regulations would be imposed without attendant injury and there would be a loss of the full waste-absorption capacity of the sea. Viewed in this perspective, pollution only becomes a problem when a beneficial use is threatened or injured. "Unless the introduction of extraneous matter so unfavorably affects such use, the condition is short of pollution. In reality the thing forbidden is the injury. The quantity introduced is immaterial."[19]

Second, pollution legislation, particularly in the United States, has been designed to protect the beneficial uses of national waters. Thus any definition of pollution other than that which is commonly accepted would conflict with the prevalent legal and legislative provisions. Under the Federal Water Pollution Control Act[20] pollution is not defined. Rather, the states are left to develop pollution laws which can be tailored to the needs of particular areas and waters.[21] The Act, however, does require the Secretary of the Interior to develop a comprehensive pollution control program in which "due regard shall be given to the improvements which are necessary to conserve . . . waters for public water supplies, propagation of fish and aquatic life and wildlife, recreational purposes, and agricultural, industrial, and other legitimate uses."[22]

The Suggested State Water Pollution Control Act,[23] which has formed the basis of many state water pollution acts,[24] defines pollution in terms of deleterious effects on beneficial uses.

> "Pollution" means such contamination, or other alteration of the

---

e. recreation;
f. esthetic enjoyment;
g. navigation."

State Water Resources Control Board, Statewide Policy for the Control of Water Quality art. I, § E (Dec. 18, 1967).

[19] Wilmore v. Chain O'Mines, Inc., 86 Colo. 319, 331; 44 P.2d 1024, 1029 (1934).

[20] 33 U.S.C. § 466 (1964), *as amended,* (Supp. II, 1965–1966).

[21] 33 U.S.C. § 466g (b) (Supp. II, 1965–1966).

[22] 33 U.S.C. § 466a(a) (Supp. II, 1965–1966).

[23] U.S. DEP'T OF THE INTERIOR, FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, SUGGESTED STATE WATER POLLUTION CONTROL ACT, REVISED (rev. ed. 1965) [hereinafter cited as SSWPCA].

[24] "The Suggested State Water Pollution Control Act, developed in 1950 and recommended for adoption by the States, has contributed significantly to their efforts—to the extent that the laws of approximately three-fourths of the States include all or part of its provisions." *Id.* at v.

> physical, chemical or biological properties of any waters of the State . . . as will or is likely to . . . render such waters harmful, detrimental or injurious to public health, safety or welfare, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses . . . .[25]

Many states have adopted legislation similar to the SSWPCA. In New York pollution is not defined, but a classification system of waters, including a "marine district," has been adopted.[26] The system, based upon the uses to which the waters are put, requires that the Water Resources Commission classify all waters in accordance with their best beneficial use.[27] In California, the definition of pollution is also based upon the beneficial uses of state waters, but it is ambiguous in terms of its applicability to the coastal marine waters.

> "Pollution" means an impairment of the quality of the waters of the state by sewage or other waste which does not create an actual hazard to the public health but which does adversely and unreasonably affect such waters for domestic, industrial, agricultural, navigational, recreational or other beneficial use, or which does adversely and unreasonably affect the ocean waters and bays of the state devoted to public recreation.[28]

The definition could be interpreted as limiting the coverage of the statute vis-à-vis marine pollution to areas devoted to recreation. Conceivably, changes could occur to beneficially used marine life in areas not devoted to recreation, and a narrow interpretation of the definition would lead to the conclusion that these changes are not pollution. This position, however, seems untenable in view of the stated goal of pollution legislation in California: to protect the "beneficial uses of all receiving waters, saline as well as fresh."[29] The main obstacle in accepting the applicability of the beneficial use definition to marine waters is that it would lead inescapably to the conclusion that the last phrase of the California legislation is superfluous. If beneficial uses of all waters are to be protected, then clearly any injury to marine recreation would be pollution. But in view of the stated goal of pollution legislation, the best interpretation of the statute is that any alteration of beneficial uses of a marine area in California not devoted solely to recreation must be considered pollution proscribed by law.

Third, international law may be interpreted as imposing liability for extraterritorial damage only in cases of injury to beneficial uses. The *Trail Smelter*

[25] SSWPCA § 2(a). It is interesting to note that the Polish Code of 1962 defines pollution similarly to the SSWPCA. Litwin states that Poland "considers that any waters have been harmfully polluted if they have been altered physically, chemically, or biologically by the discarge of excessive quantities of solid, liquid, gaseous, radioactive, or other substances, so as to be unfit for normal domestic, industrial, agricultural, piscatory, or other utilization." J. LITWIN, *supra* note 17, at 28.

[26] N.Y. PUB. HEALTH LAW §§ 1202, 1205 (McKinney Supp. 1967).

[27] N.Y. PUB. HEALTH LAW § 1209(2) (McKinney 1954).

[28] CAL. WATER CODE § 13005 (West Supp. 1967).

[29] CALIF. STATE WATER POLLUTION CONTROL BOARD, MARINE WASTE DISPOSAL RESEARCH PROGRAM 11 (Pub. No. 22, 1960).

case,[30] which involved extraterritorial air pollution, has been the leading precedent for state-to-state liability for injurious water pollution[31] and can be interpreted as imposing a duty upon nations to prevent injuries to the beneficial uses of waters of neighboring states. The case involved a claim against Canada by the United States for damage to property in the State of Washington through the emission of noxious sulphur dioxide fumes by a Canadian smelting company. Because Canada assumed liability for the damage, the only issues to be resolved by the arbitral tribunal were the extent of the damage, the indemnity to be paid therefor, and the permissible scope of future smelting operations.[32] Liability was not an issue, but the tribunal stated as a general rule "under the principles of international law, as well as 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 . . . when the case is of serious consequence . . . ."[33] The meaning of "serious consequence" must be found in injury to beneficial uses. Injury in the legal sense (in cases in which absolute liability is not imposed) means damage to something useful. If it were otherwise, international law would be breached any time one state altered the natural quality of waters of neighboring states. In light of the increased use of the sea as a waste depository and the likelihood of some alterations in the marine environment, imposition of international liability for alteration without injury is manifestly absurd. The best policy is to allow under international law alteration of the marine environment up to the point at which injury to the uses of the sea occurs.

The *Trail Smelter* case is weighty precedent in the international law of pollution, but several factors reduce its impact. First, the opinion of the tribunal with respect to the international liability was not warranted by the facts of the case. Canada assumed liability, making the independent judgment of liability dictum. Second, assuming arguendo that the opinion concerning liability was appropriate, it was based, not upon an interpretation of customary international law, but rather upon principles derived from analogous municipal situations involving states of national federations. Cases of the United States Supreme Court in air and water pollution controversies primarily among the states[34] and cases from the Swiss Federation[35] formed the basis

[30] Trail Smelter Arbitral Tribunal, 35 AM. J. INT'L L. 684 (1941). For a discussion of the case, see Kuhn, *The Trail Smelter Arbitration—U.S. and Canada,* 32 AM. J. INT'L L. 785 (1938); Read, *The Trail Smelter Dispute,* 1 CAN. Y.B.I.L. 213 (1963).

[31] Lester, *supra* note 7, at 836; M. MCDOUGAL, LAW AND PUBLIC ORDER IN SPACE 628 (1964); Hardy, *International Protection Against Nuclear Risks,* 10 INT. & COMP. L.Q. 739, 751 (1961); Manner, *Water Pollution* 447; Margolis, *Hydrogen Bomb Experiments and International Law,* 64 YALE L.J. 629, 642 (1955).

[32] Trail Smelter Arbitral Tribunal, 35 AM. J. INT'L L. 684, 686 (1941).

[33] *Id.* at 716.

[34] Missouri v. Illinois, 200 U.S. 496 (1905); Georgia v. Tennessee Copper Co., 206 U.S. 230 (1906); New York v. New Jersey, 256 U.S. 296 (1920); New Jersey v. New York, 283 U.S. 473 (1931). The tribunal also relied on a case involving diversion of waters. Kansas v. Colorado, 185 U.S. 125 (1901).

[35] Trail Smelter Arbitral Tribunal, 35 AM. J. INT'L L. 684, 714 (1941).

of the determination of international liability.[36] The use of municipal law to decide international legal questions has never been an accepted practice. In its judgment in *Certain German Interests in Polish Upper Silesia,*[37] the Permanent Court of International Justice articulated the relationship between municipal law and international law:

> From the standpoint of International Law and of the Court which is its organ, municipal laws are merely facts which express the will and constitute the activities of States, in the same manner as do legal decisions or administrative measures.[38]

Thus, an analogous situation in municipal law and international law does not of itself warrant incorporation of municipal law into the body of international law. "The existence of rules of municipal law . . . is no proof of the existence . . . of rules of customary international law having an identical content."[39] But despite the fact that the determination of liability in the *Trail Smelter* case did not entirely rest upon sound international legal foundations, it has become precedent for control of all forms of extraterritorial pollution. This has been achieved by virtue of its acceptance by most leading scholars.[40]

Other sources of international law lend support to the position that injuries to the beneficial uses of waters in another state are not permissible. These sources stem largely from international river pollution. The *Institut de Droit International* at its 1911 Madrid conference adopted a resolution prohibiting injurious alteration of international rivers: "All alteration injurious to the water, the emptying therein of injurious matter (from factories, etc.) is forbidden."[41] The Declaration of the Pan American Conference of 1933 concerning the Industrial and Agricultural Use of International Rivers[42] limited the pollution of rivers to injurious alteration.

> [N]o State may, without the consent of the other riparian State, intro-

---

[36] Following its determination of international liability, the tribunal stated "[t]he decisions of the Supreme Court of the United States . . . are the basis of these conclusions . . . ." *Id.* at 716. Earlier in the decision the tribunal stated:

"There are, . . . as regards both air and water pollution, certain decisions of the Supreme Court of the United States which may legitimately be taken as a guide in this field of international law, for it is reasonable to follow by analogy, in international cases, precedents established by that court in dealing with controversies between States of the Union or with other controversies concerning quasi-sovereign rights of such States, where no contrary rule prevails in international law and no reason for rejecting such precedents can be adduced from the limitations of sovereignty inherent in the Constitution of the United States." *Id.* at 714.

[37] [1926] P.C.I.J., ser. A, No. 7.

[38] *Id.* at 19.

[39] F. BERBER, RIVERS IN INTERNATIONAL LAW 168 (1959). A caveat must be added to this broad generalization. Article 38 of the Statute of the International Court of Justice provides that the I.C.J. may adjudicate disputes through reliance in part on "the general principles of law recognized by civilized nations." Some recourse to municipal law is proper. Municipal law may not serve the traditional function of precedent, but it may encourage "reasoning by analogy." H. STEINER & D. VAGTS, TRANSNATIONAL LEGAL PROBLEMS: MATERIALS AND TEXT 208 (1968).

[40] *See, e.g.,* authorities cited in note 31 *supra.*

[41] Quoted in Manner, *Water Pollution* 453

[42] 28 AM. J. INT'L L. (Supp.) 59 (1934).

duce into water courses of an international character, for the industrial or agricultural exploitation of their waters, any alteration which may prove injurious to the margin of the other interested State.[43]

Although the United States and Mexico did not sign the declaration,[44] the majority of the nations considered as impermissible in international law only injurious alterations to the use of the water. The International Law Association Conference in 1956 approved a resolution similar to the Madrid and Pan-American Conference resolutions: "Preventable pollution of water in one state which does substantial injury to another State renders the former State responsible for the damage done."[45]

In August 1963 at Helsinki the International Law Association adopted a further resolution on international river pollution. The resolution imposed a duty on nations

(a) to prevent any new form of water pollution or any increase in the degree of existing water pollution in an international drainage basin which would cause substantial injury in the territory of a co-riparian State, and

(b) to take all reasonable measures to abate existing water pollution in an international drainage basin to such an extent that no substantial injury is caused in the territory of a co-riparian State.[45a]

These resolutions uniformly proscribe injuries to waters or to neighboring nations. As in the *Trail Smelter* case, the meaning of injury, "serious consequence," or "substantial injury" can only be given effect if interpreted as injury to the beneficial uses of water. On the basis of these authorities, one nation may lawfully alter the natural marine environment without violating international law. With respect to marine pollution, a breach of international law arises only when there is injury to the beneficial uses of the sea. Consequently, the definition of pollution, to be in harmony with international law, must limit itself to those alterations of the water which produce harm to its use.

II. Oil Pollution

A. The Problem

In this century the exploitation of the resources of the sea, the use of oil-burning vessels,[46] and the increase of maritime commerce have been accompanied by oil pollution which now plagues most coastal nations.[47] The pollution results principally from marine accidents, spills during bunkering

[43] *Id.*

[44] Manner, *Water Pollution* 456.

[45] Quoted in *id.* at 458.

[45a] Quoted in Comm. on the Uses of Waters of International Rivers, *Report*, in International Law Association, American Branch, Proceedings 35 (1963–1964).

[46] In 1914, 95 percent of the ships were coal-burning and only 5 percent used oil. By 1952 the situation was almost the reverse. 85 percent burned oil; 15 percent used coal. Statement of R. Casey, *Hearings on S. 1591 and S. 1604 Before the Subcomm. on Air and Water Pollution of the Senate Comm. on Public Works*, 90th Cong., 1st Sess., at 15 (1967) [hereinafter cited as *S. Hearings*].

[47] ZoBell, *The Occurrence, Effects and Fate of Oil Polluting the Sea*, in 3 Advances in Water Pollution Research 86 (E. Pearson ed. 1964).

(fueling), and from the discharge by ships of oil, tank washings, bilge, and ballast water.[48] Other non-natural[49] oil pollution stems from offshore mining operations and from marine pipelines running from the drilling rigs to storage facilities on land.[50]

The wreck of the *Torrey Canyon*[51] in March 1967 and other more recent shipping losses, such as the *Ocean Eagle*[52] in Puerto Rico in March 1968, have highlighted the potential magnitude of disaster-caused oil pollution. Over 80,000 tons of oil escaped from the *Torrey Canyon,* destroying marine and bird life and fouling beaches and coastal areas in England and France.[53] The high casualty rate of vessels, in addition to the construction of tankers of ever-increasing size, create the possibility of damage even more extensive than that caused by the *Ocean Eagle* and the *Torrey Canyon.* In 1965 there were over 18,000 vessels in the world merchant fleet of which 3500 were tankers.[54] Over 50,000 visits in 1966 were made to American ports by vessels "with a cumulative capacity of almost 300 million tons of potential polluting materials."[55] Table 1 shows the increase in average tanker size from World War II to the present. The average size of tankers over 30,000 tons will also be greatly expanded in the near future; orders have been placed for supertankers of over 300,000 tons, and tankers of 500,000 tons are in the planning stage.[56]

Table 1. Average Tanker Size 1945–1970[57]

Year	Average tanker size	Average tanker size over 30,000 dwt
1945	15,000	—
1950	15,100	30,300
1955	17,000	33,300
1962	23,800	39,500
1966	30,400	46,700
1970	36,500	51,400

[48] New techniques developed by the shipping industry promise to reduce the incidence of oil pollution resulting from the discharge of bilge and ballast water by tankers. One such technique is the load-on-top method. *See* Statement of W. C. Brodhead, *S. Hearings* 216.

[49] Natural sources of oil include submarine seeps and natural oily material. *See* ZoBell, *supra* note 47, at 89–91. Sunken tankers torpedoed during World War II also contribute to the oil pollution problem. These have been estimated to contain at the time of sinking between 5 and 10 million tons of oil. *See id.* at 89.

[50] For a discussion of drilling regulations in light of the Santa Barbara disaster, see Addendum, *infra.*

[51] *See* V. GILL, F. BOOKER & T. SOPER, THE WRECK OF THE TORREY CANYON (1967).

[52] *See* N.Y. Times, March 4, 1968, at 1, col. 6.

[53] One year after the disaster "it is now possible to stroll the same beaches without a sight of black oil patches." Parrot, *Cornish Sands Golden a Year After Oil Bath,* The Christian Science Monitor, March 20, 1968, at 2, col. 1.

[54] SECRETARY OF THE INTERIOR AND SECRETARY OF TRANSPORTATION, A REPORT ON POLLUTION OF THE NATION'S WATERS BY OIL AND OTHER HAZARDOUS SUBSTANCES 5 (1968) [hereinafter cited REPORT ON OIL POLLUTION].

[55] *Id.*

[56] Nanda, *The Torrey Canyon Disaster: Some Legal Aspects,* 44 DENVER L. J. 400, 402 (1967).

[57] Adapted from Newton, *The Long Term Development of the Tanker Freight Market,* 50 INSTITUTE OF PETROLEUM J. 209, 214 (1964).

Upon analysis of the marine casualty rate, bearing in mind the present and future size of tankers, the potential oil pollution problem becomes very ominous. Table 2 shows the casualty rate in 1966 and 1967 of United States vessels in all waters and foreign-flag vessels in waters of the United States.

Table 2. Casualty Rate of United States Vessels Worldwide and Foreign Vessels in Waters of the United States[58]

	1966	*1967*
Number of Casualties	2,408	2,353
Vessels over 1,000 tons	1,310	1,347
Locations:		
U.S. Waters	1,685	1,569
Elsewhere	723	784

Worldwide losses of oil tankers have been proportional to the increase of maritime traffic and tanker size. In 1948, for example, 200,000 tons of shipping were lost at sea; in 1963 nearly 600,000 tons were lost in accidents and disasters.[59]

In the wake of the *Torrey Canyon* disaster and in the face of an increasing threat of other large-scale oil pollution disasters, studies have been initiated[60] to discover means to remove the oil once spilled and to prevent accidents from occurring by imposing further maritime safety rules, speed restrictions on vessels, navigational aids, stricter certification of crew members, and mandatory sea-lanes. Disasters, however, cannot be entirely eliminated by legislation. The possibility of oil pollution from this source will last as long as oil is used and transported by ships.

The other source of oil pollution, the discharge of oil and oily mixture by ships and tankers, is the cause of most of the persistent pollution problems affecting harbors, beaches, and coastal waters.[61] This problem has also been the object of most national and international regulations and agreements, and thus it will be the focus of the discussion in this section.

B. Method of Solution

Generally, both national and international regulations have been necessary to resolve the oil pollution problem. Coastal nations have unilaterally prohibited the discharge of oil into waters under their jurisdiction.[62] At

[58] Adapted from REPORT ON OIL POLLUTION 7.

[59] REPORT ON OIL POLLUTION 11.

[60] *See* Intergovernmental Maritime Consultative Organization, Conclusion of the Council on the Action To Be Taken on the Problems Brought to Light by the Loss of the "Torrey Canyon," C/ES. III/5, May 8, 1967; HOUSE COMM. ON MERCHANT MARINE AND FISHERIES, REPORT ON INTERNATIONAL CONTROL OF OIL POLLUTION, H. R. REP. No. 628, 90th Cong., 1st Sess. (1967); Intergovernmental Maritime Consultative Organization, Consideration of the Work of the Legal Committee Concerning "Torrey Canyon" Questions, A/ES. IV/5, Nov. 15, 1968.

[61] MCDOUGAL & BURKE, *supra* note 14, at 848.

[62] National regulations imposed pursuant to international agreements and treaties will be discussed in the section treating international action.

present no agreement has been reached on the breadth of the territorial sea which delimits the geographical extent of jurisdiction.[63] However, the 1958 Geneva Convention on the Territorial Sea and Contiguous Zone[64] permits a state to extend jurisdiction over a contiguous zone not to exceed twelve miles from the baseline[65] which is measured from the low-water mark of the territorial sea.[66] As a signatory to this Convention, the United States, for example, could legislatively extend jurisdiction to the full twelve miles. Beyond the twelve miles, recognized as the domestic jurisdictional limit, international law precludes states in peacetime from exercising control over foreign-flag vessels.[67] In view of this fact, international agreements have been necessary to regulate the discharge of oil in international waters. In the absence of such agreements a nation signatory to the Geneva Convention is without recourse in cases in which oil is spilled or discharged by foreign-flag vessels beyond the twelve-mile limit.

1. Unilateral Action—The United States

Legislation enacted by the United States affords an example of unilateral action to decrease the incidence of oil pollution in waters under its jurisdiction. The basic oil pollution legislation is the Oil Pollution Act of 1924,[68] which prohibits the discharge of oil from any vessel into the navigable waters of the United States. These waters include the coastal territorial waters extending three miles seaward. In 1966 the Oil Pollution Act was amended[69] to define discharge of oil as "any grossly negligent, or willful spilling, leaking, pumping, pouring, emitting, or emptying of oil."[70] This amendment has reduced the effectiveness of the Act, for in order successfully to prosecute violators, it is now necessary to prove gross negligence or willful spilling, a task difficult indeed in view of the anonymous nature of most oil spills. In 1966 there were 267 reported violations of the Act; but in 1967, after the

[63] For a discussion of the conflicting claims regarding the width of the territorial sea, see Wilkers, *The Use of World Resources Without Conflict: Myths About the Territorial Sea*, 14 WAYNE L. REV. 441 (1968).

[64] Adopted by the United Nations Conference on the Law of the Sea, April 27, 1958, 2 OFFICIAL RECORDS, *supra* note 12, at 132. Ratified by Senate, May 26, 1960, effective Sept. 10, 1964. 15 U.S.T. 1607, T.I.A.S. No. 5639.

[65] Article 24 provides in part: "2. The contiguous zone may not extend beyond twelve miles from the baseline from which the breadth of the territorial sea is measured." 2 OFFICIAL RECORDS 135.

[66] Article 3 provides: "Except where otherwise provided in these articles, the normal baseline for measuring the breadth of the territorial sea is the low-water line along the coast as marked on the large-scale charts officially recognized by the coastal State." 2 OFFICIAL RECORDS 132.

[67] Article 6 of the Convention on the High Seas provides in part: "1. Ships shall sail under the flag of one State only and, save in exceptional cases expressly provided for in international treaties or in these articles, shall be subject to its exclusive jurisdiction on the high seas . . . ." 2 OFFICIAL RECORDS 136. *See also* G. SCHWARZENBERGER, A MANUAL OF INTERNATIONAL LAW 134 (5th ed. 1967); 2 D. O'CONNELL, INTERNATIONAL LAW 666 (1965).

[68] 43 Stat. 604 (1924), *as amended*, 33 U.S.C. §§ 431–37 (Supp. II, 1965–1966).

[69] 80 Stat. 1252 (1966).

[70] 33 U.S.C. § 432 (Supp. II, 1965–1966).

amendment became effective, only 51 violations of the Act were reported.[71]

Because the 1966 amendment hinders the effective use of this Act, other federal statutes, principally the Rivers and Harbors Act of 1899,[72] have been successfully invoked in those pollution cases in which the pre-1966 Oil Pollution Act would have been applied. The penalties imposed upon individuals convicted of violating either the Oil Pollution Act of 1924 or the Rivers and Harbors Act of 1899 are essentially the same. In both, conviction may result in a fine not exceeding $2500 or imprisonment up to one year, or both.[73] Under the Oil Pollution Act of 1924, a violator has the duty to remove the oil or be held for the cost of removal.[74] Recently, the Rivers and Harbors Act of 1899 has been interpreted as imposing a similar duty to reimburse the United States for the cost of removing the spilled oil.[75] Imposing full liability for the cost of the damage may be difficult because an earlier federal statute allows the owner of a vessel to limit his liability to the actual value of the violating vessel and its cargo.[76] The law, enacted in 1851, provides that "[t]he liability of the owner of any vessel, whether American or foreign, . . . for any loss, damage, or injury . . . without the privity or knowledge of such owner or owners, shall not . . . exceed the value of the interest of such owner in such vessel, and her freight . . . ."[77] It has been contended in a federal study[78] that an owner could argue that the oil pollution penalties which impose liability for the actual damage do not preempt the provisions of the 1851 act, and, thus, penalties greater than the interest of an owner in a vessel may not be imposed. This argument, however, seems unsound in light of the ordinary rules of statutory construction and several federal decisions. Normally statutes in pari materia, those which have similar or overlapping provisions, should be construed harmoniously, giving effect to all provisions.[79] But if there are irreconcilable conflicts, the later statute should control or should be considered a qualification of the earlier statute.[80] The limitation of liability is contained in a general statute, articulating the broad purpose of Congress to protect shipowners in cases of extensive damage caused by their ships.[81] The Oil Pollution Act of 1924 can be considered an exception to the general rule of limited liability. In analogous

[71] Statement of Admiral Willard J. Smith, Commandant, U.S. Coast Guard, *S. Hearings, supra* note 46, at 259.

[72] 33 U.S.C. §§ 407–11 (1964). The Act prohibits discharge of "any refuse matter of any kind . . . into any navigable water of the United States." In United States v. Standard Oil, 384 U.S. 224 (1966), the Supreme Court elaborated on the meaning of "refuse." "There is nothing more deserving of the label 'refuse' than [spilled] oil . . . ." 384 U.S. 229–30 (1966).

[73] 33 U.S.C. § 434(a) (Supp. II, 1965–1966); 33 U.S.C. § 411 (1964).

[74] 33 U.S.C. § 433(b) (Supp. II, 1965–1966).

[75] United States v. Perma Paving Co., 332 F.2d 754 (2d Cir. 1964).

[76] 46 U.S.C. § 183 (1964).

[77] 46 U.S.C. § 183(a) (1964).

[78] REPORT ON OIL POLLUTION, *supra* note 54, at 23.

[79] *See* 82 C.J.S. *Statutes* §§ 362, 365, 366a (1953); 50 AM. JUR. *Statutes* §§ 347–351, 354 (1962). See also 82 C.J.S. *Statutes* § 369 (1953).

[80] *Id.*

[81] For the history of the act, see The Main v. Williams, 152 U.S. 122 (1893).

cases, courts have held that statutes which carve out exceptions to the general limitation of liability will be given effect as qualifications of the 1851 act.[82] Under the Rivers and Harbors Act of 1899, however, the imposition of full liability may be disallowed because the statute itself does not impose liability for the actual damage. Rather, liability under the Rivers and Harbors Act is of judicial origin, and the congressional intent to make an exception to the 1851 act is lacking. The possibility that the 1851 statute would be invoked becomes significant upon occurrence of disasters on the scale of the *Torrey Canyon*. Most oil spills do not cause damage greater than the value of the violating vessel or its cargo. In *Torrey Canyon* situations, the statute, if successfully invoked, could be used to decrease by millions an owner's liability.

Other monetary penalties have been prescribed for violations of both acts in oil pollution cases. The Oil Pollution Act provides that the vessel from which oil is discharged may be fined up to $10,000,[83] whereas under the Rivers and Harbors Act, the violating vessel is liable only for the same monetary penalty imposed upon individual violators.[84] This provision of the Rivers and Harbors Act has been judicially interpreted as imposing strict liability in rem on a craft regardless of the lack of negligence or willful intent of the operators or the owners.[85] Under both statutes the licenses of the officers of violating vessels may be revoked by the Coast Guard.[86] Since both statutes have essentially the same penalties, it is not surprising that the United States eagerly turned to the Rivers and Harbors Act when the Oil Pollution Act of 1924 became virtually unenforceable. The Rivers and Harbors Act of 1899 is invoked in accidental oil pollution incidents, and the Oil Pollution Act of 1924 is invoked in cases involving willful spilling or grossly negligent discharge of oil when the United States can muster sufficient evidence to convict.

2. International Action

In 1958 the First United Nations Conference on the Law of the Sea[87] adopted Article 24 of the Convention on the High Seas[88] which provides in part that:

> Every State shall draw up regulations to prevent pollution of the seas by the discharge of oil from ships or pipelines resulting from the exploitation and exploration of the seabed and its subsoil, taking into account . . . existing treaty provisions on the subject.

The Convention is now in force among signatory nations, including the

[82] The Annie Faxon, 75 F. 312 (9th Cir. 1896); Hines v. Butler, 278 F. 877 (4th Cir. 1921).

[83] 33 U.S.C. § 434(b) (Supp. II, 1965–1966).

[84] 33 U.S.C. § 412 (1964).

[85] United States v. The Terry Buchanan, 138 F. Supp. 754 (S.D.N.Y. 1956).

[86] 33 U.S.C. § 412 (1964); 33 U.S.C. § 434(b) (Supp. II, 1965–1966).

[87] UNITED NATIONS CONFERENCE ON THE LAW OF THE SEA, 1–7 OFFICIAL RECORDS.

[88] 2 OFFICIAL RECORDS 138.

United States.[89] Since the signatories are not obligated to enact specific oil pollution legislation or to sign the 1954 International Convention for the Prevention of Pollution of the Sea by Oil,[90] as amended in 1962,[91] the requirements of Article 24 are little more than hortatory. Article 24 is significant, however, in evincing a general international concern about oil pollution and in recommending further domestic legislation to resolve the problem.

The International Convention for the Prevention of Pollution of the Sea by Oil, the basic international system of oil pollution control, represents the culmination of a series of efforts during the past fifty years to resolve the problem internationally.[92] The Convention,[93] originally drafted in London in 1954 and strengthened in 1962,[94] prohibits tankers and ships (with certain exceptions) from discharging oil or oily mixture within any of the prohibited zones established in the Convention.[95] Ultimately, ships and tankers greater than 20,000 tons gross tonnage will be prohibited from discharging oil or oily mixture anywhere at sea.[96] The basic prohibited zone wherein no oil or oily mixture may be discharged is an area 50 miles in width measured from the baseline of each signatory nation.[97] In addition, Annex A to the Convention lists certain areas greater than 50 miles in width within which the discharge of oil is prohibited.[98] Each vessel registered with a signatory government must maintain an oil record book listing all oil discharges at sea.[99]

Punishment of violations is entrusted to the nation in which the ship violating the Convention is registered.[100] In the United States the provisions of the Convention are implemented by the Oil Pollution Act of 1961[101] and

---

[89] Ratified by Senate May 26, 1960, effective Sept. 30, 1962. 13 U.S.T. 2313, T.I.A.S. No. 5200.

[90] The Convention entered into force for the United States on December 8, 1961. 12 U.S.T. 2989, T.I.A.S. No. 4900.

[91] T.I.A.S. No. 6109.

[92] *See Final Report of the Preliminary Conference on Oil Pollution in Navigable Waters,* in 1 U.S. DEP'T OF STATE, FOREIGN RELATIONS OF THE UNITED STATES 1926, at 238 (1941); LEAGUE OF NATIONS, COMMUNICATIONS AND TRANSIT ORGANIZATION, POLLUTION OF THE SEA BY OIL, REPORT ON THE SECOND SESSION OF THE COMMITTEE OF EXPERTS, (L.N. Doc. No. C.449.M.235. 1935.VIII); UNITED NATIONS, SECRETARIAT, POLLUTION OF THE SEA BY OIL (U.N. Doc. A/CONF. 13/8) (1957); Mann, *The Problems of Sea Water Pollution,* 29 DEP'T STATE BULL. 775 (1953).

[93] For a compilation of the 1954 and 1962 Conference reports, resolutions, texts, annexes, oil record book forms, and maps, see *S. Hearings, supra* note 46, at 27–202.

[94] For a discussion of the amendments added in 1962, see Johnson, *The Pollution of the Sea by Oil,* in CONFERENCE ON LAW AND SCIENCE (LONDON), REPORT 44 (1964).

[95] Art. III. (References are to the amended Convention as of 1962.)

[96] Art. III(c).

[97] Annex A.

[98] Annex A now lists 16 zones greater than 50 miles in width within which no oil or oily mixture may be discharged. These zones, for example, include the Canadian Western Zone (100 miles from the nearest land along the west coast of Canada), the Icelandic Zone (100 miles from the nearest land along the coast of Iceland), the Red Sea Zone, and the Kuwait Zone.

[99] Art. IX.

[100] Art. VI; art. X.

[101] 33 U.S.C. §§ 1001–15 (Supp. II, 1965–1966).

regulations imposed pursuant thereto by the Coast Guard.[102] The Act incorporates the provisions of the Convention and prescribes fines not to exceed $2,500, imprisonment up to one year, or both, for individuals convicted of violating the Act and the Convention.[103] The vessel from which oil is discharged may be penalized up to $10,000, and the license of the master or any officer may be revoked.[104] Penalties prescribed for failing to comply with the oil record book provisions are slightly less than the other monetary penalties previously mentioned.[105]

3. Further Action—Unilateral, International, or Both?

Although the Convention was amended in 1962, deficiencies remain under the present system of regulation. The anonymity of most oil spills, even in harbors and coastal waters, renders detection of violations extremely difficult.[106] Those oil spills which have been observed in the United States, for example, "originate in the more confined port areas rather than on the open sea."[107] The difficulty of detecting violations is attested to by the fact that, although there are 40,000 visits of foreign vessels to American ports annually,[108] there have been only 192 alleged violations of the Convention communicated to the governments with which these ships have been registered.[109]

The ultimate solution to oil pollution must be the prohibition of oil discharges anywhere at sea. Both the 1954 and the 1962 Conferences recognized this principle and embodied it first in 1954 in Resolution 1 and reiterated it in 1962 without modification. The resolution states in part:

> The only entirely effective method known of preventing oil pollution is the complete avoidance of the discharge of persistent oils into the sea and . . . measures are possible which would enable this to be substantially achieved.
>
> While the Conference have come to the conclusion that a date cannot be fixed at the present time by which there should be complete avoidance of the discharge of persistent oils into the sea, they consider that complete avoidance of the discharge of these persistent oils should, with

[102] 33 C.F.R. § 151 (1969).

[103] 33 U.S.C. § 1005 (Supp. II, 1965–1966).

[104] 33 U.S.C. § 1006 (Supp. II, 1965–1966).

[105] 33 U.S.C. § 1008(f) (Supp. II, 1965–1966).

[106] The commandant of the U.S. Coast Guard has stated that "[t]he vast area of the prohibited zone makes difficult the detection of oil spills on the high seas. Unless the offending vessel is caught in the act of violating the law, it is extremely difficult to determine the responsible party or parties. Further, in all probability, a willful discharge of oil or oily mixture is done under the cover of darkness when detection is nearly impossible." *S. Hearings, supra* note 46, at 258.

[107] Letter from Bryan M. Johnson, Acting Director, Enforcement Program, Federal Water Pollution Control Administration, Northwest Region, to the *U.C.D. Law Review*, Nov. 2, 1967.

[108] DEPARTMENT OF THE INTERIOR, WASTES FROM WATERCRAFT, S. DOC. NO. 48, 90th Cong., 1st Sess. 3 (1967).

[109] Letter from Sylvia E. Nilsen, Acting Assistant Legal Adviser, U.S. Department of State, to the *U.C.D. Law Review*, Nov. 1, 1967.

> certain exceptions, be observed from the earliest practicable date and strongly urge all Governments and other bodies concerned to use their best endeavours to create the conditions upon which the observance of such a prohibition necessarily depends by securing the provision of adequate facilities in their ports and the necessary arrangements in ships.[110]

Complete avoidance hinges, as Resolution 1 states, upon the construction of adequate shore facilities to receive tank washings, bilge, and ballast water and upon installation, where feasible, of oil-water separators in ships. In the United States, shore facilities are inadequate to receive the wastes from visiting vessels. In 1960 the total storage capacity for oily wastes was 897,175 tons.[111] It has been estimated that ships entering American ports in ballast in 1964 carried over 100,000 tons of oily wastes.[112] Seemingly, the capacity of facilities would not be exhausted; but the 1964 total refers only to those vessels arriving *in ballast.* If all 50,000 vessels annually visiting American ports were required to deposit oily residues in shore facilities, it is likely that the capacity of the present facilities would be exhausted. In the past the United States has been reluctant to sponsor or require the construction of shore facilities for receiving oily wastes.[113] Port facilities are owned and operated by private firms, local governments, and states, and thus it has been argued that the federal government may not have the constitutional authority to require the construction of such facilities.[114] Were such legislation enacted, it is doubtful that a successful attack on its constitutionality could be made considering the present understanding of the scope of the commerce clause and the health and welfare provisions of the Constitution.

Legislative sanctions would be necessary to insure the use of the storage facilities. In exchange for permission to enter American waters, a condition could be imposed requiring vessels to deposit oil in designated receptacles. Or, no vessel would be permitted to leave a port without having obtained a certificate showing that the oily residues, bilge, and ballast water had been properly deposited.[115] The fact that a vessel arrives at a port without

---

[110] IMCO, INTERNATIONAL CONFERENCE ON PREVENTION OF POLLUTION OF THE SEA BY OIL 1962, annex II, resolution 1 (1962).

[111] *S. Hearings, supra* note 46, at 23, 25.

[112] REPORT ON OIL POLLUTION, *supra* note 54, at 6.

[113] Reservation 1 to the 1954 Convention ratified by the United States stated that: "The United States accepts article VIII of the Convention [ensuring adequate port facilities] subject to the reservation that, while it will urge port authorities, oil terminals or private contractors to provide adequate disposal facilities, the United States shall not be obligated to construct, operate, or maintain shore facilities at places on U.S. coasts or waters where such facilities may be deemed inadequate, or to assume any financial obligation to assist in such activities." 12 U.S.T. 2989, 3024. For an explanation of the reservation see Statement of Edwin M. Martin, *Hearing Before the Senate Comm. on Foreign Relations on Ex. C,* 86th Cong., 2d Sess., May 17, 1960, at 6 (1960). *See also* Statement of Abram Chayes, *Hearing Before the Senate Comm. on Foreign Relations on Ex. C,* 86th Cong., 2d Sess., April 25, 1961, at 13 (1961).

[114] Statement of Edward M. Martin, *supra* note 113; Statement of Abram Chayes, *supra* note 113.

[115] *See* Statement by Congressman Keith, *S. Hearings, supra* note 46, at 12.

oily wastes could give rise to a presumption of a discharge at sea and a violation of the law.

The potential wrath of shipowners and foreign governments on whose ships regulations may be imposed could defeat the enactment of such legislation. In order to save time, deballasting and tank cleaning are often done prior to entering port. Extra time spent in port by vessels owing to regulations requiring the deposit of oily wastes may be financially burdensome to the shipping industry. Foreign governments, too, may react adversely to unilateral regulations of dubious international legality. With respect to domestic jurisdiction over foreign-flag vessels, unilateral regulations may be legally imposed. The United States, as most nations, considers that any ship entering the territorial waters is subject to domestic law.[116] The classic statement of the position of the United States was enunciated by the Supreme Court in *Cunard S.S. Co. v. Mellon.*[117]

> A merchant ship of one country voluntarily entering the territorial limits of another subjects herself to the jurisdiction of the latter. The jurisdiction attaches in virtue of her presence, just as with other objects within those limits. During her stay she is entitled to the protection of the laws of that place and correlatively is bound to yield obedience to them.[118]

But whether a state institutes unilateral controls depends more upon deference to the principle that activities affecting international shipping must be regulated by international agreement rather than to a lack of jurisdiction over foreign-flag vessels in port. Without international agreement, there may be a strong reaction by the state over whose vessel jurisdiction has been asserted, and, as a consequence, an escalation of reciprocal anti-foreign-flag regulations may ensue. The United States' handling of the sinking of the *Lakonia* and the *Yarmouth Castle* is an example of the reluctance to impose strong unilateral measures. The failure to impose strict safety measures (which were clearly in order) resulted primarily from the fear that other shipping nations would react adversely to these unilateral controls.[119]

III. Nuclear Pollution

A. The Problem

Pollution through the introduction of artificial radioactivity is potentially the most hazardous of all marine pollution problems.[120] Unlike many pollutants which are neutralized by the sea within relatively short periods of time after introduction, the capacity of radioactive materials for doing serious

[116] For a discussion of the position of the United States and other nations, see D. O'Connell, International Law 669–88 (1967); McDougal & Burke, *supra* note 14, at 161–73.

[117] 262 U.S. 100 (1923).

[118] *Id.* at 124.

[119] For a discussion of legislation in the aftermath of the *Yarmouth Castle* disaster, see Clingal, *Legislative Flotsam and International Action in the "Yarmouth Castle's" Wake*, 35 Geo. Wash. L. Rev. 675 (1967).

[120] McDougal & Burke, *supra* note 14, at 853.

harm lasts in some cases for hundreds of centuries.[121] Since the danger of pollution persists for such an extended period of time, preintroduction controls are needed to prevent the deleterious effects of radiation.

There are several means by which radioactive materials are introduced into the sea: fallout from atomic explosions, oceanographic experiments, runoff from land, effluent discharged by coastal nuclear facilities,[122] waste from nuclear vessels,[123] and direct disposal of radioactive waste products.[124] Most of the legislative and administrative controls of atomic waste disposal have been addressed to the problem of direct liquid and solid waste disposal, and therefore this section will focus on that aspect of nuclear pollution. Direct disposal at sea is very likely to persist in the future since an increase in waste materials is an unavoidable consequence of an increase in the production of nuclear energy. This increase in waste production may exhaust the availability of land-based depositories, making the sea a very attractive receptacle for these wastes.[125]

One of the current dangers of indiscriminate and unregulated disposal is that little is known of the effects of radioactive materials introduced into the sea.[126] As Revelle and Shaefer note:

> Our knowledge of just what share of these fission products can be safely introduced into the oceans is woefully incomplete because we simply do not know enough about the physical, chemical, and biological processes. If the sea is to be seriously considered as a dumping ground for any large fraction of the fission products that will be produced even within the next ten years, it is urgently necessary to learn enough about the processes to provide a basis for engineering estimates.[127]

Although the precise effects are not known, three things happen as a rule

[121] The life of radioactive materials is measured in terms of the rate of decay or "half-life." "Half-life" has been defined as "the time in which half the atoms of a particular radioactive substance disintegrates to another form. Measured half-lives vary from millionths of a second to billions of years." AEC, NUCLEAR TERMS: A BRIEF GLOSSARY 24 (2d ed. 1966).

[122] The largest single documented source of artificial radioactivity introduced into the sea from nonweapon sources is the Hanford installation on the Columbia River. Here river water is used to cool the reactors directly without a closed primary cooling loop. The Columbia River has for some years contributed to the Pacific Ocean about 1,000 curies a day of artificial radioactive materials. NATIONAL ACADEMY OF SCIENCE-NATIONAL RESEARCH COUNCIL (NAS-NRC), OCEANOGRAPHY 1966—A REPORT OF THE COMM. ON OCEANOGRAPHY, DIVISION OF EARTH SCIENCES 83 (Pub. No. 1492, 1967) [hereinafter cited as OCEANOGRAPHY 1966].

[123] For a discussion of the problem of wastes from nuclear vessels, see Doyle, *Radioactive Waste Disposal,* JAG J., April 1959, at 12; L. HYDEMAN & W. BERMAN, INTERNATIONAL CONTROL OF NUCLEAR MARITIME ACTIVITIES 84 (1960).

[124] NAS-NRC, *Artificial Radioactivity in the Marine Environment,* in OCEANOGRAPHY 1960 to 1970, at 2 (1959).

[125] *Id.* at 10.

[126] *See* Revelle & Shaefer, *General Considerations Concerning the Ocean as a Receptacle for Artificially Radioactive Materials,* in NAS-NRC, THE EFFECTS OF ATOMIC RADIATION ON OCEANOGRAPHY AND FISHERIES 1–25 (Pub. No. 551, 1957).

[127] *Id.* at 7.

to radioactive materials introduced into the sea.[128] The radiation is dispersed and diluted by the intermixing processes of the sea; marine animals concentrate the radioactive elements and isotopes;[129] and the radioactivity is absorbed into bottom sediments and bottom-dwelling organisms. As a result of these three occurrences, man may be affected both directly and indirectly by the radiation. Direct exposure to radiation, however, threatens man less than the indirect effects.[130] The radioactive materials may indirectly alter the marine food chain and, as a consequence, reduce the stocks of fish and other living resources on which man may come to depend.[131] Disease may occur from the ingestion of radioactively contaminated food products in which radioactive elements and isotopes have been concentrated.[132] The determination of the possible harmful effects of exposure to radioactive materials released into the marine environment is extremely difficult. Harmful effects vary in relation to the amount of radioactivity present and also with respect to the uses to which the sea is put by man.[133] The "pathways" of exposure vary with the occupation, diet, age, and recreational proclivities of individuals making use of the sea.[134] Thus, it is difficult to establish definitively the permissible levels of radioactive waste introduction, since exposure varies from individual to individual.

B. Method of Solution

Nuclear pollution, like the problem of oil pollution, is both a unilateral and an international problem. Because the United States and Great Britain have been the most active nations[135] among those depositing radioactive materials at sea,[136] the unilateral controls of these nations will serve as examples of the types of controls imposed. Moreover, unlike the majority of nations, the United States and Great Britain have enacted legislative controls and have established administrative procedures specifically applicable to marine radioactive waste disposal.[137]

---

[128] Statement by R. Revelle, 3 *Hearings on Industrial Radioactive Waste Disposal Before the Special Subcomm. on Radiation of the Joint Comm. on Atomic Energy*, 86th Cong., 1st Sess. 2434 (1959) [hereinafter cited as *Hearings*].

[129] H. BYRNIELSSON, RADIOACTIVE WASTE DISPOSAL INTO THE SEA 27 (IAEA Safety Series No. 5, 1961).

[130] Revelle & Shaefer, *supra* note 126, at 5.

[131] *Id.*

[132] H. BYRNIELSSON, *supra* note 129, at 27.

[133] UNITED KINGDOM ATOMIC ENERGY AUTHORITY (UKAEA), HEALTH AND SAFETY BRANCH, ENVIRONMENTAL MONITORING ASSOCIATED WITH DISCHARGES OF RADIOACTIVE WASTE DURING 1965 FROM U.K.A.E.A. ESTABLISHMENTS 3 (AHSB(RP) R72 1966) [hereinafter cited as ENVIRONMENTAL MONITORING 1965]; UKAEA, HEALTH AND SAFETY BRANCH, ENVIRONMENTAL MONITORING ASSOCIATED WITH DISCHARGES OF RADIOACTIVE WASTE DURING 1966 FROM U.K.A.E.A. ESTABLISHMENTS 2–3 (AHSB-(RP) R79 1967) (F. Morley ed.) [hereinafter cited as ENVIRONMENTAL MONITORING 1966].

[134] *Id.*

[135] McDOUGAL & BURKE, *supra* note 14, at 857.

[136] Among the nations which use the sea as a depository of radioactive wastes are the United States, Great Britain, Canada, Australia, and The Netherlands.

[137] For a survey of national controls of radioactive waste disposal, see HYDEMAN & BERMAN, *supra* note 123, at 71–77.

International action to control nuclear pollution is in an early stage of development. In recent years the most significant international action has been a legal panel convened by the International Atomic Energy Agency (IAEA) to draft a nuclear pollution convention. This convention was not ratified and did not get beyond the draft stage, but its importance as a step toward eventual international control merits detailed discussion of its provisions.

1. Unilateral Action—The United States and Great Britain.

The United States has been disposing of radioactive materials at sea since 1946.[138] These have been mixed wastes of the low- to intermediate-level types[139] derived primarily from universities,[140] laboratory experiments, hospitals, and industry.[141] High-level wastes are not deposited at sea, but are concentrated and contained in storage tanks on land because the level of radioactivity is considered too harmful to man and the environment to be safely released.[142] The aggregate amount of radioactivity deposited in the sea has never been precisely ascertained, but estimates have been made.[143] From 1946 to 1959 over 8,000 curies[144] had been deposited in the Atlantic and less than 4,000 curies in the Pacific Ocean.[145] In the past few years disposal in certain areas seems to be declining, for only seventeen curies have been deposited in the Pacific Ocean during the last three years.[146]

---

[138] Pacific disposal began in 1946, Atlantic disposal in 1951. Statement of General Luedecke, 4 *Hearings, supra* note 128, at 3092.

[139] The classification of wastes has not been standardized. Straub states that: "Usage has led to the arbitrary characterization of radioactive wastes as (1) *low level,* if the activity is low enough to be measured in microcuries per liter or per gallon; (2) *intermediate level,* if the activity is measured in millicuries per liter or per gallon; and (3) *high level,* if the activity is measured in curies per gallon." C. STRAUB, LOW-LEVEL WASTES: THEIR HANDLING, TREATMENT, AND DISPOSAL 3 (1964).

[140] For a discussion of the disposal operations of the Lawrence Radiation Laboratory of the University of California, see Garden, *Radioactive Waste Disposal at Lawrence Radiation Laboratory,* in 1 *Hearings, supra* note 128, at 842.

[141] J. ISAACS, DISPOSAL OF LOW-LEVEL RADIOACTIVE WASTES INTO PACIFIC COASTAL WATERS 7 (NAS-NRC Pub. No. 985) (1962).

[142] C. STRAUB, *supra* note 139, at 2.

[143] D. CARRITT, RADIOACTIVE DISPOSAL INTO ATLANTIC AND GULF COASTAL WATERS 4 (NAS-NRC Pub. No. 655) (1959).

[144] "The activity of a radioisotope is often characterized by the disintegration rate, which is expressed in the unit 'curie.' A 'curie' is defined as 37 thousand million disintegrations per second and is approximately the rate of disintegration for one gram of radium. This unit does not take into account the nature and energy emitted by the radionuclide in question." H. BRYNIELSSON, *supra* note 129, at 14.

"[Curies have] little absolute meaning when applied to a mixture of radioactive substances such as fission products. The reason is that different kinds and strengths of radiation are given off by different radioactive materials. One kind (alpha particles) is blocked by an ordinary piece of writing paper, while another kind (gamma rays) can penetrate several feet of concrete. Also, different radioactive substances, besides having different radioactive properties, also differ in other properties that are important from the viewpoint of safety. Thus, to say that there are X curies of radioactivity . . . is a little like lumping together the number of oranges, apples, grapes, watermelons, etc., in a grocery store; it is a number that does not tell us much." J. HOGERTON, BACKGROUND ON ATOMIC POWER SAFETY 9–10 (1964).

[145] L. HYDEMAN & W. BERMAN, *supra* note 123, at 63.

The Atomic Energy Commission (AEC), on the basis of a study conducted by the Bureau of Standards,[147] has required that solid waste materials deposited by the AEC itself (U.S. Navy disposal), government agencies (U.S. Navy and Coast Guard disposal) and by private users (private disposal)[148] meet the following criteria:

a. Wastes must be packaged.[149]
b. Wastes must be deposited in a minimum of 1000 fathoms.
c. Packages must be of sufficient density to sink to the bottom.
d. Packages must be properly labeled for shipment.[150]

Disposal carried out by the military is partly supervised by the AEC[151] and partly exempt from supervision and control.[152] Waste disposal at non-AEC and nongovernment facilities has been handled by private firms licensed by the AEC after approval of disposal plans.[153] At present there are five private licensees authorized to deposit wastes in the Pacific and Atlantic Oceans, and no new licenses have been granted since 1960.[154] The AEC regulations allow individual evaluation and control of disposal in the United States.[155] "The summary of United States' methods of controlling the sea disposal of radioactive wastes indicates an extremely cautious approach."[156] Monitoring of two disposal sites has recently revealed that there was, "within experimental error, no activity detected that exceeded background levels."[157]

Disposal practices in Great Britain have been generally less cautious than those of the United States. As in the United States, packaged wastes have been deposited at sea. Also, greater quantities of liquid wastes, more highly radioactive than the cooling waters discharged by the United States, have

---

[140] Letter from Nathan Bassin, Isotope Branch, Division of Materials Licensing, AEC, to the *U.C.D. Law Review*, Nov. 29, 1967. This number of curies stated must be only the amount of packaged wastes disposed of into the Pacific, for the Hanford plant discharges over 1,000 curies daily into the Pacific via the Columbia River. See note 122 *supra*.

[147] *See* NATIONAL BUREAU OF STANDARDS, DEP'T OF COMMERCE, RADIOACTIVE DISPOSAL IN THE OCEAN (Handbook 58, 1954).

[148] D. CARRITT, *supra* note 143, at 5.

[149] The obvious exceptions to this rule are wastes from nuclear powered vessels and effluent discharged by coastal nuclear facilities.

[150] The practices of the United States have followed the recommendations of the National Bureau of Standards. 4 *Hearings, supra* note 128, at 2512.

[151] "For those activities carried out under license, the United States military organizations are subject to the provisions of 10 C.F.R. § 20 with respect to waste disposal. Although the administrative mechanism for the waste disposal programs is not the same in the Army, Navy and Air Force, the ultimate disposal procedure is the same—radioactive waste materials are sent to authorized land burial facilities." Letter from Nathan Bassin, Isotope Branch, Division of Materials Licensing, AEC, to the *U.C.D. Law Review*, March, 1968.

[152] 42 U.S.C. § 2140 (1964).

[153] 10 C.F.R. § 20.302 (1968).

[154] Letter, *supra* note 146.

[155] L. HYDEMAN & W. BERMAN, *supra* note 123, at 63–64.

[156] *Id.* at 65.

[157] ATOMIC ENERGY COMMISSION, TECHNICAL REPORT—SURVEY OF RADIOACTIVE WASTE DISPOSAL SITES ix (TID-13665, 1961).

been directly discharged into nearshore waters without prior containment.[158] The Windscale Nuclear Fuel Processing Installation, for example discharges liquid wastes into the Irish Sea via a three kilometer pipeline.[159] Disposal of wastes amounting to more than 300,000 curies annually has been authorized but the maximum amount actually discharged has not exceeded 100,000 curies per year.[160] The Dounreay Experimental Reactor Establishment also utilizes a pipeline to dispose of liquid wastes directly into the sea. In 1965 and 1966 the plant was authorized to dispose of a total of 6,000 curies during three-month periods between September and March.[161] During the salmon season from April to August the rate was reduced to 1,000 curies monthly in order to insure that fishing nets located near the pipeline would not become contaminated.[162] Subsequent to the imposition of these restrictions, monitoring of the disposal area revealed that no deleterious effects would result to the salmon industry from normal disposal levels, and thus in 1967 the restrictions were removed.[163] Extensive monitoring of the other disposal areas has shown that radioactivity is below the maximum permissible levels,[164] but other effects which reduce the beneficial uses of the areas have been observed. Seaweed, an edible plant eaten by the inhabitants of the region near which the wastes are discharged, has increased in radioactivity.[165] Mussels and other marine animals in Dounreay have also been shown to contain low amounts of radioactivity.[166] During periods of on-shore winds, patches of radioactive sludge appear on the shore. "This tends to

[158] Whipple, *Considerations on the Siting of Outfalls for the Sea Disposal of Radioactive Effluent in Tidal Waters,* in 3 ADVANCES IN WATER POLLUTION RESEARCH 1 (E. Pearson ed. 1964). For the total amount of liquid wastes discharged into coastal waters in 1966, see MINISTRY OF AGRICULTURE, FISHERIES, AND FOOD, FISHERIES RADIOBIOLOGICAL LABORATORY, RADIOACTIVITY IN SURFACE AND COASTAL WATERS OF THE BRITISH ISLES 4 (Tech. Report FRL 1, Oct. 1967) [hereinafter cited as RADIOACTIVITY IN SURFACE AND COASTAL WATERS].

[159] In Great Britain there are three such pipelines used to dispose of liquid wastes into the sea. The three are:

"(a) For Windscale, off the Cumberland coast and 3–4 miles south of St. Bee's Head. This pipeline, constructed in 1950, is two miles long, and terminates in water of 60 ft. depth.

(b) For Dounreay, into the Pentland Firth. This pipe, constructed in 1956 in the form of a tunnel bored through the rock, is ½ mile long, and terminates in water of 80 ft. depth.

(c) For Winfrith in Dorset. The pipe enters the sea at Arisk Mell, one mile east of Lulworth Cove, about ten miles east of Weymouth and Portland Bill. The termination is two miles out to sea, in water of 60 ft. depth."

Whipple, *supra* note 158, at 1.

[160] ENVIRONMENTAL MONITORING 1965, Table 16, at 18; ENVIRONMENTAL MONITORING 1966, Table 13, at 14; RADIOACTIVITY IN SURFACE AND COASTAL WATERS, Fig. 2, at 4.

[161] ENVIRONMENTAL MONITORING 1965, at 11; ENVIRONMENTAL MONITORING 1966, at 9.

[162] *Id.*

[163] ENVIRONMENTAL MONITORING 1966, at 10–11.

[164] RADIOACTIVITY IN SURFACE AND COASTAL WATERS 7.

[165] RADIOACTIVITY IN SURFACE AND COASTAL WATERS 6–10.

[166] ENVIRONMENTAL MONITORING 1965, at 13–14; ENVIRONMENTAL MONITORING 1966, at 10–11.

occur during the autumn and winter months . . . but the levels of activity are insufficient to cause concern."[167]

Disposal in Great Britain is regulated by the Radioactive Substances Act of 1960[168] which came into force on December 1, 1963.[169] Before 1963, the ability to dispose of radioactive waste was limited by the Atomic Energy Authority Act of 1954[170] to the Atomic Energy Authority (AEA). Any disposal, however, required authorization by the Ministries of Housing and Local Government and Agriculture and Fisheries.[171] In 1959 the Nuclear Installations Bill[172] gave the AEA power to grant licenses for disposal, thereby enlarging the number of persons permitted to dispose of radioactive waste materials. Similar to the early Acts, the Radioactive Substances Act of 1960 requires authorization by the same two ministries after consultation with the appropriate local authorities.[173] Liquid waste disposal is controlled by separate approval procedures in which each nuclear plant is authorized to dispose of a fixed quantity of effluent.[174] "In general, these limits cover only the actual needs of each site even though larger discharges could be made with safety."[175] Solid radioactive wastes are also deposited at sea, and individual authorization is required as well.[176] Despite the fact that the two ministries must both evaluate proposed solid waste disposal operations,

> principal executive responsibility for sea disposal logically rests with the Ministry of Agriculture, Fisheries and Food. Their Chief Inspector of Fisheries approves the type of container, the dumping area and the weight of each consignment. The Radiological Inspector carries out checks on containment processes. In addition, the Ministry of Transport and the Board of Trade, who have general statutory responsibilities for safe transit of goods by land and sea respectively, establish standards of design of containers to ensure that they can be safely transported. If necessary, the Board of Trade also approves the suitability of the dumping vessel.[177]

Monitoring and analysis of the materials to be discharged are required in the

---

[167] ENVIRONMENTAL MONITORING 1966, at 11. In the United States even the possibility of contamination of beaches causes an adverse reaction which precludes the adoption of nearshore disposal practices. *See* 5 *Hearings, supra* note 128.

[168] 8 & 9 Eliz. 2, c. 34 (1960).

[169] MINISTRY OF HOUSING AND LOCAL GOVERNMENT, RADIOACTIVE SUBSTANCES ACT 5 (1963).

[170] 2 & 3 Eliz. 2, c. 32 (1954).

[171] 2 & 3 Eliz. 2, c. 32, § 5(4) (a) (1954).

[172] 7 & 8 Eliz. 2, c. 46 (1959).

[173] 8 & 9 Eliz. 2, c. 34, §§ 8(1)–(2).

[174] ENVIRONMENTAL MONITORING 1965, at 1; ENVIRONMENTAL MONITORING 1966, at 1.

[175] *Id.*

[176] ENVIRONMENTAL MONITORING 1965, at 2; ENVIRONMENTAL MONITORING 1966, at 1.

[177] Letter from A. G. Perrin, UKAEA, Health and Safety Branch, to the *U.C.D. Law Review*, Feb. 15, 1968.

disposal operation.[178] The monitoring takes two forms.[179] First, sampling and analysis of wastes to be disposed of must be made to ascertain whether the level of radioactivity is in conformity with the limits specified by the approving ministries. Second, monitoring of the disposal areas is also undertaken to check that no harm results either to the environment or to the public.

2. International Action

Other countries have enacted little legislation and have imposed few administrative controls in this field.[180] "Most nations do not appear to have any controls. And among those that do, most of the controls are not directed specifically at radioactive wastes."[181] The lack of national attention to disposal problems and the obvious international issues pertaining to marine pollution evidence the need for a specific international agreement to supplement the general international policy toward waste disposal enunciated in the Geneva Convention on the High Seas. Article 25[182] of the Convention provides that:

1. Every State shall take measures to prevent pollution of the sea from dumping of radio-active waste, taking into account any standards and regulations which may be formulated by the competent organizations.
2. All States shall co-operate with the competent international organizations in taking measures for the prevention of pollution of the sea or air space above, resulting from any activities with radio-active material or other harmful agents.[183]

Article 25 is of little use in determining the precise waste levels which may be safely and legally introduced into the sea. Besides being a statement of policy, the article passes the problem of waste disposal to the IAEA and allows it to devise acceptable levels of waste disposal.

In addition to Article 25, the Conference on the Law of the Sea adopted a resolution on radioactive waste disposal which provides in part that:

> the International Atomic Energy Agency, in consultation with the existing groups and established organs having acknowledged competence in the field of radiological protection, should pursue whatever studies and take whatever action is necessary to assist States in controlling the discharge or release of radioactive materials in the sea, in promulgating standards, and in drawing up internationally acceptable regulations to prevent pollution of the sea by radioactive materials in amounts which would adversely affect man and his marine resources.[184]

---

[178] ENVIRONMENTAL MONITORING 1965, at 2; ENVIRONMENTAL MONITORING 1966, at 2.

[179] *Id.*

[180] L. HYDEMAN & W. BERMAN, *supra* note 123, at 77.

[181] *Id.*

[182] 2 OFFICIAL RECORDS 138.

[183] For a discussion of the adoption of Article 25, *see* MCDOUGAL & BURKE, *supra* note 14, at 864–67.

[184] Resolution II, POLLUTION OF THE HIGH SEAS BY RADIOACTIVE MATERIALS (U.N. Doc. A/Conf. 13/L. 56), in 2 OFFICIAL RECORDS 143–44.

The drafting of an internationally acceptable nuclear pollution convention, the need for which has been stressed by most authorities,[185] has been abondoned for the present time by the IAEA. An IAEA official has recently stated that since there is not a widespread practice of sea disposal, the "Agency feels that there is not an immediate danger of pollution nor need of regulation to justify an international convention confined to the prevention of sea pollution by radioactive waste disposal alone . . . ."[186] This statement is somewhat surprising since practically all experts have felt the need for an international agreement to control disposal at sea. Perhaps the IAEA's view stems from the desire to disengage itself from the debate in the international community regarding the legality under international law of marine radioactive waste disposal.[187] At present there are irreconcilable attitudes toward disposal, and the IAEA would surely suffer were it actively to promote a nuclear pollution agreement authorizing sea disposal.[188]

The differences of opinion emerged at the 1958 Conference on the Law of the Sea. The Soviet Union[189] and several other nations took the position that any disposal of radioactive waste was contrary to customary international law and urged that this principle be embodied in the conventions stemming from the work of the Conference.[190] Countries taking the opposing position argued that waste disposal under carefully regulated conditions is a lawful use of the oceans.

The differences of opinion within the legal panel convened by the IAEA in 1960 constituted the immediate cause of the abondonment of a nuclear pollution convention. On the basis of a previous study sponsored by the IAEA,[191] the panel considered legal measures for the international regula-

[185] *See* 1 *Hearings, supra* note 128, at 21; Discussion, in 1 IAEA PROCEEDINGS OF THE SCIENTIFIC CONFERENCE ON THE DISPOSAL OF RADIOACTIVE WASTES, MONACO 601–03 (1960). McDougal & Burke note that "it is a striking feature of the comments of scientific participants and observers that great stress is placed upon the desirability of international agreement on this use of the sea." MCDOUGAL & BURKE, *supra* note 14, at 861.

[186] Letter from Werner Boulanger, Director, Legal Division, I.A.E.A., to the *U.C.D. Law Review*, Dec. 21, 1967.

[187] An interesting sidelight of the debate about the legality of waste disposal at sea concerns the legality of weapons tests carried out in the Pacific Ocean. *See* Margolis, *Hydrogen Bomb Experiments and International Law*, 64 YALE L.J. 629 (1955); McDougal and Schlei, *The Hydrogen Bomb Tests in Perspective: Lawful Measures for Security*, 64 YALE L.J. 648 (1955).

[188] For insights into the relationship of the Soviet Union and the IAEA after the latter began to sponsor a nuclear pollution convention, see Khlestov, *Dangers of Radioactive Contamination of the Seas*, INTERNATIONAL AFFAIRS (MOSCOW), Oct. 1962, at 75. In the article the author states that "[i]n the past few years [countries] have been trying to work out an international agreement which would legalize the dumping of radioactive waste into the sea. Unfortunately, the Secretariat of the International Atomic Energy Agency . . . is lending a hand in this matter." *Id.* at 75.

[189] Though the Soviet Union insists that all marine disposal of radioactive wastes is illegal, it was reported several years ago that Russia was making a survey of the North Atlantic for the purpose of locating a disposal site. N.Y. Times, Feb. 17, 1960, at 12, col. 4.

[190] *See* proposal by Czechoslovakia to prohibit all marine radioactive waste disposal. 4 OFFICIAL RECORDS, *supra* note 12, at 149.

[191] H. BYRNIELSSON, *supra* note 129.

tion of waste disposal at sea.[192] From the beginning of its work the panel noted that "two different views arose on the fundamental question of the permissibility of disposing radioactive waste into the sea under international law."[193] The Soviet Union reiterated the position that any radioactive waste disposal in the sea is both contrary to the principle of freedom of the sea and the international law embodied in Article 25 of the Convention on the High Seas.[194] It argued that Article 25 requires all nations to prevent pollution through radioactive waste disposal; any radioactivity pollutes the sea; therefore, disposal in any manner is contrary to international law.[195] The majority of the panel, however, concluded that disposal is lawful, a conclusion based on the earlier Brynielsson study sponsored by the IAEA which found that low-level wastes can be safely deposited at sea and do not pose any harm to man or to marine life.[196]

Both the majority and minority of the panel drafted conventions. The former devised a system of control regulating the disposal of low-level wastes; the latter prohibited disposal entirely. Because the draft convention of the majority was the first real step toward ultimate international agreement, it will be discussed in detail. The definition of "disposal" in the convention included both direct introduction and indirect introduction via rivers.[197] Indirect introduction of airborne radioactive waste was excluded from the definition[198] because it raised problems obliquely involving the testing of nuclear weapons, a problem partially settled subsequently by the adoption and ratification of the Nuclear Test Ban Treaty. [199] All members of the

[192] IAEA, THE LEGAL IMPLICATIONS OF DISPOSAL OF RADIOACTIVE WASTE INTO THE SEA (DG/WDS/L. 19, June 14, 1963) [hereinafter cited as PANEL].

[193] *Id.* at 5.

[194] Khlestov, *supra* note 188, at 75.

[195] A more logical interpretation of Article 25 is that since it does not expressly prohibit disposal, it is not contrary to international law to dispose of wastes at sea. For this theory, *see* Doyle, *supra* note 123, at 16.

[196] PANEL 6.

[197] Article I of the draft convention provides in part:

"1. *'Disposal'* means

(i) direct introduction into the sea of radioactive material, the total radioactivity of which exceeds 'X' curies in a year at a particular site; or

(ii) introduction of radioactive material into the internal or inland waters of the Disposing State with the knowledge that, as a result, radioactivity exceeding 'X' curies in a year will reach the sea at a particular site."

PANEL 10.

[198] Article I of the draft convention provides in part:

" '[D]isposal, shall not include introduction of radioactive material

(a) through the medium of air; or

(b) as a source of power for purposes connected with aiding navigation or predicting weather, or for performing other such useful functions."

PANEL 10.

[199] Since the Nuclear Test Ban Treaty, only France and China have conducted atmospheric tests which are likely to cause the introduction of significant amounts of radioactive materials into the sea.

[200] Article III of the draft convention provides: "Unprocessed irradiated nuclear fuel and the radioactive material arising . . . from the first stage process of separation of the fission products in the chemical processing of irradiated nuclear fuel shall not be discharged into the sea or internal waters." PANEL 14.

The convention proposed by the two dissenting members of the panel provides in

panel agreed that the introduction of high-level wastes should be prohibited.[200] Disposal of solid wastes in depths less than 2,000 meters was also prohibited,[201] primarily to insure that coastal fisheries would not be affected.[202]

The most significant provisions of the draft dealt with registration, reporting, and arbitration.[203] States are first obligated to report to the IAEA all sea disposal operations carried out in the past.[204] Prospective disposal is to be reported to the IAEA noting the disposal site, the time or period of disposal, the type of waste to be disposed, and the monitoring of the disposal site required.[205] These prospective disposal plans were required under the draft to be submitted to the IAEA and signatory nations.[206] The panel was unable to agree on the rights of a state which objected to a proposed disposal operation. One alternative merely provided, in effect, that a disposing nation could

---

Article 2: "All disposal of radioactive waste into the sea, including the High Seas, the Territorial Seas and internal sea waters, is prohibited." PANEL 24.

[201] Article IV of the draft convention provides: "No packaged or sold radioactive material shall be discharged into the sea or internal waters at a depth of less than 2000 metres." PANEL 14.

[202] PANEL 15.

[203] Articles V–IX. PANEL 16–20.

[204] Article V provides:

"1. States shall transmit to the Director General as soon as possible after the adoption of these Articles information concerning disposals which have already been carried out by them or under their authority or permission, as well as available relevant scientific data.

"2. Articles VI(5) and VII to IX shall not apply to disposals authorized or undertaken by a State prior to the adoption of these Articles." PANEL 16.

[205] Article VI of the draft convention provides:

"1. States shall transmit to the Director General information concerning disposals which they intend to carry out or authorize or permit to be carried out after the adoption of these Articles.

"2. Such information shall include the following:

(a) The disposal sites.

(b) The time or period of the disposal.

(c) The quality and quantity of the radioactive material to be disposed of.

(d) The investigations made and the controls required.

"3. The Director General may consult with States concerning the type of, and the form in which the information should be given.

"4. When transmitting the information to the Director General, States shall inform him concerning other States, if any, to which they have transmitted it.

"5. The disposals referred to in paragraph 1 shall not be carried out before [six] months after the transmission of the information to the Director General." PANEL 16.

[206] Article VII of the draft convention provides:

"1. The Director General shall transmit as soon as possible the information which he receives pursuant to Article VI, or a summary thereof, to such States as have not already been informed by the Disposing State, and to the competent international organizations.

"2. The Director General may consult with the Disposing State concerning the disposal, and may carry out independent investigations by arrangement with the Disposing State where appropriate.

"3. The Director General may advise the Disposing State to postpone the disposal, in whole or in part, pending the consultations or investigations referred to in paragraph 2." PANEL 18.

postpone disposal plans if objections to its plans were made.[207] The other alternative provided for a mandatory delay of disposal operations until agreement with the objecting state was reached.[208] In conjunction with these alternatives, another article of the draft provided for mediation to resolve differences among disposing and objecting nations. Again the panel was unable to agree on the issue whether or not there should be a mandatory period of delay during mediation.[209] Moreover, the panel was unable to agree on the role of the mediator. Five members of the panel felt that the mediator should deliver an opinion on the proposed disposal,[210] while three

[207] Article VIII, Alternative 1 provides:

"1. Any State which considers that it is likely to be affected by the disposal referred to in Article VI, paragraph 1, may raise questions concerning the disposal directly with the Disposing State, or through the Director General.

"2. If such a State raises such questions through the Director General, the procedure set forth in Article VII, paragraphs 2 and 3, shall apply.

"3. If such a State raises such questions directly with the Disposing State, it shall inform the Director General of this fact, of the nature of the questions raised, and the result of the consultations.

"4. The Director General may advise the Disposing State to postpone the disposal in whole or in part pending consultations between the Questioning and the Disposing States." PANEL 18.

[208] Article VIII, Alternative 2 provides in part:

"5. The State objecting to the disposal . . . and the Disposing State shall attempt to reach an agreement by negotiations, within the scope of the information transmitted under Article VI, paragraph 1, and not inconsistent with the provisions of these Articles. [Where the objection is raised by an Objecting State, the Director General shall be associated in the negotiations.] If an agreement is reached, the Director General shall be informed about it.

"6. If the objection is raised within the period specified in Article VI, paragraph 5, the disposal shall not be carried out so long as an agreement is not reached." PANEL 18.

[209] Article IX, Alternative 1 provides in part: "5. At the time of the appointment of the mediator, or at any time thereafter, the Director General may advise the Disposing State to postpone the disposal in whole or in part, and may give his reasons therefor."

In contrast Article IX, Alternative 2 provides in part:

"6. If the objection is raised after the period specified in Article VI, paragraph 5, the intended disposal shall not be carried out pending the conclusion of the work of the authority, except to the extent and in the manner permitted by the authority.

"7. If the objection is raised within the period specified in Article VI, paragraph 5, the Director General may at any time advise the Disposing State to postpone the disposal, in whole or in part, and may give his reasons therefor." PANEL 20.

[210] Article IX, Alternative 2, supported by five members of the panel, provides in part:

"1. If the Objecting State . . . and the Disposing State are unable to reach an agreement . . . within a period of [one] month, any party may refer the objection to mutually agreed authority, or in the absence of a mutual agreement within one month of the reference, to] a competent authority . . . to be appointed by the Director General . . .

"3. The authority shall endeavour to settle the differences to the mutual satisfaction of the parties . . . .

"4. If the differences are not thus settled, *the authority shall render its opinion* and make a report to the Director General, who shall transmit copies thereof to the Disposing State and the Objecting State. The Disposing State shall give due consideration to the opinion of the authority." [Emphasis added.]

Article IX, Alternative 1, supported by three members of the panel, provides in part: "4. At the conclusion of the mediation proceedings, the mediator shall report thereon to the Director General, who shall transmit the report to the Questioning and the Disposing States." PANEL 20.

members "regarded such a provision as unacceptable on the ground that it was contrary to the notion of mediation."[211]

The major argument against a mandatory moratorium on disposal operations after objections have been made is that one nation may use this provision to hamper legitimate sea disposal or for propaganda purposes. A state unlikely to be affected by the proposed disposal would have the power under the draft to delay disposal operations for an indefinite period of time.

Although agreement is unlikely to be concluded in the near future owing to presently irreconcilable differences of opinion,[212] agreement must ultimately be reached. Because nuclear waste disposal at sea is likely to increase in the future and because such disposal is far too dangerous to be left unregulated, it is imperative that regulatory measures be established before any serious nuclear pollution occurs.

IV. Other Sources of Pollution

A. The Problem

Other sources of pollution originate from the myriad of municipal, industrial, and agricultural activities carried out on land. Elsewhere in this volume the special problems of agriculture and industry have been discussed, focusing on the nature of the pollutants and the means of control. In this section attention will be devoted to the unique problems these pollutants present to the marine environment.

Municipal sewage and wastewaters, with or without treatment, are discharged into the sea by most of the coastal communities in the United States. In California, for example, 66 percent of the municipal wastes are discharged into coastal or estuarine waters.[213] These wastes are neutralized relatively rapidly by the sea,[214] but they do contain products which can alter the marine ecology to the ultimate detriment of man. Inorganic nitrogen and phosphorous compounds are produced in the treatment of municipal wastes.[215] Phytoplankton which forms the basis of the entire food chain may be affected by the introduction of these compounds in two ways. First, phytoplankton, stimulated by an infusion of phosphorous and nitrogen, could clog marine areas of recreational and scenic value.[216] Second, certain species which depend upon phosphorus and nitrogen may increase in number, re-

[211] Panel 19.

[212] One significant step in regard to international regulation of radioactive waste disposal has been the prohibition of disposal in the Antarctic area. This has been accomplished by the Antarctic Treaty which applies to those areas south of 60° S. latitude. Article 5 of the Treaty provides that: "1. Any nuclear explosions in the Antarctic and the disposal there of radioactive material shall be prohibited." The Treaty entered into force for the United States on June 23, 1961. 12 U.S.T. 794, T.I.A.S. No. 4780.

[213] California State Water Pollution Control Board, Marine Waste Disposal Research Program in California 10 (Pub. No. 22, 1960).

[214] Oceanography 1966, *supra* note 122, at 88.

[215] *Id.* at 89–90.

[216] *Id.*

ducing the possibility of survival of other forms of marine life.[217] In Southern California, for example, the destruction of commercially valuable kelp beds may have been caused by the discharge of sewage into coastal waters.[218] The growth of phytoplankton, stimulated by sewage, contributed to the growth of sea urchins which in turn fed on and destroyed the kelp.[219]

Chemical and industrial wastes may also seriously affect man and the beneficial uses of the sea. Occurrence of so-called Minamata disease in Japan indicates the potential harm of unregulated chemical and industrial waste disposal. Between 1953 and 1960, at least 105 cases of an often fatal, severe nervous disorder occurred in an area around Minamata Bay.[220] Scientific research narrowed the source of the disease to shellfish, containing high concentrations of mercury, which constituted a primary source of food for the inhabitants of the area.[221] A chemical factory on Minamata Bay had been discharging wastewaters containing mercury into the Bay.[222] "Subsequent work . . . provided evidence that the responsible toxin for Minamata disease [was] associated with the discharge of the mercury-containing effluent from the chemical factory."[223]

Waste heat discharged by power plants using water as a coolant is another potential source of pollution of the marine environment, especially of estuaries and nearshore regions. "The future need for larger water volumes and larger surface areas for maximum cooling rates will result in a larger percentage of S.E.S. [stream electric stations] to be located in estuaries—32% in 1980 compared to 22% in 1950."[224] Cooling waters discharged by power plants may be as much as twenty degrees Fahrenheit higher than at intake.[225] This waste heat may injure many species of marine life which are affected by minute changes in the water temperature.[226] Nuclear power plants are of special concern because they are less efficient than conventional fossil fuel plants in that they discharge about 50 percent more heat.[227] Presently only one percent of the total generating capacity of the United States is provided by nuclear facilities, but by 1980 nuclear power promises to produce about 30 percent of an estimated 530 million kilowatts.[228] By 1980 it is estimated that power needs for cooling waters will be one-fifth to one-sixth the total freshwater runoff in the United States.[229] Over 100

[217] *Id.*

[218] W. MARX, THE FRAIL OCEAN 40–53 (1967).

[219] *Id.*

[220] *Id.* at 56.

[221] Kurland, Faro, & Siedler, *Minamata Disease*, 1 WORLD NEUROLOGY 370 (Nov. 1960).

[222] *Id.*

[223] *Id.*

[224] Mihursky & Kennedy, *Water Temperature Criteria to Protect Aquatic Life*, in AM. FISHERIES SOC'Y, A SYMPOSIUM ON WATER QUALITY CRITERIA TO PROTECT AQUATIC LIFE 20, 21 (SPECIAL PUB. NO. 4, 1967).

[225] OCEANOLOGY INTERNATIONAL, March–April 1968, at 15.

[226] Mihursky & Kennedy, *supra* note 224.

[227] OCEANOLOGY INTERNATIONAL, *supra* note 225, at 15.

[228] OCEANOLOGY INTERNATIONAL, Jan.–Feb. 1968, at 11.

[229] Mihursky & Kennedy, *supra* note 224, at 20.

trillion gallons of heated water could be discharged into streams, estuaries, and nearshore regions.[230]

The indirect introduction of pollutants via rivers and air currents also threatens the beneficial uses of the sea.[231] Pesticides used primarily in agriculture are perhaps the most lethal pollutant in this category. The problem is quite serious, for studies have shown that a majority of the estuaries in the United States are now contaminated with pesticides such as DDT.[232] Unlike many pollutants, pesticides are not neutralized rapidly by the sea.[233] Residues of pesticides have been found in the oil of fish inhabiting the seas off of North America, South America, Europe, and Asia.[234] As an example of the extent of the problem, penguins and seals, indigenous to the Antarctic, have also been found to contain residues of DDT,[235] a pesticide used only since World War II.[236]

B. Method of Solution

As with oil and nuclear pollution, these other sources must be regulated by both unilateral and international regulations. But unlike oil and radioactive waste, these sources are not as easily identified or isolated and are thus not as amenable to unilateral and international controls. The waters into which most of these pollutants are discharged are within the territorial limits of the disposing state and they support most of its commercial and sport fishing activities. In the United States, for example, over 90 percent of the seafood caught is derived from the waters of the continental shelves, and nearly 66 percent of the total is taken from estuarine waters in which marine flora and fauna live or through which they must pass.[237] Consequently, primary responsibility for regulation and control of these pollutants must lie with the disposing coastal nation. International control is also necessary because these pollutants may deplete or destroy stocks of commercially valuable fish and other marine life or may cause injuries to the margin of neighboring states. Pollutants flowing into the sea via rivers are of international concern especially when a river flows through several countries before depositing its suspended wastes into the sea.

All nations must come within the scope of international regulations. If several states, for example, were to enact strong pollution measures but other nations were to allow pollution to go unabated, the likelihood of preventing marine pollution would be diminished. Because the waters of one marine area cannot be isolated from waters of other marine areas, regulation of

---

[230] *See* The Wall Street Journal, Dec. 1, 1967, at 1, col. 1.

[231] *See* Nicholson, *Pesticide Pollution Control,* 158 SCIENCE 871 (Nov. 17, 1967); *Herbicide Hassle: The Army Fires Back,* CHEMICAL WEEK, Jan. 13, 1968, at 67; Mount, *Considerations for Acceptable Concentrations of Pesticides for Fish Production,* in AM. FISHERIES SOC'Y, *supra* note 224.

[232] OCEANOLOGY INTERNATIONAL 11, March–April 1968.

[233] Nicholson, *supra* note 231, at 873.

[234] *Id.*

[235] *Id.* at 872.

[236] *Id.* at 871.

[237] PRESIDENT'S SCIENCE ADVISORY COMMITTEE, ENVIRONMENTAL POLLUTION PANEL, RESTORING THE QUALITY OF OUR ENVIRONMENT 219 (1965).

pollution in one area would be rendered useless if an adjacent area were not to regulate as well. Even if pollution measures were enacted by most coastal disposing nations, lack of uniform criteria for evaluating water quality, effluent standards, or harmful effects would lend itself to international disputes. Unsystematic international regulation would not form a meaningful basis on which a duty to prevent pollution could be imposed. If disputes were to arise, one nation could argue that it has diligently carried out national regulations, despite the fact that these are inadequate to prevent harm to beneficial uses of the sea.

1. Unilateral Control

Because unilateral disposal practices and controls vary widely, it is impossible to discuss all the existing regulatory schemes. Rather, the system of control which is being instituted in part in the United States to abate pollution of marine waters will be discussed and will serve as a model of the regulations which could be imposed in other areas plagued by similar problems. The United States is an excellent example, for it has had to contend with increasing water pollution problems originating mainly from an unsurpassed expansion of industrialization and technology. If the United States could resolve its marine water pollution problems and thereby protect the beneficial uses of the sea, the other nations facing similar problems would soon follow the same approach. Conversely, if the approach were to fail, the reason for failure would lie with the approach itself and not with the lack of financial or technological resources which would deter many countries.

In the United States, under the Federal Water Pollution Control Act,[238] the states are required to establish effluent standards or receiving-water standards to abate pollution in the waters within the scope of the Act.[239] In implementing such standards, two approaches are possible.[240] States may proceed on a case-by-case basis or they may employ a classification system delineating the use of waters and the general water quality or effluent standards which must be maintained for each use.[241] Many states and interstate compacts have now adopted the classification approach.[242] With respect to marine waters, most classification has been of bays, estuaries, and other nearshore regions into which most of the wastes are discharged and from which most of the resources of the sea are extracted. In New York,[243] for example, there are four classes established for tidal salt waters.[244] Class SA seeks to protect the commercial shellfishing industry and any other uses

[238] 33 U.S.C. § 466 (1964), *as amended* (Supp. II, 1965–1966).

[239] 33 U.S.C. § 466a(c) (Supp. II, 1965–1966).

[240] Gindler, *Water Pollution and Quality Controls,* in 3 WATER & WATER RIGHTS 237 (R. Clark ed. 1967).

[241] *Id.*

[242] *Id.*

[243] N.Y. PUB. HEALTH LAW § 1205 (McKinney Supp. 1967). *See also* N.Y. PUB. HEALTH LAW §§ 1202(c), 1221.

[244] J. MCKEE & H. WOLF, WATER QUALITY CRITERIA 419–20 (California State Water Quality Control Board Pub. No. 3-A, 1963).

compatible with the primary use; class SB seeks to protect the bathing waters of the state; class SC seeks to protect fishing and any other uses of the water except bathing and shellfishing; and class SD seeks to protect any uses of saline waters except fishing, bathing, or shellfishing.[245]

The Interstate Sanitation Commission, created by an interstate compact between New York, New Jersey, and Connecticut, overseas pollution abatement on 1,500 miles of shoreline including estuaries and coastal waters.[246] The commission employs a classification system in which waters are divided into two classes. Class A includes beneficial uses of recreation, shellfishing, and other marine fish life; class B includes all other uses.[247] Pursuant to each classification, water quality standards have been established, requiring all dischargers to comply.[248]

In Maine a more detailed classification system has been adopted.[249] Every river, estuary, and tidal area[250] has been classified, specifying the use to which the water is to be put and the water quality standard to be maintained.

In California classification is also employed. The nine Regional Water Quality Control Boards are required by the State Constitution[251] and legislative acts[252] to protect the beneficial uses of all waters. Classification has been adopted as the means of achieving this goal. There is no statewide system of classification in California; rather, the regional boards are permitted to establish standards suited to the needs of each region.[253]

The goal of the classification system of regulation in the United States is the protection of designated beneficial uses of the sea. This system requires a five-step procedure to regulate adequately the water quality of marine waters.[254] The procedure requires:

a. Determination of the beneficial uses to which any marine area is put.
b. A systematic survey to determine the amounts of waste introduced and the types of waste discharged.[255]

---

[245] *Id.* at 420.

[246] 49 Stat. 932 (1935).

[247] Art. VI, 49 Stat. 932 (1935).

[248] Glenn, *An Effective Estuarine Pollution Abatement Program*, in AM. FISHERIES SOC'Y, A SYMPOSIUM ON ESTUARINE FISHERIES 117 (Special Pub. No. 3, 1966).

[249] ME. REV. STAT. ANN. tit. 38, § 364 (Supp. 1967).

[250] ME. REV. STAT. ANN. tit. 38, § 370 (1965).

[251] CAL. CONSTITUTION, art. XIV, § 3 (West 1954).

[252] CAL. WATER CODE § 13005 (West Supp. 1967).

[253] CAL. WATER CODE §§ 13000–03 (West Supp. 1967).

[254] For a study which followed closely this five-step procedure, *see* U.S. DEP'T OF THE INTERIOR, FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, POLLUTIONAL EFFECTS OF PULP AND PAPER MILL WASTES IN PUGET SOUND 6 (1967).

[255] The House Committee on Government Operations recognized the need for such a systematic survey when it recently called for an inventory of industrial wastes. The Committee stated in part: "Since industrial plants discharge vast quantities of complex pollutants into America's waterways, it is essential, if the national water pollution control and abatement program is to be effective, that water pollution control agencies at all levels be able to obtain information as to the source, composition, quantity and points of discharge of industrial wastes and effluents." 3 CCH WATER CONTROL NEWS No. 8, at 2 (July 9, 1968).

c. Determination of the precise effects of waste on the marine ecology.
d. Establishment of water quality standards or effluent standards.
e. Monitoring of the disposal area.[256]

Steps b, c, and d are the most difficult in the regulation of the pollutants in this section. Successful control depends upon the ability to isolate the sources upon which controls are imposed. The sources of waste directly discharged into the sea are obviously more easily isolated than are sources of pollution indirectly flowing into the sea. Controls, therefore, can be imposed with less difficulty and with more success upon the former than upon the latter. Failure to determine the specific effects of a waste discharge also hinders the effective use of this system. Unless the precise effects of a particular waste discharge are known, effluent standards or water quality standards may not be adequate to protect the beneficial uses.

The system of regulation based on classification of waters offers many advantages. Classification allows a comprehensive system of control covering all discharges of waste.[257] It fosters specific formulation of discharge requirements, a necessity in scientific regulation of water pollution.

> [Classification] is both flexible and progressive, since the purpose of a classification into categories is not to confirm a given situation but, instead, to make it possible for improvements to be made so that a watercourse may be upgraded. Moreover, rather than unreservedly forbidding pollution of the receiving waters, a system of classification makes it possible to compel any enterprises discharging or about to discharge effluents to act in such a manner that the effluents are suitable for the characteristics of the receiving medium and are "acceptable."[258]

Unfortunately, classification in the United States is concerned solely with the territorial waters. The high sea is beyond the scope of the present legislation. Increasingly, chemical and industrial wastes are being barged out to sea and dumped,[259] few authorities having any control over these operations.[260] Classification may fail if polluted waters of the high sea were to

---

[256] Although monitoring and determining the possible harmful effects of pollution present difficult problems, they are by no means insuperable. The Department of Commerce, for example, has recently initiated the first extensive pollution prediction service in the United States. Bimonthly forecasts will be made on the rate at which possible pollutants pass through Penobscot River and Bay Estuary in Maine. Knowledge of this rate ("flushing rate") will allow potential polluters to vary the introduction of pollutants with increases or decreases in the flushing rate. During the summer months, when reduced rainfall has decreased the flushing rate, pollution may occur if the introduction of harmful materials is maintained at the winter rate. The prediction service "will enable state and local authorities to institute possible remedial measures to reduce the rate at which potential pollutants are being added to the water until the water flow increases." 3 CCH WATER CONTROL NEWS No. 5, at 6 (June 17, 1968).

[257] Gindler, *supra* note 240, at 241.

[258] J. LITWIN, *supra* note 17, at 31.

[259] *See At Sea About Chemical Wastes,* CHEMICAL WEEK, Oct. 14, 1957, at 133.

[260] *Id.* at 134.

commingle and adversely affect the coastal waters within the scope of regulations.[261]

Admittedly, both the regulation of nearshore and high-sea pollution may be an impossible task because of scientific, financial, political, and administrative reasons. At present it is impossible to gauge precisely the specific effects of the many pollutants introduced into the sea, and scientific controls may never be more precise than estimated water quality or effluent standards in regard to the permissible amounts of waste introduction. As Ludwig and Onodera note:

> There is a paucity of specific scientific knowledge concerning the effects of wastes on marine life of economic value . . . . In coastal situations it is difficult to assess the effects of a waste discharge either with respect to the over-all marine ecology or with respect to a particular species, except in the immediate vicinity of the point of discharge. While it seems certain that the wastes do materially affect the marine ecology over considerable areas beyond the vicinity of the discharge, it is not possible to relate ecological situations and values to particular discharges.[262]

The cost of an adequate system of control may be too great a burden on government and industry. In the United States the estimated cost of eliminating water pollution within the next five years is between 26 and 29 billion dollars.[263] Regulation of pollution by industry is also costly.

> From [industry's] point of view, [a] purification plant . . . entails heavy expense for which nothing is obtained in return and is unproductive. Besides, it is obvious that, to industrial enterprise in production, the obligation of making investments . . . to comply with some new law over a short period, may sometimes appreciably influence financial results and increase cost prices.[264]

In the United States, for example, the AEC has been reluctant to impose requirements to prevent thermal pollution originating from nuclear power plant operations. The AEC has rationalized its position on the basis of a supposed lack of jurisdiction to deal with problems other than nuclear energy.[265] Although the avowed rationale is the lack of specific statutory authority, the AEC is "clearly reluctant to saddle the infant nuclear power industry with water cooling restrictions, while coal, oil and gas-fueled power plants escape regulation because they don't have to obtain Federal li-

[261] This danger has been recognized by the Tri-State Compact and has been partially resolved by classifying all waters within the jurisdiction. "Water quality standards are necessary even in the lowest classifications of the waters . . . . This is necessary not only for aesthetic reasons but also to prevent the flow of Class 'B' water into areas requiring higher quality for best usage." Glenn, *supra* note 248, at 119.

[262] Ludwig & Onodera, *Scientific Parameters of Marine Waste Discharge*, in 3 ADVANCES IN WATER POLLUTION RESEARCH 48 (E. Pearson ed. 1964).

[263] N.Y. Times, Jan. 24, 1968, at 24, col. 1.

[264] LITWIN, *supra* note 17, at 56.

[265] CCH ATOMIC ENERGY L. REP., *Health and Safety* ¶ 11,267. *See also* exchange of letters between Sen. Muskie and the AEC. *Id.* ¶¶ 10,092, 10,095.

censes."[266] These restrictions would increase the financial investment of the nuclear industry, making it less competitive with conventional power suppliers.

In the United States the federal-state dichotomy increases the difficulty of a uniform national program of marine pollution control. Were pollution of the sea to occur, the United States may be obligated under international law to take steps to reduce the pollution. Yet under our federal system, national control of all sources of marine pollution, which would entail an extension of control down to the local level, may be constitutionally forbidden.

The administrative implementation of comprehensive marine pollution legislation may be extremely difficult. Administrative agencies may not be able to cope with the great number of dischargers. To be successful, an administrative agency must also work intimately with local jurisdictions and local industries to insure full compliance with water quality or effluent standards. Administrative difficulties may be alleviated in part by a system of self-regulation by industries contributing to the introduction of waste products in the sea. Administrative agencies under this system need not intrude in force if industries and municipalities regulate themselves.

Too, the difficulties of adequate regulation are increased because many products harmful to marine life which cannot be regulated short of total prohibition of use often originate from activities beneficial in other ways to man. Pesticides, for example, are needed in agriculture, on the one hand, to prevent starvation; but on the other hand, starvation may also result if marine life were destroyed by pesticides flowing indirectly into the sea in significant and harmful quantities.

2. International Control

Pollution of the high sea affects the common interests of all nations in the resources of the ocean. Little has been accomplished heretofore in the regulation and control of the other sources of pollution. In the past the United Nations has worked toward the international control of water pollution. By sponsoring conferences,[267] it has provided a forum for the comparison of national pollution problems and their means of regulation. Other agencies of the United Nations are involved in pollution abatement on the international level. The FAO, for example, which is concerned with nutrition, food, and agriculture, including fisheries and marine products, has promoted international control of water pollution.[268] Although some international action has occurred, a general pollution convention has not been ratified nor has an international water pollution agency been created.

With respect to a general international pollution agreement, the types of controls which could serve usefully to prevent injurious alteration of the

[266] The Wall Street Journal, Dec. 1, 1967, at 16, col. 2.

[267] J. LITWIN, *supra* note 17, at 19.

[268] Dill, *The Position of the Food and Agricultural Organization with Respect to Water Pollution Control,* in UNITED NATIONS ECONOMIC COMM'N FOR EUROPE, CONFERENCE ON WATER POLLUTION PROBLEMS IN EUROPE 121 (U.N. Doc. ECE/Water Poll./Conf./12, 1960).

beneficial uses of the sea may be found in the existing conventions and commissions designed to protect marine fisheries. Fisheries conventions obligate signatory nations to refrain from overfishing and depleting commercially valuable stocks of fish. They may also require fisheries management to maximize the potential harvest. Article 1 of the Convention on Fishing and Conservation of the Living Resources of the High Seas,[269] for example, which went into effect on March 20, 1966,[270] provides in part that:

> All States have the duty to adopt or to co-operate with other States in adopting such measures for their respective nations as may be necessary for the conservation of the living resources of the High Seas.

In Article 2 "conservation" is defined as "the aggregate of the measures rendering possible the optimum sustainable yield to secure a maximum supply of food and other marine products . . . ." The basic regulatory approach of such fisheries conventions is national self-regulation.[271] By imposing a general international duty to conserve fisheries, nations are allowed to enact unilateral controls and establish individual procedures consistent with particular or unique national problems.

A pollution convention, imposing a duty similar to such fisheries conventions, could be a first step in the ultimate international regulation and control of the other sources of pollution. A convention, however, is less useful in translating the general duty of signatory governments to prevent marine pollution into specific national marine pollution regulations. Thus, in conjunction with a convention imposing a general duty upon contracting governments to abate pollution, an international agency, patterned perhaps after the IAEA, could be created. It could be authorized to oversee and systematize unilateral pollution legislation. The main task of such an agency would be the standardization of pollution regulations and the standardization of pollution terminology, water quality criteria, and beneficial uses. As the IAEA, it could sponsor research in marine pollution and have the power to recommend abatement measures pursuant to the results of such research. If disputes were to arise among contracting governments, it could serve as a board of arbitration to which disputants could turn. The establishment of such an international water pollution agency would greatly further universal pollution abatement.

V. Conclusion

Until recently, little attention has been devoted to the legal control of all sources of marine pollution. There are three basic reasons which explain this late development. First, the sea has been considered traditionally an unsaturable depository of waste products. Not until beaches were fouled,

[269] Adopted by the United Nations Conference on the Law of the Sea, April 26, 1958. 2 Official Records 139.

[270] The convention went into force one month after the Netherlands deposited its notice of ratification on Feb. 18, 1966.

[271] For a symposium on the conventions of the North Pacific Area and the basic system of regulation, see 43 Wash. L. Rev. (Oct. 1967).

marine life destroyed, and knowledge gained about the sea, were national and international regulations imposed. Second, pollution situations out of which would arise international laws of pollution, have not as yet occurred. Third, international organizations and agencies able to sponsor and oversee international agreements regulating the various sources of pollution, have come into existence only in this century.

Legal control of marine pollution is hindered primarily by the fact that many nations discharge wastes into the sea and by the lack of specific scientific knowledge of the effects of pollution on the marine environment. Because the sea is communally owned, used, and polluted by all nations, regulations must have universal compliance to be totally effective. But at present, even if universal compliance were forthcoming, regulations and universal compliance would be hindered by the lack of specific scientific knowledge about the sea. But, merely because control of marine pollution is still in its infancy owing in part to incomplete scientific knowledge, we should not abdicate the responsibility of imposing some controls. As international law which itself is still imperfect in the traditional Austinian sense but nevertheless daily utilized, national and international legal devices to control pollution, however imperfect, are necessary first steps.

Although steps have been taken to control pollution of the sea, primarily in the areas of oil and nuclear pollution, concerted action must be employed to control the other more prevalent sources of pollution which are produced and discharged into the sea by all nations of the world. At present standardization of regulations is only beginning to occur. An agency, patterned after the IAEA, could be established, charged with the duty to standardize pollution legislation and oversee national pollution activities. If international standardization of regulations were accomplished and a systematic regulatory approach adopted by most, if not all, of the nations of the world, the beneficial uses of the sea, which are playing an increasingly important role in world development, would be protected.

William D. Farber

ADDENDUM

The recent oil pollution near Santa Barbara, California, which originated from an offshore oil leak, has graphically revealed the dangers inherent in marine oil exploitation and has for a time overshadowed the other more prevalent sources of pollution which formed the basis of the discussion in this chapter. Pollution resulting from drilling is not merely limited to accidents. Off the coast of Louisiana, for example, every one of 2,000 drilling rigs is said to be "releasing oil into the Gulf of Mexico."[272] Indeed, even before the Santa Barbara incident, residents of the area were complaining of the increased incidence of oil on beaches.[273]

At present, drilling beyond the three-mile limit is regulated by the Outer Continental Shelf Lands Act.[274] The Act empowers the Secretary of the Interior to grant leases[275] for the exploitation of minerals in the continental shelf of the United States.[276] Under the regulations promulgated pursuant to the Act,[277] a district supervisor of the Geological Survey is charged with the duty to oversee drilling operations and to enforce the terms of the leases.[278] Before the commencement of drilling the supervisor does not require or propose a specific plan of operation. Rather, lessees are required to submit plans for the drilling structures to be erected,[279] the location of the initial well, the proposed well-casing program,[280] and any pertinent geological or geophysical data.[281] From the information submitted by the lessees the supervisor adopts, for example, well-spacing and well-casing requirements,[282] and the method of abandoning and plugging wells.[283] Throughout the subsequent drilling period the lessees are also required to submit detailed information as well as reports and records on various aspects of drilling.

Despite these requirements, effective control of the drilling practices of the lessees is hindered by two major factors. First, the methods of operation and drilling plans are proposed initially by the lessees themselves. Second,

---

[272] OCEANOLOGY INTERNATIONAL Jan.–Feb. 1968, at 16.

[273] The Wall Street Journal, Feb. 3, 1969, at 7, col. 3.

[274] 43 U.S.C. §§ 1331–43 (1964).

[275] 43 U.S.C. § 1337 (1964).

[276] For the lease of submerged lands in the Santa Barbara Channel to the Union Oil Company, *see* U. S. Dep't of the Interior, Bureau of Land Management, Oil and Gas Lease of Submerged Lands, Serial No. 2222 OCS-P 0241 (Feb. 29, 1968).

[277] 30 C.F.R. § 250 (1969).

[278] 30 C.F.R. § 250.11 (1969).

[279] *See* U. S. Dep't of the Interior, Geological Survey, Conservation Division, Branch of Oil and Gas Operations, Pacific Region [hereinafter cited as Geological Survey], Marking of Wells and Platforms, OCS Order No. 1 (March 31, 1965).

[280] *See* Geological Survey, Minimum Casing, Cement and Blowout Preventers for Drilling in the Outer Continental Shelf, OCS Order No. 2 (March 31, 1965).

[281] 30 C.F.R. § 250.34 (1969).

[282] 30 C.F.R. § 250.17 (1969).

[283] 30 C.F.R. § 250.15 (1969). *See also* Geological Survey, Plugging and Abandonment of Wells, OCS Order No. 3 (as amended Sept. 3, 1968).

much information necessary for independent and careful evaluation of drilling is kept secret by the oil companies who are fearful that the information may filter out to competitors. Only recently has the Department of the Interior demanded drilling records and precise geological information from the lessees.[284] In view of these factors it is difficult to believe that either the supervisor or the Geological Survey can control adequately the crucial drilling practices of the oil industry to prevent oil pollution. This view is supported by former Secretary of the Interior Udall who recently termed his decision to lease submerged lands in the Santa Barbara channel as "a sort of conservation Bay of Pigs."[285] He also stated that:

> [t]he "lessons" of Santa Barbara include the need for "tighter regulations and tougher enforcement," and more funds for the Geological Survey to carry out studies of its own rather than depend upon oil companies for data about submerged land formations and possible damage to natural resources.[286]

With respect to enforcement of drilling requirements and penalties imposed for pollution, the regulations prior to the Santa Barbara disaster merely imposed a duty on offshore lessees not to "pollute the waters of the high seas or damage the aquatic life of the sea . . . ."[287] A violation of the regulations was punishable by a fine not to exceed $2000 or by imprisonment up to six months, or both.[288] Clearly, these regulations and penalties were not adequate to deter oil companies from drilling in a manner likely to cause pollution. It is unrealistic to assume that a potential fine of $2000 will deter multi-million dollar corporations from careless drilling or will goad them into adopting stringent self-regulatory measures. The laxity of the drilling regulations was recognized somewhat belatedly by the Secretary of the Interior who, on February 17, 1969, issued new pollution penalties.[289] Henceforth (for the penalties are not retroactive), lessees will be liable for the control and removal of the oil and for any damage the discharge causes. If the polluter fails to clean up or remove the oil, remedial action may be taken by local, state, or federal authorities who may then recover from the lessee the expenses incurred. Thus, unlike the prior penalties, strict liability is imposed regardless of the absence of negligence or misconduct.

In the Santa Barbara pollution case not only may the lessee, Union Oil Company, be liable for violation of federal law and for civil damage predicated on negligence, but possibly also for violation of California law. Under a 1968 amendment to the California Harbors and Navigation Code,[290] any intentional or negligent deposit of oil in the waters of the state is punishable by a fine not to exceed $6000. The ultimate applicability of the amendment

[284] *See* N.Y. Times, March 12, 1969, at 1, col. 5.
[285] N.Y. Times, March 11, 1969, at 31, col. 4.
[286] *Id.*
[287] 30 C.F.R. § 250.42 (1969).
[288] 43 U.S.C. §1334(a)(2) (1964).
[289] 34 Fed. Reg. 2503–04 (Feb. 21, 1969).
[290] CAL. HARB. & N.C. § 151 (West Supp. 1969).

to this case is in doubt, for an argument can be made that technically the oil was not deposited in the waters of the state. Under the state constitution the territorial limits extend three miles seaward.[291] Thus, the oil originated beyond the limits of California's jurisdiction and only indirectly was deposited in state waters. Although logically impeccable, the argument should not outweigh the underlying rationale of the statute which is to deter all oil discharges which threaten the resources of the state.

The most significant aspect of the amendment is the imposition of liability for the cost of cleaning up or abating the oil pollution in addition to the cost of actual damages. The amount of damages imposed is based on the amount of oil spilled and the "likelihood of permanent injury."[292] It is unfortunate that damages are to be based on the likelihood of permanent injury, for the oil will in time dissipate. If "permanent" were defined as being infinitely long or "incapable of being abated,"[293] the amount of damages would be negligible. In this context the definition of pollution can play a significant role. If "permanent injury" were defined not as a factor of time but as harm to beneficial uses, the underlying policy of the statute would be honored.

The difficulty in equating permanent injury with harm to beneficial uses lies, of course, in ascertaining the precise beneficial uses and their value. Vessels, beaches, and commercially valuable marine life are certainly within the ambit of the statute, and damage to these are capable of being ascertained. But the precise (or even approximate) value of whales, seals, or seagulls—animals which should also be deemed worthy of protection—is difficult indeed to compute, even assuming permanent injury can be discovered. Thus, in the absence of a workable utilitarian calculus, damages imposed for injury to marginal beneficial uses can be no more than speculative.

In view of the difficulties involved in abating oil pollution and imposing penalties for damage caused, legislation must be aimed primarily at prevention of pollution through drilling and only secondarily at imposition of liability for damage and injury. It is likely that pollution from offshore drilling cannot be entirely eliminated even with the most stringent of requirements; and therefore the question arises whether the aggrandizement of a few (through continued drilling) is more worthy of protection than the preservation of the environment for all (by banning offshore drilling in certain locations). These opposing interests may not be absolute and irreconcilable, for by balancing the interests of both through careful siting of offshore drilling zones, the needs of business and the preservation of the environment can be safeguarded.

---

[291] CAL. CONST. art. XXI, § 1 (West 1954).
[292] CAL. HARB. & N.C. § 151 (West Supp. 1969).
[293] City of Stillwater v. Cundiff, 87 P.2d 947, 948 (Okla. 1939).