

EFFECTS OF MAN'S ACTIVITIES ON THE MARINE ENVIRONMENT

PREPARED AT THE REQUEST OF
HON. WARREN G. MAGNUSON, *Chairman*
COMMITTEE ON COMMERCE
AND
HON. ERNEST F. HOLLINGS, *Chairman*
NATIONAL OCEAN POLICY STUDY
FOR THE USE OF THE
COMMITTEE ON COMMERCE
AND THE
NATIONAL OCEAN POLICY STUDY



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LETTER OF TRANSMITTAL

DEAR COLLEAGUE: The following report, prepared by the Congressional Research Service at the request of the National Ocean Policy Study, presents a comprehensive report on ocean pollution.

We wish to emphasize that the findings and recommendations incorporated in this report have neither been approved, disapproved, nor considered by the Senate Committee on Commerce or the National Ocean Policy Study. Rather, this report, prepared at our request for the information and use of the National Ocean Policy Study, is the work product of the Congressional Research Service.

WARREN G. MAGNUSON,
Chairman,
Committee on Commerce.

ERNEST F. HOLLINGS,
Chairman,
National Ocean Policy Study.

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LETTER OF TRANSMITTAL

Dear Congressman: The following report, requested by the Congressional Research Service at the request of the National Ocean Policy Study, presents a comprehensive report on ocean policy. We wish to emphasize that the findings and recommendations incorporated in this report have neither been approved, disapproved, nor endorsed by the Senate Committee on Commerce and Fisheries. Ocean Policy Study. Rather, this report, prepared at the request of the information and use of the National Ocean Policy Study, is the work product of the Congressional Research Service.

WARREN G. ALANSON,
Committee on Commerce

THOMAS H. HOLMES,
Chairman,
National Ocean Policy Study

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LETTER OF SUBMITTAL

THE LIBRARY OF CONGRESS,
CONGRESSIONAL RESEARCH SERVICE,
Washington, D.C., August 26, 1974.

HON. ERNEST F. HOLLINGS,
*Chairman, Subcommittee on Oceans and Atmosphere, Committee on
Commerce, U.S. Senate, Washington, D.C.*

DEAR MR. CHAIRMAN: In response to your request, I am submitting a comprehensive report on ocean pollution.

The report, entitled "Effects of Man's Activities on the Marine Environment," describes most of the salient aspects of ocean pollution beginning with the importance of preserving the ocean resource, through man's activities that generate marine pollution, specific marine pollutants, private international organizations concerned with marine pollution, United Nations conventions and United States legislative activities, and current technology for abating ocean pollution. The appendixes include lists of harmful substances in the sea, international conferences and agreements for controlling marine pollution, recommendations of the UN Conference on the Human Environment, and the recently drafted international conventions on the dumping of wastes and prevention of pollution from ships.

The report was prepared by Dr. James E. Mielke, Analyst in Marine and Earth Sciences.

We hope that this report serves your committee's needs as well as those of other committees and Members of Congress concerned with marine pollution and the National Ocean Policy Study.

Sincerely,

LESTER S. JAYSON, *Director.*

LETTER OF SUBMITTAL

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I. ASSESSING MAN'S INFLUENCE ON THE OCEANS

Importance of the Oceans

The oceans are one of man's greatest resources. Over seventy percent of the earth's surface is covered by seas. The interaction of these areas with the atmosphere is a major determinant of our weather. Man depends on the oceans as a major source of his food supply. Ocean-going vessels provide a simple and practical means of transporting large quantities of materials. The oceans themselves are essential for man's existence as nearly all of man's fresh water supply is ultimately derived from the oceans. The ocean resource, like other resources, cannot be exploited without limit.

Definitions

Contamination and pollution of the oceans are continuing processes begun by natural means and heightened by man's activities. Contamination is the introduction of any substance foreign to the oceans whereas pollution is the addition of a contaminant detrimental to ocean use. This often involves a value judgement as to what or how much of a contaminant is detrimental. For example, municipal sewage can be a health problem or a source of plant nutrients; heated water can be fatal to some marine organisms and favorable to others. In many cases adequate and reliable data have yet to be gathered to enable proper assessment of the effects of ocean pollution.

There are many ways in which man utilizes marine resources. Many of these activities are mutually compatible but some are not. Some activities that produced contaminants in the past produce pollutants now through an increase in the magnitude of the activities involved. With increasing population and technological development, it is becoming imperative to develop policies that promote balanced use and conservation of the oceans. Without such assessment and planning now, there is a high probability that man's greatest resource, the oceans, may become his greatest tragedy.

Extent of Man's Influence on the Oceans

Pollution of the world's oceans is now possible simply by expansion of man's present activities. For example, disposal of wastes or runoff into limited bodies of water is primarily a local problem, and with abatement of the pollution, recovery of these bodies is slow but possible. With continued discharge, however, there is little hope for recovery and the oceans themselves will become polluted. Isolated incidents of pollution such as oil spilled or discharged into the ocean are local problems, but the sum of many such problems constitutes a threat to the entire ocean. Because of the oceans' size and very long mixing cycles, a polluted ocean ultimately poses a threat to man's healthful existence on earth.

II. ACTIVITIES THAT GENERATE MARINE POLLUTION

Man utilizes the oceans and ocean resources in numerous ways. Many of man's activities either directly or indirectly contribute to marine pollution. Among the activities that generate pollution are the following: shipping and commerce, waste heat disposal, ocean dumping, industrial and municipal effluent discharge, energy development, fuel combustion and industrial processing, military uses, dredging, and deep seabed mining.

Shipping and Commerce

Pollution derived from shipping and commerce can be either accidental or deliberate. Accidental pollution arises from disasters such as the breaking up of a tanker or spillage from loading facilities. Deliberate pollution is generated when a vessel intentionally discharges oil from its tanks or bilge into the ocean.

Waste Heat Disposal

Disposal of waste heat is primarily a coastal problem arising from the use of inland and coastal waters as coolants in electric-power generation facilities. The return of heated water to bays and estuaries has produced ecological changes in the local coastal environment. The full effects of these changes are still being evaluated to determine whether positive benefits outweigh the negative effects.

Ocean Dumping

Ocean dumping is still practiced although some countries such as the United States have taken strong steps to control dumping in their own territories or by their citizens. Dumping includes mainly barging wastes out to sea, but disposal from long offshore pipes can also be included in this category. These activities in the past have accounted for the emplacement on the ocean floor of severely toxic and radioactive materials in sealed containers in addition to a wide variety of uncontained wastes of a less hazardous nature.

Industrial and Municipal Waste Discharge

Discharge of industrial and municipal waste effluent into streams and estuaries also affects the quality of the coastal marine environment. These activities release mainly heavy metals, organic material, and nutrients causing eutrophication and pollution of many important seafood producing areas. Bays and estuaries are the most severely affected bodies although many ocean fish have been contaminated by this discharge. Curtailment of some ocean fisheries and seafood industries has already resulted.

Energy Development

Energy development has begun to impinge more widely on the marine environment. Offshore exploration, development, and production of oil and gas is continuing to increase rapidly. Both normal operations and accidental mishaps such as blowouts can create significant marine pollution. In addition, plans are being discussed for construction of deep water superports and offshore oil terminals. Floating offshore power plants may also begin to affect marine ecosystems. Nuclear energy development including atmospheric testing and reprocessing of nuclear fuels have contributed radioactive pollutants to the oceans. While atmospheric testing has decreased, the use of nuclear fuels is increasing rapidly. Radioactive materials enter the ocean through the atmosphere-ocean interchange and by discharge into rivers or into the ocean directly.

Combustion and Processing

Another source of marine pollution entering through the atmosphere-ocean interface is derived from the combustion of fossil fuels. Carbon dioxide plus the products from incomplete combustion and the oxidation or vaporization of contaminants in the fuels pollute the atmosphere and eventually pollute the oceans. Evaporation of volatile substances such as chlorinated hydrocarbons and petroleum products and vapors from industrial processing also contribute to ocean pollution via the atmosphere.

Military Activities

Military use of the oceans for target and bombing practice has contributed some measure of pollution. Wartime activities involving the sinking of tremendous tonnages of shipping must also be considered. Seepage of oil and munitions or other materials from destroyed ships may locally affect the marine environment. Testing of nuclear weapons has also contributed to ocean pollution both via the atmosphere and directly from oceanic test sites.

Dredging

Dredging is primarily a near-shore problem with the exception of deep sea mining which will be considered separately. Present dredging activities are concerned primarily with port and channel development and recovery of commercial minerals such as sand, gravel, shells, barite, cassiterite, ilmenite, zircons, gold, and diamonds from estuaries and offshore locations. Future dredging activities may include deep-water port construction and the related development of offshore oil terminals.

Deep Seabed Mining

The recovery of ferromanganese nodules from the ocean floor is likely to have an impact on the marine environment. At present, lack of international agreements regulating deep seabed mining, concern for the security of the investment, and uncertainty regarding the environmental impact of the activity is hindering commercial development. Preliminary studies indicate that the environmental disruption from the physical aspects of deep seabed mining may be minimal.

III. SPECIFIC MARINE POLLUTANTS

Man's activities have generated a number of pollutants in the marine environment. Among the specific pollutants are chlorinated hydrocarbons, heavy metals, municipal wastes, solid materials, carbon dioxide, petroleum, radioactivity, and thermal discharges.

Major Characteristics of Pollutants

In order to assess the potential of a pollutant to damage a marine ecosystem, several factors must be determined: quantity, toxicity, persistence, and mobility. A pollutant must be present in sufficient quantity to have a deleterious effect. Toxicity determines the critical quantity or concentration of a pollutant necessary to produce detrimental effects. Persistence allows concentrations to build up over a period of time until critical levels are reached. Mobility is important as a product released on land will remain there if it is not very mobile. Volatility is also an aspect of mobility since the atmosphere is an important medium through which some pollutants enter the ocean.

Major Classes of Pollutants

Nearly any substance can become a marine pollutant if its use is not controlled. However, it is not the intent of this study to list every possible contaminant but to consider only those of major or potentially major significance. These are the pollutants that must be considered in formulating a policy of ocean resource utilization. These pollutants, in the absence of a policy or other controls, will ultimately determine the extent to which the ocean's resources can be developed. To supplement the following discussion a table of harmful substances found in the oceans is included in Appendix I.

Chlorinated hydrocarbons.—There are two major types of chlorinated hydrocarbons found in marine ecosystems. The most widespread is p,p'-DDE which is a derivative of the insecticide p,p'-DDT. DDE has very low toxicity to insects, vertebrates, and almost all other forms of life, and has never been used as a biocide. It is, however, a persistent (non-degradable) compound and has been found in oceans and rainwater throughout the world. Though the toxicity of DDE is low it poses other problems as are discussed later.

PCB compounds (polychlorinated biphenyls) are also widespread marine pollutants. These compounds are industrial products and are not used as pesticides. There is recent evidence that PCB compounds may also result from the breakdown of DDT.¹ PCB is extensively used by industry in manufacturing various paints, plastics, adhesives, coating compounds, electrical equipment, and many other products.² The usefulness of the chlorinated biphenyl compounds derives from their chemical stability which also ensures that they will persist long after the manufactured products disintegrate

¹ Moilanen, K. W. and D. G. Crosby. in DDT: An Unrecognized Source of Polychlorinated Biphenyl (Maugh, T. H. II). *Science*, v. 180, 1973: 578-579.

² Monsanto Company. *Technical Bulletins* O/PL-311A, O/PL-306, and O-FF-1; Monsanto Company St. Louis.

Air transport is a major mechanism for dispersing chlorinated hydrocarbons which have been detected in airborne particulate matter,³ rainwater,⁴ and Antarctic snow.⁵ Chlorinated hydrocarbons tend to remain in soils rather than be leached into drainage waters. After 20 years, 35 to 50 percent of the DDT used for subterranean termite control in Mississippi was still present and there was no significant migration to adjacent soil despite intensive rainfall.⁶ Vaporization most likely accounts for the considerable loss that did occur. Atmospheric transport and subsequent fallout into the sea can explain the observed distribution and concentrations of both DDT and PCB compounds in the marine environment.

At issue is the question whether persistent waste products derived from industrial or agricultural uses are compatible with the long-term technological development of our planet. Once in the environment, chlorinated hydrocarbons move through food chains, becoming progressively more concentrated in higher order organisms. Numerous examples of this effect have been reported. In 1969, fish taken from the Pacific Ocean were seized by the U.S. Food and Drug Administration and condemned as unfit for consumption. Jack mackerel from the southern California coastal waters were found to contain 10 ppm (parts per million) of DDT compounds in their tissues (5 ppm is considered by FDA as the maximum permissible level). Several petrels and shearwaters, oceanic birds that do not approach land except to breed on islands, were analyzed and found to contain PCB and DDT (Table I).

Perhaps the most severe effect of chlorinated hydrocarbons documented thus far is on the reproductive processes of several species of marine birds. Brown pelicans, nesting on the Channel Islands and Coronados Islands in California, were found to contain 80 ppm of

TABLE I.—DDT AND PCB RESIDUES IN PETRELS AND SHEARWATERS; DDT RESIDUES CONSIST OF P,P'-DDE PLUS P,P'-DDT PLUS P,P'-DDD

Species, locality (breeding area), tissue	Number	DDT (wet weight, ppm)	PCB (wet weight ppm)
Fulmar, <i>Fulmarus glacialis</i> , California, whole birds (Alaska).....	3	7.1	2.3
Pink-footed Shearwater, Mexico, whole bird (Chile) <i>Puffinus creatopus</i> ..	1	3.0	.4
Sooty Shearwater (New Zealand and Chile) <i>Puffinus griseus</i> :			
California, whole bird.....	2	11.3	1.1
New Brunswick, fat.....	3	40.9	52.6
Slender-billed Shearwater (Australia), <i>Puffinus tenuirostris</i> , California, whole bird.....	1	32.0	2.1
Greater Shearwater, <i>Puffinus gravis</i> , New Brunswick (Southern Atlantic), fat.....	3	70.9	104.3
Bermuda Petrel, <i>Pterodroma cahow</i> (Bermuda), eggs and chicks.....	5	6.4	-----
Ashy Petrel, <i>Oceanodroma homochroa</i> (California), whole birds.....	12	66.0	24.0
Black Petrel, <i>Loxophanes melanotos</i> (Mexico), whole birds.....	8	9.2	1.0
Least Petrel, <i>Helodyptes microsomus</i> (Mexico), whole birds.....	3	3.2	.35
Leach's Petrel, <i>Oceanodroma leucorhoa</i> :			
(Baja California), egg fat.....	1	953.0	351
(New Brunswick), body fat.....	3	164.0	192
Wilson's Petrel, <i>Oceanites oceanicus</i> New Brunswick (Antarctica), body fat.....	3	199.0	697

Source: Risebrough, R. W. Op cit, p. 262.

³ Risebrough, R. W., R. J. Huggett, J. J. Griffin, and E. D. Goldberg. Pesticides: transatlantic movements in the northeast trades. *Science*, v. 159, 1968: 1233-1236.

⁴ Tarrant, K. R. and J. O'G. Tatton. Organochlorine pesticides in rainwater in the British Isles. *Nature*, v. 219, 1968: 725-727.

⁵ Peterle, T. J. DDT in Antarctic snow. *Nature*, v. 224, 1969: 620.

⁶ Smith, V. K. Pesticides in soil: long-term movement of DDT applied to soil for termite control. *Pesticides Monitoring J.*, v. 2, 1968: 55-57.

chlorinated hydrocarbons in their bodies.^{7,8} Eggs of these pelicans frequently collapsed due to a deficiency of calcium carbonate which was highly correlated to the amounts of DDE in the birds. The birds with less DDE showed less shell thinning. Many other species of birds have since been shown to react in a similar manner to ingested DDE from marine fish. These birds include double-crested cormorants, American egrets, common murres, American kestrel, ashly petrels, and mallard ducks. In addition, there is circumstantial evidence to indicate that such species as peregrine falcon, osprey, and bald eagle are having reproductive failures due to ingested chlorinated hydrocarbons.

Chlorinated hydrocarbon insecticides such as dieldrin and heptachlor epoxide have been detected in resident wildlife in Antarctica. Dieldrin has also been found in some sea birds. Another chlorinated hydrocarbon, endrin, is extremely poisonous to life forms requiring concentrations of only 2.6 ppb (parts per billion) in water to kill juvenile fish of some species. This compound has been found in fish from the Mississippi River and in brown pelicans from Florida and the Gulf of California. Since the early sixties, the brown pelican has disappeared from along the coast of Louisiana. Previously it had been the state bird of Louisiana. It is possible that endrin in the fish the pelicans ate caused their disappearance from the Gulf coast.

Effects of chlorinated hydrocarbons on fish reproduction have also been studied. Concentrations of chlorinated hydrocarbons necessary to impair reproduction (0.2 to 2.0 ppm) were of the same order as those found in Lake Michigan eggs of coho salmon and in the kiwi, a species formerly abundant in Lake Michigan but which has become rare. Tables II and III list DDT and PCB concentrations in plankton and fish from many areas of the world. There is no proof that these or other marine species are or will be harmed by these concentrations, but there are reasonable grounds for concern, especially if accumulation continues. One goal of the International Decade of Ocean Exploration (IDOE) is to establish a worldwide monitoring program to determine the distribution and biological effects of chlorinated hydrocarbon compounds and other pollutants. Every nation is encouraged to participate in this effort. The future of many populations of marine birds and fish is clearly related to the rates of accumulation of chlorinated hydrocarbons in marine ecosystems.

TABLE II.—DDT AND PCB IN PLANKTON

Area	No. of samples	Totals (μg/kg wet weight)	
		DDT	PCB
Sargasso Sea.....	4	0.7	7-450
South Atlantic.....	4	.2-2.6	19-638
Northeast Atlantic.....	22	2-26	10-110
Clyde, Scotland.....	15	6-130	40-230
California, USA.....	15	.2-206	.7-30
Do.....	250	-----	100-1300
Iceland (phytoplankton).....	1	-----	1500

Source: IDOE. Baseline studies of pollutants in the marine environment and research recommendations. IDOE Baseline Conference, May 24-26, 1972. New York, IDOE Baseline Conference, p. 12.

⁷ Risebrough, R. W., D. B. Menzel, D. J. Martin, and H. S. Olcott. DDT residues in Pacific sea birds: a persistent insecticide in marine food chains. *Nature*, v. 216, 1967: 589-591.

⁸ Risebrough, R. W. Chlorinated hydrocarbons. In *Impingement of Man on the Oceans* (Hood, D. W., ed.). New York, Wiley-Interscience, 1971: 259-286.

TABLE III.—DDT AND PCB CONCENTRATIONS IN FISH

Region and material	Concentration ¹	
	PCB	DDT
Open North Atlantic: Pelagic fish:		
Muscle.....	1-10	0.6-3
Liver.....	1,000-6,000	95-4800
Midwater fish and crustacea.....	8-59	3-12
Open South Atlantic: Midwater fish and crustacea.....	2-14	1-8
Denmark Strait: Groundfish:		
Muscle.....	2-360	3-30
Liver.....	300-1,000	9-260
Northwest Atlantic shelf: Groundfish:		
Muscle.....	37-187	3-74
Liver.....	1870-21,800	390-2,680
Gulf of Mexico: Whole fish or muscle.....	<1-530	1-150
Northeast Pacific:		
Euphausiids.....	9.2 (mean)	2.7 (mean)
Pink shrimp.....	23 (mean)	2.5 (mean)
Flatfish.....	23 (mean)	10.8 (mean)
Scottish west coast:		
Fish muscle.....	<100-1,500	<30-480
Fish liver.....	200-42,600	70-5,800
Baltic Sea:		
Herring.....	150-1,500	100-1,500
Cod.....	16-180	9-340

¹ Expressed in micrograms/kilogram (ppb) wet weight; DDT values include all metabolites.

Source: IDOE, Op. cit. p. 14.

Municipal wastes.—The most common method of disposing of municipal waste is to release it into a convenient body of water. Since the majority of the cities in the world are situated near the coast or on inland rivers and lakes, the resultant release of municipal sewage has a direct effect on the world's oceans. With increasing amounts of sewage being generated, natural purification processes are being overwhelmed and many sewage treatment plants are operating at capacity. Even sewage treatment plants do not remove everything, generally leaving nitrogen and phosphorus compounds and some oxidizable organic matter. In some cases sewage is discharged directly into the sea either by barge, as does New York City, or from offshore pipes, as does the Hyperian plant in Los Angeles.

The first negative effect of disposal of sewage and sludge into seawater is in decreasing the light penetration into the water, leading to a decrease in photosynthesis and plant product. A second effect is biodegradation of organic matter resulting in a reduction of the available oxygen in the water. After the available dissolved oxygen is depleted, further biodegradation can continue by reducing nitrates and sulfates, producing, among other things, hydrogen sulfide which is poisonous to many life forms. Another consequence of biodegradation is the phosphorus and nitrogen compounds remaining after degradation of organic material. Added to the phosphorus and nitrogen entering directly from sewage, these plant fertilizers can induce excessive growth of phytoplankton in the surface layers of the ocean. This plant growth may increase to such an extent that the photosynthetic activity in the water masses below is reduced to zero. One description of such conditions in a Dutch oyster district reads: "At some distance from the harbor the water had a greenish color; large amounts of flagellates predominated. Oyster larvae carried to this section failed to settle. They developed symptoms of ill health, lost their attractive

natural pigmentation, developed a hyaline vesica, and finally disintegrated."⁹

Plankton blooms leading to toxic conditions in the water are well known from the phenomenon called the "red tide." Appearance of red tide is associated with overfertilization and is generally caused by upwelling of nutrient-rich water masses, but may also be caused by nutrient-rich effluent from land. These algae may directly poison and kill fish and even cause skin irritations to man when the algae are blown inshore with the foam. Filter feeders, which are not poisoned themselves by toxic algae, might accumulate the toxin in their flesh, and when eaten by man cause grave paralytic poisoning. In more dilute concentrations this fertilizer can be beneficial in stimulating reasonable levels of plant productivity, but it is suggested that the removal of these nutrients from sewage and their application on land would be of more economic benefit.¹⁰ Although not municipal sewage, another source of plant nutrients that should be included is runoff from agricultural areas. This source annually contributes significant quantities of nitrates and phosphates to the oceans either directly from coastal areas or by river systems.

There are many additional effects of sewage disposal in the ocean such as pollution of fish and fishing gear by sludge material, destruction of bottom fauna and flora by settled sludge, reduction of amenities by floating material washed on shore, and destruction of valuable recreation sites. These effects are, however, of a more or less local nature concentrated around outlets and dumping places.

Bacteria and viruses are another problem of municipal wastes. Bacterial pollution is generally monitored by coliform bacteria counts. Coli in itself is not considered dangerous to human health, but the number of coli may be an indicator of the presence of other bacteria and viruses that cause such diseases as typhoid fever, hepatitis, and polio. The persistence of coliform and pathogenic bacteria in the sea is dependent on the amount of predation by protozoa or zooplankton, salinity, sunlight, temperature, pressure, bacteriophage, and heat-labile bacterial substances.¹¹ Bacteria gradually disappear in the open ocean but can reach high concentrations in nearshore filter feeders. Researchers have studied the fate of poliovirus in Northern Quahaugs and found that several species of shellfish were capable of rapidly accumulating significant amounts of virus in their digestive tracts.¹² Outbreaks of infectious hepatitis associated with the consumption of raw oysters were reported in Sweden in 1956. Four outbreaks which involved approximately 900 cases of illness in the United States were also traced back to consumption of raw oysters, quahaugs, and hard clams.¹³

Parasites must also be considered in connection with disposal of municipal wastes in the sea. The possibility exists that marine animals may be affected by human parasites released with the waste.

⁹ Korrington, P. Biological Consequences of Marine Pollution With Special Reference to the North Sea Fishery *Helgolander wiss. Meeresunters.*, v. 17, 1968: 126-140.

¹⁰ Pentelow, F. T. K. Fish, Sewage and Sea Outfalls. *Instit. Publ. Health Engrs. J.*, v. 60, 1961: 232

¹¹ Gunnerson, C. G. Sewage disposal in Santa Monica Bay, California. *J. Sanit. Eng. Div. Amer. Soc. Civil Engrs.*, v. 84, No. SA 1, Proc. paper 1534, 1958.

¹² Liu, O. C., H. R. Seralchekas, and B. L. Murphy. Fate of poliovirus in northern Quahaugs. *Proc. Soc. Exp. Biol. Med.*, v. 121, 1966: 601-607.

¹³ Mason, J. O. and W. R. McLean. Infectious hepatitis traced to the consumption of raw oysters. *Amer. Jour. Hyg.* v. 75, 1962: 90-111.

By feeding on infected animals, a transmittance to man may again occur. The nematode, *Anisakis*, for instance, which may be ingested from poorly cooked herrings causes tumorous-like growths in the stomach and intestines of man. In Holland several persons were recently reported to have become seriously ill and many died from the attack of this parasite.¹⁴

In most communities, an inseparable part of municipal waste is derived from industrial activity. Such wastes may contain heavy metals which may build up to toxic levels in the food chain. Polluted runoff from streets may also be added to the municipal waste. Clearly, control of municipal waste is a necessary step to enhance and preserve the ocean resource.

Solid materials.—In addition to municipal sludge, a number of solid materials are carried into the oceans. These range from harmful microscopic particles carried by rivers to barge loads of dredge spoil and construction wastes dumped directly into the oceans. The U.S. has recently passed legislation to limit the dumping of solid wastes into the oceans, but the effects of previous dumping and the materials carried by river systems still remain a problem.

Spoil from channel dredging accounts for most of the solid material disposed of in the sea. This can pose a pollution problem by disturbing the equilibrium of the water-sediment interface, allowing new chemical reactions to occur. For example, when reduced (oxygen-deficient) sediments are dredged, sulfides may be released, causing the oxygen level in nearby waters to drop, thereby endangering marine life.

Among the smaller particles that are now being found polluting the open ocean are bits of plastic, as well as small balls of polystyrene, the crumbly plastic foam widely used for packing, drinking cups, and insulating material. These bits of indigestible plastic have been found in ten species of larval, juvenile, and adult fish. It has been suggested that ingestion of plastic particles could cause intestinal blockage and mortality, but to date evidence in support of this hypothesis is lacking. Plastics, predominantly polyethylene, have also been found floating in the Sargasso Sea in concentrations of about 300 grams/square kilometer.¹⁵

Microscopic asbestos fibers are another contaminant which may cause cancer. Asbestos is widely used in the food and beverage industry as a filter for soft drinks, beer, liquor, and edible oils and is used by some municipalities for filtration of water supplies. Once the increasing amounts of asbestos fibers have reached the oceans they are less of a direct hazard to man. Very little is known about the possible effects of asbestos fibers on marine life. The quantities reaching the oceans are probably insignificant at this time except possibly in local areas where asbestos is extensively used or processed. An example of local contamination, although in fresh water, is Lake Superior where asbestos resulting from the processing of taconite (a low grade iron ore) has recently been detected. This resulted in a statement from the Environmental Protection Agency on June 15, 1973, advising residents of Duluth, Minnesota, and other north shore towns that "prudence dictates that an alternative source of drinking water be

¹⁴ Foyn, E. Municipal wastes. In *Impingement of Man on the Oceans* (Hood, D. W. ed.). New York, Wiley-Interscience, 1971: 457.

¹⁵ Carpenter, E. J. and K. L. Smith. Plastics on the Sargasso Sea surface. *Science*, v. 175, 1972: 1240-1241.

found for very young children." The Federal Government, the states of Minnesota, Wisconsin, and Michigan, and five environmental groups have brought suit against the Reserve Mining Company to force the company to discharge its ore processing waste on land. In recognition of the "very substantial public health menace," on April 20, 1974 U.S. District Court Judge Miles Lord ordered the firm to immediately cease operations. The immediate closing of the plant, which accounts for 15 percent of the iron ore produced in the United States, was considered a landmark decision by environmentalists. Although the district court ordered immediate cessation of Reserve's dumpings, implementation of that order has been stayed by an appeals court.

Heavy metals.—Heavy metals play an important role in man's industrial and technological progress. Coupled with their beneficial use, however, is the adverse effect they have as environmental pollutants. As pollutants, metals find their way into the ocean through many routes both direct and indirect. Direct introduction arises when metallic pollutants are discharged into the water by vessels, pumped into estuaries or the sea from shore, or enter the ocean from aerial fallout. Indirect routes are taken by inland-release pollutants carried to the oceans by rivers and streams.

Natural weathering processes, industrial wastes, pesticides, and combustion of fuels account for much of the heavy metals entering the oceans. Although the heavy metal pollutants include virtually every metallic element, those of major importance are listed in Tables IV and V. Table IV compares the rate of supply from combustion of fossil fuels with natural processes and lists the metals in order of their toxicity. Table V lists metals concentrations currently found in the ocean.

The industrial production of some heavy metals and the rate of their transport to the oceans by rivers and the atmosphere is given in Table VI. Most of the heavy metals contaminating the coastal areas of the oceans are associated with the discharge of industrial wastes into streams, rivers, lakes, and estuaries. The Sea of Dokai in the Bay of Kita-Kyushu has become the most polluted waterway in Japan, if not the world. Concentrations of 448 ppm of cadmium and 551 ppm of mercury have been found in sludge samples taken there. Industrially discharged methyl mercury has also polluted the Sea of Ariake. Since the majority of the seafood consumed comes from estuaries and shelf areas, pollution in these regions is a direct threat to human health. Mercury poisoning from contaminated seafood has become a serious problem in Japan.

Pesticides are another source of heavy metals pollution. While chlorinated hydrocarbon pesticides are usually cited for their detrimental side effects, pesticides of heavy metal compounds are also common. Fungicides are likely to contain metals such as copper, mercury, or zinc. Copper is often used in molluscicides or antifouling paints, and insecticides frequently contain lead or arsenic. Mercury has widespread agricultural use as a germicide or fungicide. There are many cases of mercury poisoning of marine wildlife and of humans who consumed contaminated seafood, but evidence has generally suggested industrial pollution as the primary source.

TABLE IV.—TOXIC ELEMENTS OF CRITICAL IMPORTANCE IN MARINE POLLUTION BASED ON POTENTIAL SUPPLY AND TOXICITY, LISTED IN ORDER OF DECREASING TOXICITY

Element	Rate of Mobilization (10^9 g/yr)			Toxicity mg/l
	Fossil fuels (man)	River flow (natural)	Total	
Mercury	1.6	2.5	4.1	1×10^{-3}
Cadmium	.350	—	3.0	2×10^{-3}
Silver	.07	11	11.1	1×10^{-3}
Nickel	3.7	160	164	2×10^{-2}
Selenium	.45	7.2	7.7	5×10^{-2}
Lead	3.6	110	113.6	1×10^{-2}
Copper	2.1	250	252.1	1×10^{-2}
Chromium	1.5	200	201.5	1×10^{-2}
Arsenic	.7	72	72.7	1×10^{-2}
Zinc	7	720	727	2×10^{-1}
Manganese	7.0	250	257	2×10^{-4}

Source: Ketchum, B. H. A realistic look at ocean pollution. Marine Tech. Soc. Jour. v. 7, 1973: p. 11.

TABLE V.—SOME HEAVY METAL CONCENTRATIONS IN THE OCEANS

Substance	$\mu\text{g/liter}$	Total in ocean (10^6 metric tons)
Copper	3	4×10^3
Cadmium	0.11	1.5×10^2
Chromium	0.05	7
Iron	10	14×10^3
Lead (estimated natural)	0.03	4
Mercury	0.03	4
Nickel	2	3×10^3
Vanadium	2	3×10^1
Zinc	10	14×10

Source: Hood, D. W. Pollution of the world's oceans. Topics in Ocean Engineering, v. 4 (edited by C. L. Bretschneider) Houston, Tex. Gulf Publishing Co., 1974

TABLE VI.—HEAVY METAL PRODUCTION AND POTENTIAL OCEAN INPUTS

Substances	Mining production (10^6 metric tons/yr)	Transport by rivers to oceans (10^6 metric tons/yr)	Atmospheric washout (10^6 metric tons/yr)
Lead (Pb)	3	0.1	0.3
Copper (Cu)	6	.25	.2
Vanadium (V)	.02	.03	.02
Nickel (Ni)	.5	.01	.03
Chromium (Cr)	2	.04	.02
Tin (Sn)	.2	.002	.03
Cadmium (Cd)	.01	.0005	.01
Arsenic (As)	.06	.07	—
Mercury (Hg)	.009	.003	.08
Zinc (Zn)	5	.7	—
Selenium (Se)	.002	.007	—
Silver (Ag)	.01	.01	—
Molybdenum (Mo)	—	.03	—
Antimony (Sb)	.07	.01	—

Source: Ketchum, B. H. (ed.) "The Water's Edge." Cambridge. MIT Press, 1972: p. 153.

Atmospheric transport is a major source of input of trace metals to the open ocean. In Table VII an attempt is made to quantify and place in perspective the impact of atmospheric pollutants on the marine environment. This mechanism is of particular importance in the distribution of lead by aerosols created by automobile exhaust and lead processing industries. It is estimated that atmospheric transport contributes three times more lead to the oceans than

runoff.¹⁶ Lead concentrations measured in annual snow layers in Greenland show a gradual increase beginning in 1750 with the Industrial Revolution and climbing sharply after 1940 to 500 times natural levels.¹⁷ Lead concentrations, hundreds and thousands of times above natural levels, are found in precipitation and air near urban areas.¹⁸

Vanadium, manganese, cobalt, and nickel are found in crude oils,¹⁹ and these may enter the oceans from ships, pipelines, offshore wells, coastal refineries, etc. High concentrations of toxic metals (mercury, lead, cadmium, zinc, and arsenic) have been reported in waters adjacent to offshore oil rigs in the Gulf of Mexico and decreased with distance from the rigs. Sewage treatment probably removes a large fraction of the heavy metals in the sludge, but polluted runoff from paved areas, buildings, and plant foliage that does not undergo treatment may bring heavy metals into the oceans. Mine residues have also polluted streams and rivers.

TABLE VII.—POSSIBLE IMPACT OF ATMOSPHERIC POLLUTANTS ON THE MARINE ENVIRONMENT

Element	Concentration ¹		Enhancement ratio in air ²	Ratio air/ocean	Estimated percent increase of trace elements in upper 200 m of ocean ³	
	Open ocean (μg/liter)	U.S. urban air (μg/m ³)			High	Most probable
Pb	0.02	1,000	2,300	50,000	-----	-----
Al	1	1,500	5	1,500	200	30
Cd	.02	20	1,900	1,000	400	20
Sc	.001	1	1	1,000	80	20
Sn	.02	20	280	1,000	-----	20
Mn	.3	200	6	700	60	15
Fe	5	2,000	1.00	400	80	8
La	.01	3	3	300	-----	6
V	1	200	42	200	40	4
Zn	3	700	270	200	25	4
Cu	2	200	83	100	100	2
Ag	.01	2	830	200	-----	4
Cr	.3	40	11	130	20	3
Be	.005	1	10	200	-----	4
Sb	.2	20	2,800	100	10	2
In	.001	.1	29	100	-----	2
Ti	1	100	5	100	4	2
Co	.03	2	2	70	4	1
Se	.1	4	2,500	40	5	.8
Hg	.1	3	1,100	30	8	.6
W	.1	5	93	50	-----	1
Ga	.02	1	2	50	-----	1
Ni	2	30	12	15	4	.3
Cs	.3	4	37	10	-----	.3
Ta	.02	.2	3	10	-----	.3
As	2	20	310	10	.8	.2
Mo	10	10	190	1	-----	.02
U	3	.1	1	.03	-----	Negligible

¹ Urban-air values are approximations.

² The ratio of the concentration in urban particulates of a specific element to iron, divided by the ratio of the same elements in average crustal material.

³ The percentage increase represents the magnitude by which these trace elements could have been increased in the upper 200 m of the ocean based on the anthropogenic lead concentration in this layer. The high estimates are those which might be expected in oceanic regions adjacent to certain large urban areas.

Source: IDOE, op. cit. p. 2.

¹⁶ National Academy of Sciences. *Marine environmental quality*. Washington, D.C., Ocean Sci. Comm., National Academy of Sciences/National Resource Council, 1971: 107 p.

¹⁷ Murozumi, M., T. J. Chow, and C. Patterson. Chemical Concentrations of Pollutant Lead Aerosols, Terrestrial Dusts, and Sea Salts in Greenland and Antarctic Snow Strata. *Geochim. Cosmochim. Acta*, v. 33, 1969: 1247-1294.

¹⁸ U.S. Public Health Service. *Survey of Lead in the Atmosphere of Three Urban Communities*. U.S. Public Health Ser. Publ. 999-AP-12, 1965: 94 p.

¹⁹ Guinn, V. P. and S. C. Bellanca. Neutron activation analysis identification of the source of oil pollution of the waterways. In *Preprint of contributed condensations, the 1968 international conference modern trends in activation analysis*. National Bureau of Standards, Washington, D.C. 1968: 614-619.

One method of evaluating the rate of heavy metal pollution of the oceans by man's activities is by comparison with natural geological rates of mobilization. Table VIII lists data for 12 elements and the ratio of the man-induced rate to the geologic rate. Although the absolute magnitudes of the mobilization rates differ greatly among the elements, the ratio highlights the significance of man's impingement on the oceans. For example, man mines 110 times the amount of tin that would be cycled naturally, but Table VI indicates only 16 percent of the amount mined reaches the oceans annually.

TABLE VIII.—RANK ORDER RATES OF MOBILIZATION OF MATERIALS

Element	Geological rate, G (10 ³ metric tons) per year	Man-induced rate, M (10 ³ metric tons) per year	Ratio M/G
Tin.....	1.5	166	110.0
Phosphorus.....	180.0	6,500	36.0
Antimony.....	1.3	40	31.0
Lead.....	180.0	2,330	13.0
Iron.....	25,000.0	319,000	13.0
Copper.....	375.0	4,460	12.0
Zinc.....	370.0	3,930	11.0
Molybdenum.....	13.0	57	4.4
Manganese.....	440.0	1,600	3.6
Mercury.....	3.0	7	2.3
Silver.....	5.0	7	1.4
Nickel.....	300.0	358	1.1

Sources: Geologic rate—Bowen, H. J. M., "Trace Elements in Biochemistry," New York, Academic Press, 1966: 241 p.
 Man-induced rate—United Nations, "Statistical Yearbook, 1967," New York; Statistical Office of the United Nations, 1968: 796 p.

TABLE IX.—CONCENTRATION FACTORS FOR THE TRACE ELEMENT COMPOSITION OF SHELLFISH COMPARED WITH THE MARINE ENVIRONMENT

Element	Enrichment factors		
	Scallop	Oyster	Mussel ¹
Silver (Ag).....	2,300	18,700	330
Cadmium (Cd).....	2,260,000	318,000	100,000
Chromium (Cr).....	200,000	60,000	320,000
Copper (Cu).....	3,000	13,700	3,000
Iron (Fe).....	291,500	68,200	196,000
Manganese (Mn).....	55,500	4,000	13,500
Molybdenum (Mo).....	90	30	60
Nickel (Ni).....	12,000	4,000	14,000
Lead (Pb).....	5,300	3,000	4,000
Vanadium (V).....	4,500	1,500	2,500
Zinc (Zn).....	28,000	110,300	9,100

Source: Brooks, R. R. and M. G. Rumsby. The biogeochemistry of trace element uptake by New Zealand bivalves. "Limnology and Oceanography," vol. 10, 1965: 521-527.

The heavy-metals uptake and contamination of marine organisms has been mentioned. A useful index of the potential hazard of a pollutant is the concentration factor in the food chain. Table IX lists the enrichment factors of several trace elements in shellfish. Metals are nondegradable and even when discharged into the ocean in small quantities can be accumulated to an alarming and lethal extent by certain species. Land pollution creates sea pollution and the time required for passage of metals from seawater to marine organisms to man often can be brief.

Petroleum.—One of the most visible and highly publicized pollutants in the world's oceans is petroleum. Thousands of minor, and

several major, oil spills occur every year. For example, in the first half of 1973 the Coast Guard reported 800 oil spills in the mid-Atlantic region alone, ranging from one gallon to 450,000 gallons, and expected there to be 12,000 oil spills nationwide in 1973. The Coast Guard classifies a spill over 10,000 gallons in coastal areas and over 1,000 gallons in inland waters as "major." Public awareness of the scope of ocean pollution was further heightened when Thor Heyerdal was quoted in the New York Times, saying there is "a continuous stretch of at least 1400 miles of open Atlantic polluted by floating lumps of solidified asphalt-like oil." Previously most public concern focused on specific spills or local oil pollution disaster areas such as resulted from the Torrey Canyon accident or the Santa Barbara Channel blowout.

Petroleum is essential to the world economy. Of the total tonnage of all commodities moving by sea in world trade, petroleum represents nearly 70 percent. More than 1300 million tons of crude oil and oil products are transported by sea each year and even loss of a small fraction of this could have a serious impact on marine environments. Some petroleum seeps into the oceans naturally. Two natural seeps have long been known off southern California and seven are charted in the Gulf of Mexico. Natural seeps may represent a significant amount of the total amount of petroleum entering the marine environment (Table X). It has been estimated that 50 to 100 times as much oil has been lost to the environment through natural seeps as now exists in reservoirs. Pollution from offshore drilling is estimated to amount to less than 4 percent of the amount entering the sea by ship operations. One of the largest and most difficult to estimate losses to the sea annually is from vaporization of petroleum products during their use or transport and subsequent precipitation at sea. Another major source of petroleum contamination in the oceans is from sewage effluent and surface runoff. One study of New York City sewer water found oil and grease concentrations from 9 to 53 ppm in dry weather and up to 9,000 ppm in wet weather periods.²⁰

Marine plants and animals also produce hydrocarbons, but generally these differ from petroleum hydrocarbons in some important respects. Some petroleum hydrocarbon compounds, especially those of low molecular weight, are toxic to marine ecosystems. Marine organisms do, however, incorporate petroleum hydrocarbons into their systems. This has some beneficial effect in providing a slow, gradual clean up of an oil spill, but it has the associated short term problem of incorporation of petroleum hydrocarbons into the food chain.

However, there is no evidence to date of food-web magnification of petroleum comparable to that observed with DDT. The ultimate consequences of petroleum uptake are not yet known. Fish retain petroleum compounds in their fatty tissues but metabolize most of them within two weeks. Taste tainting has already been a problem to the shellfish industry. Very small concentrations of petroleum hydrocarbons, in the order of 10 ppb, can produce this effect in filter feeders. Sub-lethal amounts of oil pollutants can, over a period of time, annihilate a species by disturbing its ability to reproduce. As little as 10 to 100 ppb of petroleum components has been found to disrupt the

²⁰ Environmental Protection Agency. *Combined sewer overflow study for the Hudson River Conference*. EPA-R2-73-152, January, 1973: 287 p.

TABLE X.—BUDGET OF PETROLEUM HYDROCARBONS INTRODUCED INTO THE OCEANS

Source	Input (millions of tons/year)	
	Best estimate	Probable range
Offshore production.....	0.08	0.08-0.15
Transportation:		
LOT tankers.....	.31	.15-.4
Non-LOT tankers.....	.77	.65-1.0
Dry docking.....	.25	.2-.3
Terminal operations.....	.003	.0015-.005
Bilges bunkering.....	.5	.4-.7
Tanker accidents.....	.2	.12-.25
Nontanker accidents.....	.1	.02-.15
Total.....	2.133	
Coastal refineries.....	.2	.2-.3
Coastal municipal wastes.....	.3	
Coastal, nonrefining, industrial wastes.....	.3	
Urban runoff.....	.3	.1-.5
River runoff.....	1.6	
Atmosphere through vaporization of petroleum products.....	.6	.4-9.0
Total through man's activities.....	5.513	
Natural seeps.....	.6	.1-1.0
Total annual petroleum input.....	6.113	
World oil production (1973).....		2890
Oil transport by tanker (1973).....		1695
Torrey Canyon discharge.....		.117
Santa Barbara blowout.....		.003-.011
Hydrocarbons produced by marine organisms.....		10

Note: Adopted from National Academy of Sciences, Petroleum in the Marine Environment, Washington, D.C., 1975, p. 6, and other sources.

TABLE XI.—SUMMARY OF TOXICITY DATA

Class or organisms	Estimated typical toxicity ranges (ppm) for various substances			
	SAD*	No. 2 fuel oil/kerosene	Fresh crude	Weathered crude
Flora.....	10-100	50-500	10 4-10 ⁵	Coating more significant than toxicity.
Finfish.....	5-50	25-250	10 4-10 ⁵	Do.
Larvae.....	.1-1	.5-5	10 2-10 ³	Do.
Pelagic crustaceans.....	1-10	5-50	10 3-10 ⁴	Do.
Castropods.....	10-100	50-500	10 4-10 ⁵	Do.
Bivalves.....	5-50	25-250	10 4-10 ⁵	Do.
Benthic crustaceans.....	1-10	5-50	10 3-10 ⁴	Do.
Other benthic invertebrates.....	1-10	5-50	10 3-10 ⁴	Do.

*Soluble aromatic derivatives (aromatics and naphthenoaromatics).

Source: Moore, S. F., R. L. Dwyer, and A. M. Katz. A preliminary assessment of the environmental vulnerability of Machias Bay, Maine to oil supertankers. Sea Grant Project Office Report No. MITSG 73-6, Jan. 15, 1973: p. 92.

behavior of marine organisms.²¹ Furthermore, relatively low concentrations of petroleum hydrocarbons are sufficient to produce toxic effects on marine organisms (Table XI). However, organisms that survive seem to be able to purge themselves of much of the oil.

Massive spills, such as the *Torrey Canyon*, can cause a serious impact on the marine community in the vicinity. Such spills can kill considerable quantities of marine life at all levels and pollute nearby beaches and shore property. Even a much smaller spill in an enclosed bay or nearshore area can have a long-term effect on the marine environment (Table XII). For example, a well documented study in Buzzards Bay, Massachusetts, revealed the persistence in the sediments for more than 2 years of toxic fuel oil components that are still

²¹ Moore, S. F., G. R. Chirlin, C. J. Puccia, and B. P. Schrader. Potential biological effects of hypothetical oil discharge in the Atlantic coast and Gulf of Alaska. Rept. to the Coun. on Envir. Qual., No. MITSG 74-19, April 1, 1974: 121 p.

TABLE XII. PETROLEUM HYDROCARBON CONTAMINATION IN THE MARINE ENVIRONMENT (COASTAL WATERS)

Location	p/m
Biota:	
West Falmouth, Mass., (wet weight).....	5-90
West Falmouth, Mass., (wet weight).....	1-69
Galveston Bay, Tex., (wet weight).....	236
Narragansett Bay, R.I. (wet weight).....	3-16
South Queensland, Australia (wet weight).....	24-310
Chedabucto Bay, Canada (wet weight).....	3-545
Sediments:	
West Falmouth, Mass. (dry weight).....	up to 12,400
West Falmouth, Mass. (wet weight).....	21-3,000
Narragansett Bay, R.I. (dry weight).....	50-3,500
Chedabucto Bay, Canada (dry weight).....	0-6.8

Source: IDOE, op. cit. p. 2.

slowly being degraded.²² Oil pollution in Arctic waters would be more persistent and of more serious consequences than in warmer regions because degradation and evaporation is slower at lower temperatures. For this reason Canada has passed far-reaching legislation to mitigate this possibility.

Thermal pollution.—Thermal pollution is mainly generated by nuclear power plants. At present, nuclear power reactors are less efficient in converting thermal energy to electricity than fossil fuel plants. Most nuclear power plants operate at about 32 percent efficiency compared to 40 percent for fossil fuel. The nonrecoverable heat has to be removed and this is done by passing water through cooling units. With the present urgency to expand and develop nuclear power generating facilities, efficiency is increasing but because of the greater number of plants the thermal pollution problem is being intensified. A recent report for the State of California estimated that if all future electric generating plants in California were to locate at coastal sites because of the availability of cheap cooling water, the average distance between these additional sites could be as little as 5 miles by the year 2000 and 2 miles by the year 2020.²³

The effects of thermal pollution are difficult to assess. Higher water temperature itself may not be harmful to fish, but some studies of salmon by the Western Fish Toxicology Station of the Environmental Protection Agency have shown that many died, before they could spawn, after entering thermally polluted water because of diseases related to newly thriving bacteria. Warmer water increases metabolism in some fish enough to double their oxygen demand for each ten-degree rise in water temperature and, at the same time, warm water holds less oxygen. This combination places much more stress on the life functions of fish in thermally polluted water. On the other hand, warmer water may help keep port facilities less ice bound in winter. Warm water also stimulates plant growth which may lead to eutrophication (overfertilization characterized by depletion of oxygen and excess plant nutrients) or may simply provide a greater source of plant food for the benefit of the ecosystem. Further complicating thermal pollution assessment is the fact that thermally polluted water generally also contains a number of other pollutants, and the effects of these toxins on the marine environment are greater with increased temperature as reaction rates are faster.

²² Blumer, M. and J. Sass. Oil Pollution: Persistence and Degradation of Spilled Fuel Oil. *Science*, v. 176, 1972: 1120-1122.

²³ Anderson, K. P. Some Implications of Policies to Slow the Growth of Electricity Demand in California. Rand Corporation, R-990-NSF/CSA, Santa Monica, Calif., Dec. 1972: 1-2.

Another effect of heated water on an ecosystem is the possible creation of favorable environments for proliferation of pests into new areas. Such a case occurred recently in Oyster Creek, New Jersey where yacht basins were attacked by teredos or shipworms, a type of wood-boring clam. The problem resulted from a newly built nuclear power plant which raised the water temperature and increased the salinity of the Creek by diverting fresh water, enabling the pest to proliferate.

The consequences of pouring billions of gallons of heated water into a body of water are not fully known, but evidence indicates that it is ecologically dangerous to assume the consequences are insignificant.

Radioactivity.—Since the accomplishment of a controlled nuclear reaction in 1942, man has begun to contaminate the oceans with artificial radioactivity. Artificial (man generated) radionuclides are produced by (1) fission of heavier elements such as plutonium or uranium, (2) fusion of light isotopes such as tritium and deuterium, and (3) neutron activation or bombardment of stable isotopes with neutrons.

There are several sources of artificial radioactivity in the oceans but most of the radioisotopes presently found there resulted from atmospheric testing of nuclear weapons. With decreased worldwide testing this source has become less significant. However, peaceful uses of nuclear energy are increasing. Many radionuclides are incorporated in fallout from nuclear explosions. Those of greatest importance, because of their longer half lives and biologic activity, are iron (Fe^{55}), strontium (Sr^{90}), and cesium (Cs^{137}). Others such as iodine (I^{131}), barium (Ba^{140}), or lanthanum (La^{140}) may be biologically important for brief periods in the vicinity of the explosion. Runoff of radioactive fallout over land is not likely to reach the oceans in significant amounts. Fallout from nuclear excavations such as have been proposed to construct a sea level canal across Central America would, however, have a significant impact on radioactivity in nearby marine environments. Table XIII and Figure 1 illustrate the worldwide deposition of strontium (Sr^{90}) fallout since 1957.

TABLE XIII.—WORLDWIDE DEPOSITION OF Sr^{90}

Year	Annual deposition ¹ (MCi)	Cumulative deposition ¹ (MCi)	Average concentration in North Atlantic surface waters ² ($\mu\text{Ci/l}$)
1957	-----	2.3	-----
1958	1.05	3.22	-----
1959	1.29	4.40	-----
1960	.43	4.73	-----
1961	.54	5.12	0.08
1962	1.76	6.11	.12
1963	2.95	9.46	.18
1964	2.10	11.27	.23
1965	1.14	12.12	.16
1966	.54	12.35	.16
1967	.28	12.31	.12
1968	.28	12.28	-----
1969	.29	12.25	-----

Sources:

¹ Volchok, H. L. Worldwide Deposition of Sr^{90} Through 1969. In health and safety laboratory fallout program, quarterly summary report, July 1, 1970. USAEC HASL-227, 1970: 1-70-80.

² Adapted from Bowen, V. T., V. E. Noshkin, H. L. Volchok, and T. T. Sugihara. Fallout Strontium-90 in Atlantic Ocean Surface Waters. In health and safety laboratory fallout program, quarterly summary report, July 1, 1968. USAEC HASL-197 1968: 1-2-65.

³ For first 6 months or 1967 only.

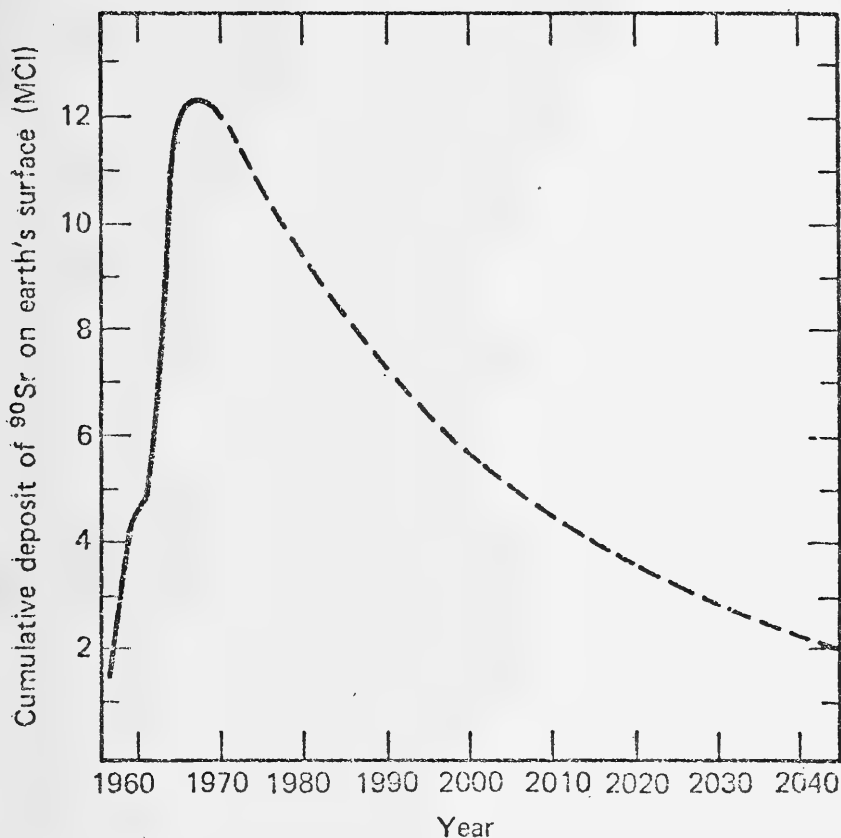


FIGURE 1.—The amount of ^{90}Sr on the earth's surface reached a maximum during 1966–1967 and will decline exponentially with a half-life of 28 years unless atmospheric testing is resumed. The level of ^{137}Cs deposited is approximately 1.7 times that shown for ^{90}Sr .

Source: Rice, T. R. and D. A. Wolfe. Radioactivity—Chemical and Biological Aspects. In "Impingement of Man on the Oceans" (Hood, D. W., ed.). New York, Wiley-Interscience, 1971, p. 333.

Nuclear power plants generate small amounts of radioactive wastes which are released into the environment. The two main sources of this radioactivity are uranium fission products which escape the fuel cladding and radionuclides resulting from activation of corrosion products. Although carefully controlled, some radioactive isotopes (mostly tritium and the noble gases) are released in water or vapor. Table XIV lists an estimate of the radioisotopes that would be released annually by a 1050 megawatt pressurized-water reactor planned for Burlington County, New Jersey. Nuclear fuel production plants and plants for reprocessing nuclear fuels are also responsible for discharging low levels of radioactivity.

The recommendations of the International Commission on Radiological Protection (ICRP)²⁴ are universally used as guides for regula-

²⁴ International Commission on Radiological Protection. *Recommendations of the International Commission on Radiological Protection* (adopted September 9, 1958), New York. Pergamon Press, vi + 18 p.

TABLE XIV.—ANNUAL RELEASE OF RADIONUCLIDES ESTIMATED FOR A PRESSURIZED-WATER POWER REACTOR OF 1,050 MW ELECTRIC CAPACITY

Isotope	Half-life	Microcuries/ year	Isotope	Half-life	Microcuries/ year
Liquid wastes:			Gaseous wastes—Continued:		
³ H.....	12.26 yr.....	4×10^9	¹³¹ I.....	8 days.....	6.61×10^3
⁵⁴ Mn.....	314 days.....	9.7×10^{-1}	¹³² Te.....	78 hr.....	6.99×10^2
⁵⁵ Mn.....	2.58 hr.....	2.64×10^1	¹³² I.....	2.3 hr.....	2.8×10^2
⁵⁷ Co.....	71 days.....	2.95×10^1	¹³³ I.....	21 hr.....	5.13×10^3
⁶⁰ Co.....	5.26 hr.....	3.48	¹³⁴ I.....	53 min.....	2.16×10^1
⁸² Sr.....	50.4 days.....	9.1	¹³⁵ I.....	6.7 hr.....	2.6×10^3
⁹⁰ Sr.....	28 yr.....	5.76	¹³⁴ Cs.....	2.1 yr.....	8.69×10^2
⁹⁰ Y.....	64 hr.....	1.06	¹³⁷ Cs.....	13 days.....	8.36×10^1
⁹¹ Sr.....	9.7 hr.....	2.49	¹³⁷ Cs.....	30 yr.....	4.58×10^3
⁹¹ Y.....	59 days.....	2.11×10^1	¹⁴⁰ Ba.....	12.8 days.....	6.28
⁹² Y.....	35 days.....	5.13	¹⁴⁰ La.....	40.2 hr.....	2.35
⁹⁹ Mo.....	66 hr.....	1.25×10^4	¹⁴⁴ Ce.....	285 days.....	7.82
Gaseous wastes:					
⁸⁵ Kr.....	10.4 yr.....	5.62×10^3			
¹³³ Xe.....	5.27 days.....	1.58×10^3			

Source: Preliminary Facility Description and Safety Analysis Report, Salem Nuclear Generating Station, Burlington County, N.J. Docket No. 50-272.

tion of waste disposal from nuclear installations, but various interpretations of the recommendations have arisen from nation to nation. The source of this discrepancy is usually in the point of application of the standards recommended by the ICRP. The British impose a restriction on the dose actually received by people living near the nuclear installation, the United States imposes a restriction on the content of radioactivity in the effluent that leaves the restricted area around the installation, and the U.S.S.R. imposes a more rigid restriction on the amount of radioactivity released from inside the installation. The British policy thus permits the greatest release of radioactivity and requires more intensive site evaluations and environmental surveillance to ensure that the dose limitation is not exceeded.²⁵ The United States permits the release of liquid wastes containing 3 to 10 times the maximum concentration of radionuclides that can be legally released within the U.S.S.R.²⁶ The Soviet policy is generally to endorse the ICRP standards for the general population, which were recommended as limits for human consumption, at the point of release inside a nuclear facility. This policy does not consider the dilution capacity of rivers, estuaries, or the ocean, or the rate of physical decay relative to the release of radioactive nuclides. The United States Nuclear Regulatory Commission regulations, on the other hand, limit the release of radioactive materials to concentrations as low as practicable by current technology but not more than 10 percent of the maximum permissible concentration (MPC) values recommended by the ICRP for 168 hour occupational exposure.²⁷

The deep ocean was once considered a suitable depository for solid radioactive wastes in sealed containers. Although the United States has ceased this practice, other nations, and this includes the major nuclear states, continue to dispose of radioactive materials in the sea even though they are signatories to the Dumping Convention.

²⁵ Preston, A. Site evaluations and the discharge of aqueous radioactive wastes from civil nuclear power stations in England and Wales. In *Disposal of radioactive wastes into seas, oceans and surface waters*. IAEA Proc. Ser., IAEA, Vienna, 1966: 725-737.

²⁶ Parker, F. L. United States and Soviet Union Waste-Disposal Standards. *Nucl. Safety*, v. 6, 1965 433-436.

²⁷ *Code of Federal Regulations*, Title 10, Chapt. 1, Parts 20 and 50. Standards for protection against radiation. Washington, D.C. U.S. Govt. Print. Off. Jan. 1974.

Introduction of radioactive materials into the oceans may also arise from accidents such as the sinking of the nuclear powered submarines *USS Thresher* in 1963 and *USS Scorpion* in 1968, or from the rupture of an atomic weapon as happened at Palomares, Spain in 1966. Another source of radioactive pollution is the use and disposal of radioactive materials by hospitals, research facilities, and industry. After radioisotopes are introduced into the marine environment they may (1) remain in solution, (2) be absorbed on suspended particulate matter or bottom sediments, (3) flocculate and precipitate to the bottom, or (4) be accumulated by plants and animals. The major consequence for man is the incorporation of radioisotopes into the food web and their progressive concentration in higher order organisms. Table XV lists approximate concentrations of radionuclides found in marine organisms. Figure 2 illustrates lethal dosages for various phyla. One instance of the lethal effect on marine organisms by ingestion and concentration of radioisotopes occurred after a nuclear detonation in the Marshall Islands in 1958. Investigators found that herbivorous fish concentrated radioactive iodine from seaweed which had previously accumulated this isotope from seawater. Carnivorous fish then further concentrated the iodine to such an extent that their thyroid glands were destroyed.²⁸

The International Commission on Radiological Protection has determined the maximum permissible concentration (MPC) for continuous exposure either by air or water to any one of 240 radioisotopes. If more than a single isotope is encountered, these exposure levels

TABLE XV.—APPROXIMATE CONCENTRATION FACTORS FOR RADIOISOTOPES OF PROBABLE SIGNIFICANCE IN THE MARINE BIOSPHERE

Radionuclide(s)	Algae	Crustacea	Molluscs	Fish
³ H	0.90	0.97	0.95	0.97
⁷ Be	250			
¹⁴ C	4,000	3,600	4,700	5,400
²⁴¹ Na	1	.2	.3	.13
²³² P	10 ⁴	2×10 ⁴	6×10 ³	3.7×10 ⁴
⁴⁵ Ca	2	120	.4	1.2
⁴⁵ Sc	1,200	300		750
⁶¹ Cr	2,000	100	400	100
^{64,66} Mn	3,000	2,000	10 ⁴	200
^{55,59} Fe	2×10 ⁴	2,500	10 ⁴	1,500
^{57,58,60} Co	500	500	500	80
⁶⁵ Zn	10 ³	2,000	1.5×10 ⁴	1,000
⁸⁵ Kr	~1	~1	~1	~1
^{89,90} Sr	~1	~1	~1	~1
^{90,91} Y	500	2	1	.2
⁹⁵ Zr- ⁹⁵ Nb	1,500	100	15	10
¹⁰⁵ Ru, ¹⁰⁶ Ru- ¹⁰⁶ Rh	400	100	5	1
¹¹⁰ Ag		100	10	1
¹³² Te- ¹³² I		7	10 ⁴	
¹³¹ I	5,000	30	50	10
¹³³ Xe	~1	~1	~1	~1
¹³⁷ Cs	15	20	10	10
¹⁴⁰ Ba- ¹⁴⁰ La	25			8
^{141,144} Ce	700	20	400	3
^{135,137} W	5	2	20	3
^{202,210} Pb	700		200	
²¹⁰ Po	1,000			
²²⁶ Ra	1,000	100	1,000	130
²³⁸ Pu	1,300	3	200	5

Source: Rice & Wolfe, op. cit., p. 351.

²⁸ Gorbman, A. and M. S. James. An exploratory study of radiation damage in the thyroids of coral reef fishes from the Eniwetok Atoll. In *Radioecology* (Schultz, V. and A. W. Klement, eds.), New York. Reinhold, 1963: 385-399.

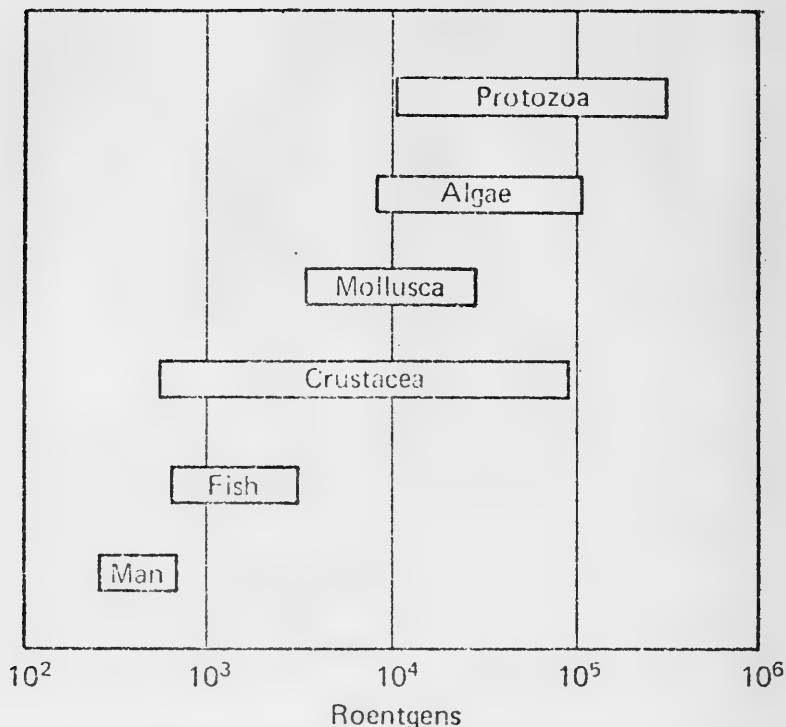


FIGURE 2.—Lethal doses of radiation for different phylogenetic groups. Sensitivity to radiation generally increases with increasing complexity of organisms.

Source: Donaldson, L. R., Evaluation of radioactivity in the marine environment of the Pacific Proving Ground. In "Nuclear detonations and marine radioactivity," (Small, S. H., ed.), Norway. Kjeller, 1963: 73-83.

must be reduced accordingly. The MPC for any completely unknown mixture of radionuclides is set at $10^{-7} \mu\text{Ci}/\text{cm}^3$ for continuous exposure. With regard to the marine environment, the danger of radiation exposure to man would arise from eating contaminated seafood. Marine organisms concentrate some elements to high degree. Evaluation of marine contamination by radioactivity is complicated by diverse environmental and biological variables that affect the disposition of a radionuclide introduced into the oceans. Varying patterns of consumption of any given seafood species also affect the MPC.

Man's major contact with the oceans has been and probably will continue to be the coastal areas. The coastal areas are most likely to receive radioactive effluents from river systems. Much of the radioactivity will become incorporated into sediments of estuaries where many marine organisms live or reproduce. About 66 percent of the total catch of commercial marine species comes from the coastal zone, from waters less than 25 fathoms deep. Consequently, the estuaries and bays are where the impact of man's nuclear technology is most likely to be felt.

TABLE XVI.—CARBON CONTENTS AND APPROXIMATE RESPONSE TIMES FOR THE DYNAMIC CARBON RESERVOIRS ON THE EARTH'S SURFACE

	Total carbon (10^{16} moles)	Carbon (moles/m ²) ¹	Total carbon (percent)	Response time (year)
Atmosphere.....	5	140	1.5	-----
Ocean.....	325	9,050	94.5	-----
Warm surface.....	5	140	1.5	~2
Main thermocline.....	80	2,250	23.3	~100
Deep ocean.....	240	6,660	69.7	~1,000
Biosphere.....	14	370	4.0	-----
Living organics.....	3	70	.8	~5
Soil organics.....	11	300	3.2	~300
Total.....	343	9,570	100.0	-----

¹ Area of ocean surface (3.6×10^{14} m).

Source: Broecker et al, op. cit. p. 291.

Carbon dioxide.—A direct consequence of the combustion of coal, gas, and petroleum fuels is the formation of carbon dioxide (CO₂) and its release into the atmosphere. During the past century this has increased the atmospheric carbon dioxide content by more than 10 percent. Furthermore, some experts predict that the carbon dioxide content of the air is expected to double during the first half of the next century.²⁹ Fortunately, carbon dioxide is not toxic and human health is not endangered. The primary concern, however, is the effect this additional CO₂ will have on our climate. Carbon dioxide and water vapor trap outgoing infrared light thus keeping the surface of our planet warmer than would be possible in the absence of these gases.

All the carbon dioxide that initially enters the atmosphere does not remain there but becomes distributed among the oceans and biosphere. The oceans contain about 55 times as much carbon as the atmosphere, and the biosphere contains about 2½ times as much. Table XVI lists the carbon contents of each reservoir and the time required to exchange carbon atoms with each reservoir. Due to the long time factors involved, about 60 percent of the carbon dioxide now entering the atmosphere as combustion products will remain there, and most of the rest will enter the surface water of the oceans. Because of the buffering system of carbonate, bicarbonate, and carbonic acid, the effect of an increase of CO₂ content on the oceans is to drive the system to slightly lower pH until carbonate begins to go into solution. Such solution will then increase the ocean's capacity for additional carbon dioxide until a new balance is reached.

The future effect on world-wide climate is the greatest problem area of increased carbon dioxide production. Approximately 70 percent of all incoming solar radiation is absorbed by the atmosphere, oceans, or land surface and the rest is reflected back into space. A change in the carbon dioxide content of the atmosphere upsets the earth's radiation balance which has a feedback in temperature, humidity, and cloudiness, though the magnitude of these effects is not known. However, they are by no means negligible.

²⁹ Broecker, W. S., Y. H. Li, and T. H. Peng, Carbon dioxide—man's unseen artifact. In *Impingement of man on the oceans* (Hood, D. W., ed.). New York, Wiley-Interscience, 1971: 287-324.

Studies have shown that an increase in global mean temperature of no more than 0.5°C has resulted over the last century from the man-made carbon dioxide injected into the atmosphere.³⁰ Distribution over the globe is not uniform. Most of this change has occurred in regions adjacent to the Arctic Ocean. Although these trends have not reached disturbing levels to date, the much greater increase in carbon dioxide production projected to come in the next 50 years must be seriously considered. It is time to make a concerted effort to understand more fully what has been termed man's greatest geophysical experiment.³¹

³⁰ Mitchell, J. M. On the world-wide pattern of secular temperature changes. *Changes of climate, Arid Zone Monograph*, v. 20, 1963. UNESCO, Paris. p. 161-181.

³¹ Broecker et al, *op. cit.*, p. 322.

IV. POLICY FOR CONTROLLING POLLUTION

Utilization of the ocean's resources can range between two procedures: (1) a haphazard approach leading to gradual dissipation of the ocean's resources and the degradation of its environment, and (2) a planned responsible approach that promotes and conserves the resources in an environmentally acceptable schedule. Before the impact of increasing population and advancing industrialization and technology brought a more general awareness of the effects of pollution in the oceans, a haphazard approach to utilizing the ocean resource was the custom. The quantities of pollutants added to the oceans by man up to a few decades ago were small. The vastness of the oceans and the insignificance of man's ability to alter the marine environment seemed certain. Lately, however, measurable quantities of pollutants are being found in the oceans, quantities that in some cases apparently are increasing at significant rates.

The need for formulating effective ocean policies and international agreements for the prevention and control of marine pollution is becoming more urgent. Internationally accepted regulatory agencies organized to control marine pollution are widely urged. Three categories of organizations are currently concerned in evolving policies for controlling ocean pollution. These are individual national governments, intergovernmental organizations, and nongovernmental organizations. A number of activities in each of these categories will be considered in the following chapters.

Among the policies and actions that need to be adopted are the following: (1) establishing reliable baselines as a starting point for determining the extent of marine pollution, (2) determining distribution and dispersal mechanisms in the oceans, (3) monitoring changes in pollution levels, and (4) assessing data to predict, if possible, the extent of pollution likely to affect the marine environment from new activities and technologies.

Baselines

Baselines need to be determined for many chemical, physical, and biological parameters.

Chemical baselines.—Chemical constituents in the oceans have been analysed for several years, but much further work is necessary to determine the exact nature of the elements and compounds involved. Toxic metals can be in the form of dissolved ions, colloids, organic complexes, mixed aggregates, crystalline solids, coatings on mineral grains, or absorbed or adsorbed into clay minerals. Each chemical state reflects a different degree or ability to become mobile and taken up into the food chain. Consequently, the fact that a metal is found in the environment does not necessarily mean it is a hazardous pollutant in its present chemical state. However, a change in chemical environment may have a significant effect on some pollutants. For

example, mercury was thought to be relatively immobile as a metal, but, under natural conditions, it can become incorporated into organic compounds such as methyl mercury. This compound is very active and biologically hazardous in concentrating mercury in the food web.

Physical baselines.—Physical baselines are also necessary. Among these are temperature, salinity, dissolved gases, depth, currents, etc. These physical parameters have a direct effect on the ecology of the estuaries and oceans. In cases where an electric power-generating facility is proposed, temperature changes created by the facility may have severe effects on the biota in the vicinity. Pollution-related changes in thermal and density gradients and ocean-atmosphere equilibria may affect weather and climate. Comprehensive physical baseline data are necessary to assess environmental changes.

Biological baselines.—Baseline data of biological populations are another requirement. These most directly affect man since a major element of food supply is derived from the oceans. Pollutants which themselves weaken or destroy a link in the food chain will also affect all the links further along. Sometimes the effect of a pollutant is not readily apparent or known. An oil spill may cause the death of a few high order organisms such as birds and fish but unnoticed millions of micro-organisms may also perish. Millions of others may become contaminated. The effect of this loss on the ecology of an area may not be immediately evident. Baseline data on populations of micro-organisms, in addition to higher order life forms, may help assess damage to the marine environment.

Distribution and Dispersal Mechanisms

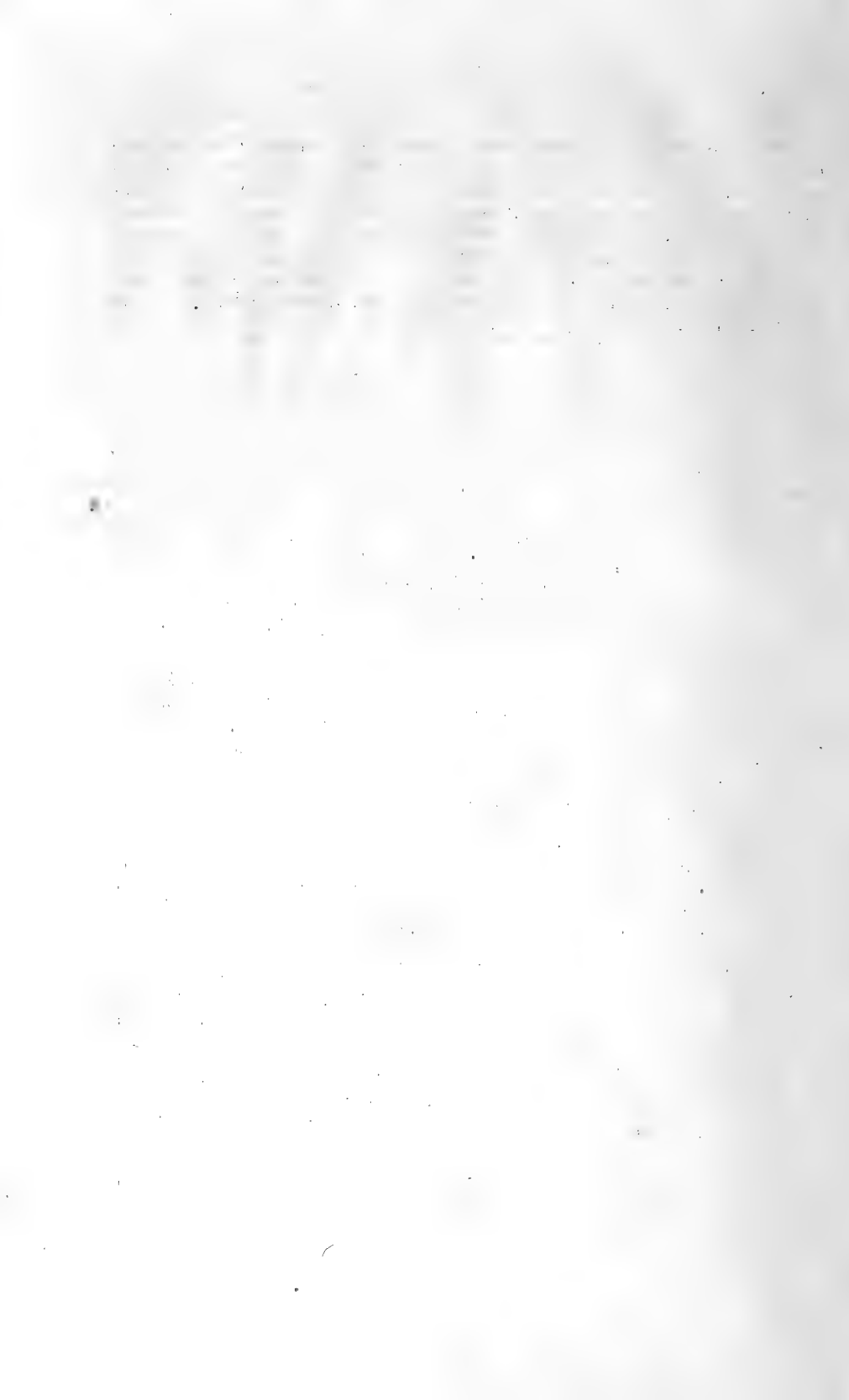
Accurate knowledge of distribution and dispersal mechanisms such as currents, tides, waves, estuarine circulation, and wind patterns over the oceans, etc. is important in pollution control. The oceans can be utilized as repositories for many materials. In some cases this will be unavoidable since materials deposited on land or in the atmosphere will not tend to remain there. In other cases intentional releases into the oceans may be the most suitable means of diluting or disposing of a substance. The latter, however, cannot be accomplished in a responsible and controlled fashion without prior knowledge of the distribution of the material within the marine environment. Information on speed, direction, and fluctuations of currents must be available to assure proper dilution and dispersion and guarantee that there will be no harmful concentration. In other cases knowledge of dispersal mechanisms may be used to assure that a material will not be dispersed.

Monitor Changes

Monitoring systems established to determine changes in the marine environment induced by man's activities are of central importance. A number of technological developments are now available to facilitate this type of program. Satellite sensors can monitor temperatures and atmospheric conditions. Surface measurements can be made from bouys, ships, and floating platforms. Seabed sensors are also being developed. Key parameters need to be selected to yield the information necessary to assess the implications and future effects of any deviations from baseline data.

Prediction of Pollution Potentials

The final goal of technical investigations of marine pollution is to develop the ability to predict accurately the consequences of man's activities. Not only are the effects of existing activities not completely known, but new activities and technologies must be assessed. This can only be possible through increased marine scientific research and free exchange of information. Analysis and dissemination of this information to the proper regulatory agencies can then become a means of preventing pollution rather than dealing with pollution after the fact.



V. NONGOVERNMENTAL INTERNATIONAL ORGANIZATIONS CONCERNED WITH MARINE POLLUTION

In the private sector a number of nongovernmental organizations are involved with the problems of marine pollution. This involvement includes information exchange and research coordination, legal research and reference, and monitoring marine pollution. Not all of the organizations listed below are involved in all of these aspects and some are involved in other areas as well. Many of the international organizations have national member organizations in each country. In addition, most developed countries have numerous local environmental groups devoted to some aspect of marine pollution such as offshore oil development in the Santa Barbara Channel, etc. The primary thrust of these local groups is to create public awareness and support for their particular cause.

The following list attempts to mention some of the major international organizations concerned with marine pollution. Other organizations with marine environmental activities may be found in the "1972 Survey of Environmental Activities of International Organizations," prepared for the Committee on Commerce, United States Senate, by the Congressional Research Service of the Library of Congress.³²

1. International Council of Scientific Unions. ICSU is an association of scientific unions and academies of several disciplines aimed at coordinating and facilitating activities among these groups. The unions having some interest in marine pollution are:

1. International Union of Geodesy and Geophysics (IUGG)
2. International Union of Biological Sciences (IUBS)
3. International Union of Geological Sciences (IUGS)
4. International Union of Pure and Applied Chemistry

ICSU has established a number of committees for specific activities. ICSU committees concerned with the marine environment are:

1. Ad Hoc Committee on Problems of the Human Environment
2. Special Committee on Problems of the Environment (SCOPE)
3. Scientific Committee on Oceanic Research (SCOR)
4. Special Committee for the International Biological Program (SCIBP)
2. David Davies Memorial Institute of International Studies.
3. International Association for Hydraulic Research
4. International Association for the Physical Sciences of the Ocean
5. International Association of Scientific Hydrology
6. International Association on Water Pollution Research (IAWPR)
7. International Council for Bird Preservation
8. International Law Association

³² U.S. Congress. Senate. Committee on Commerce. *1972 Survey of environmental activities of international organizations*. February 1972. Washington, U.S. Govt. Print. Off., 1972. 187 p.

At head of title: 92d Congress, 2d session. Committee print.

9. Inter-Parliamentary Union
 10. International Union for the Conservation of Nature and Natural Resources
 11. International Association of Microbiological Societies (IAMS)
 12. International Council for the Exploration of the Sea (ICES)
 13. International Hydrographic Organization (IHO)
- A summary of international organizations and conferences dealing with marine pollution is given in Appendix II

VI. UNILATERAL, BILATERAL, AND MULTILATERAL ACTIVITIES FOR CONTROLLING OCEAN POLLUTION

Prior to the formation of the United Nations, intergovernmental agreements on marine pollution had been discussed. Bilateral and multilateral activities continued after the United Nations became the organizational head and international forum for such activities. Intergovernmental marine pollution agreements concluded outside the United Nations generally relate to specific areas of interest to a limited group of nations such as pollution in the North Sea.

Washington Conference of 1926

The first international conference on marine pollution, prior to the formation of the United Nations, was convened in Washington, D.C., in 1926 on the initiative of the United States. Recognizing the dangers of oil pollution from shipping, the United States pressed for strong regulations prohibiting all oil discharge from vessels. Although hopelessly ahead of its time, the conference did produce a draft resolution granting states permission to establish coastal zones within which oil discharge would not be permitted.

Bonn Agreement of 1969

On June 9, 1969, eight North Sea countries signed an agreement in Bonn, Germany, requiring member states to inform, without delay, other member states when they became "aware of a casualty or the presence of oil slicks in the North Sea area likely to pose a serious threat to the coast or related interests of any other Contracting Party" to inform that state without delay and to "use their best endeavors" to provide aid "to dispose of oil floating on the sea or polluting its coast."³³ The Agreement Concerning Pollution of the North Sea by Oil is a strengthening of the previous Agreement Concerning Co-operation to Ensure Compliance with Regulations for Preventing the Pollution of the Sea by Oil, signed by four countries at Copenhagen on December 8, 1967.

Arctic Waters Pollution Prevention Act of 1970

On June 26, 1970, Canada passed the Arctic Waters Pollution Prevention Act which established pervasive controls over the depositing of waste into the zone of arctic waters that extends 100 nautical miles north of Canada's shore. Waste is defined as any substance or water containing any substance which, if added to any waters, would be detrimental to their use by man or any animal, fish, or plant that is useful to man. The Canadians have not claimed sovereignty over this area, but only the right to prevent pollution. The Act places an "absolute" liability, in no way dependent on "fault or negligence" on any person for damages resulting from the deposit of waste caused

³³ Agreement For Co-operation in Dealing With Pollution of the North Sea by Oil, signed at Bonn on June 9, 1969, art. 5 and 7.

by his developing or exploiting a natural resource, or other activities on land or water of the arctic, or on the "owner of any ship that navigates within the arctic waters" or on "the owners of the cargo" of the ship.³⁴ Pollution prevention officers are given broad powers of inspection and passage. They can keep ships out of a control zone unless they meet prescribed environmental standards or requirements.³⁵

Oslo Convention of 1971

In response to local initiatives, eleven governments established a regional Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft at Oslo in October 1971 and signed on February 15, 1972. The Oslo Convention pledges the contracting states "to take all possible steps to prevent the pollution of the sea by substances that are liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea."³⁶ The Oslo Convention established two lists of substances, a "black list" and a "gray list." Dumping of the former is prohibited and dumping of the latter is only approved under a system of permits and regulations. These substances are listed below.

EXCERPTS FROM OSLO CONVENTION

ANNEX I—"BLACK LIST"

The following substances are listed for the purposes of Article 5 of the Convention:

1. Organohalogen compounds and compounds which may form such substances in the marine environment, excluding those which are non-toxic, or which are rapidly converted in the sea into substances which are biologically harmless;
2. Organosilicon compounds and compounds which may form such substances in the marine environment, excluding those which are non-toxic, or which are rapidly converted in the sea into substances which are biologically harmless;
3. Substances which have been agreed between the Contracting Parties to likely to be carcinogenic under the conditions of disposal;
4. Mercury and mercury compounds;
5. Cadmium and cadmium compounds;
6. Persistent plastics and other persistent synthetic materials which may float or remain in suspension in the sea, and which may seriously interfere with fishing or navigation, reduce amenities, or interfere with other legitimate uses of the sea.

ANNEX II—"GREY LIST"

1. The following substances and materials requiring special care are listed for the purposes of Article 6:

- (a) Arsenic, lead, copper, zinc and their compounds, cyanides and fluorides, and pesticides and their by-products not covered by the provisions of Annex I;
- (b) Containers, scrap metal, tar-like substances liable to sink to the sea bottom and other bulky wastes which may present a serious obstacle to fishing or navigation;
- (c) Substances which, though of a non-toxic nature, may become harmful due to the quantities in which they are dumped, or which are liable to seriously reduce amenities.

³⁴ Arctic Waters Pollution Prevention Act, 18-19 Eliz. II (Can. 1970), art. 6 (1).

³⁵ Supreme Court Justice William O. Douglas commented on the Canadian Act, as follows:

"The Canadian Act is not necessarily the model for an ocean regime, though it might well fit the needs of a hemispheric regime. But in its preventive and penalty provisions it suggests the kind of international controls that are needed. It also indicates why existing efforts to define "jurisdiction of the territorial seas and contiguous zones are wide of the mark."

Source: Douglas, William O. *Environmental Problems of the Oceans: The Need for International Controls. Environmental Law, spring 1971*: p. 165.

³⁶ Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft, signed at Oslo on February 15, 1972, art. 1.

2. The substances and materials listed under paragraph 1 (b) above should always be deposited in deep water.

3. In the issuance of permits or approvals for the dumping of large quantities of acids and alkalis, consideration should be given to the possible presence in in such wastes of the substances listed in paragraph 1 above.

4. When, in the application of the provisions of Annexes II and III, it is considered necessary to deposit waste in deep water, this should be done only when the following two conditions are both fulfilled:

a) that the depth is not less than 2000 metres.

b) that the distance from the nearest land is not less than 150 nautical miles.

Each signatory state is committed to enforce the agreement with respect to (a) "ships and aircraft registered in its territory," (b) "ships and aircraft loading in its territory the substances and materials which are to be dumped," and (c) "ships and aircraft believed to be engaged in dumping within its territorial sea." This convention applies to the territorial seas as well as the international waters of the North-East Atlantic and adjoining Arctic Oceans.

U.S.A.-U.S.S.R. Agreement on Environmental Protection

A bilateral agreement signed on May 23, 1972, between the United States and the Soviet Union established a Soviet-American Joint Committee on Cooperation in the Field of Environmental Protection which "as a rule" shall meet once a year in Washington and Moscow, alternately. The basis for this action is the underlying assumption that deterioration of the environment is primarily, although not entirely, a result of advanced industrial and urban society and the correction of this devastation is mostly a problem for the advanced nations.

International Decade of Ocean Exploration

A world-wide program of work related to ocean pollution is being carried out under the auspices of the International Decade of Ocean Exploration (IDOE). This program, aimed at preservation of the quality of the marine environment, has gained the support of thirty-two nations. One aspect of this research is to take measurements at sea of the concentration of specific pollutants considered potentially hazardous to man or marine life.

VII. U.N. ACTIVITIES FOR CONTROLLING OCEAN POLLUTION

Because ocean space is physically international in character, coping with the problems of marine pollution needs to be coordinated at the international level. Unilateral actions by individual states or small groups of states will not be effective over the entire ocean without some form of international recognition. Proposals of individual states without international advancement are effective only in local areas or territorial waters. The United Nations, whose membership includes most of the nations of the world, is the logical medium through which to seek international cooperation for controlling marine pollution. To this end several organizations have been created within the existing framework of the United Nations to cope with various aspects of marine pollution.

U.N. Organizations Concerned with Marine Pollution

The following is a brief summary of the United Nations organizations presently concerned with marine pollution:

1. General Assembly and Economic and Social Council.
2. U.N. Environment Program (UNEP);
3. U.N. Secretariat;
4. U.N. Development Program (UNDP);
5. U.N. Scientific Committee on the Effects of Atomic Radiation;
6. U.N. Institute for Training and Research (UNITAR);
7. U.N. Educational, Scientific and Cultural Organization (UNESCO);
8. International Atomic Energy Agency (IAEA);
9. International Bank for Reconstruction and Development;
10. International Labor Organization (ILO);
11. Inter-Governmental Maritime Consultative Organization (IMCO);
12. Food and Agriculture Organization (FAO);
13. World Meteorological Organization (WMO);
14. World Health Organization (WHO);
15. Joint Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP);
16. Marine Environmental Protection Committee (MEPC);
17. Engineering Committee on Oceanic Resources (ECOR).

Within most of the above organizations matters of ocean pollution are directed to one or two specialized divisions or committees. For example, within FAO there is the Advisory Committee on Marine Resources Research (ACMRR), and the WMO has an Advisory Committee on Oceanic Meteorological Research (ACOMR). Within UNESCO the Intergovernmental Oceanographic Commission (IOC) is primarily concerned with oceanic exploitation and research. The IOC has overall responsibility for the Long Term and Expanded

Program of Oceanic Exploration and Research (LEPOR) which includes pollution-related research. Another program just instituted under the IOC is the Global Investigation of Pollution of the Marine Environment (GIPME). This program encourages and coordinates national scientific research efforts dealing with sources of marine pollutants, their distribution and geochemical cycling in the oceans, effects on marine organisms, and impact on the marine environment. The Integrated Global Ocean Station System (IGOSS), sponsored by IOC with the cooperation of WHO and other organizations, is expected to facilitate global monitoring arrangements.

From its inception in 1959, IMCO has been responsible for collecting and disseminating technical information on oil pollution as well as administering the 1954 Oil Pollution Convention. This Convention has since been amended through conferences convened by IMCO. As the amount of marine pollution continued to increase the Maritime Safety Committee of IMCO set up a special Subcommittee on Oil Pollution in 1965. As problems from other forms of ocean pollution became evident, this subcommittee was renamed the Subcommittee on Marine Pollution.

U.N. organizations have been active in the past and have had several accomplishments in coping with the problems of marine pollution. These activities, summarized in Appendix III, include a number of international conferences and conventions on pollution of the seas.

Oil Pollution Convention of 1954

Little actually came of the Washington Conference of 1926 and it was not until 1954 that the next international conference on marine pollution was held under the auspices of the United Nations in London. This conference produced the International Convention for the Prevention of Pollution of the Sea by Oil which was opened for signature in May 1954 and entered into force July 1958.³⁷ The 1954 Convention adopted the zonal concept promoted in the 1926 Conference wherein oil discharge was limited but not prohibited. This zone extended 50 miles from the coast. No provision was made to control oil discharge outside the coastal zones. Enforcement was left in the hands of the state of registry. States were required to provide equally severe penalties for unlawful discharge outside their own territorial waters as within them.

1962 amendments.—In 1962 amendments were adopted to the 1954 Oil Pollution Convention making the restrictions on oil discharge more stringent. These amendments extended the prohibited zones outward to 100 miles (150 miles in the case of Australia) and prohibited new ships of more than 20,000 tons, begun after the effective date of revision, from discharging even outside the prohibited zones.³⁸ These measures still appeared ineffective in controlling oil pollution in the oceans and further amendments were proposed.

1969 Amendments.—Following the Torrey Canyon disaster in March 1967, which released massive quantities of oil polluting the shores of Great Britain and France, the Intergovernmental Maritime Con-

³⁷ International Convention for the Prevention of Pollution of the Sea by Oil, adopted May 12, 1954. 2 U.S.T. 2989, T.I.A.S. No. 4900, 327 U.N.T.S. 3 (1961).

³⁸ International Convention for the Prevention of the Pollution of the Sea by Oil, adopted April 11, 1962. 2 U.S.T. 1523, T.I.A.S. No. 6109, 600 U.N.T.S. 332 (1966).

sultative Organization (IMCO) charged its Maritime Safety Committee to take all reasonable measures to achieve significant progress in the prevention and control of oil pollution. In response to this mandate the Maritime Safety Committee first proposed tightening existing control measures with respect to deliberate discharge of oily waters into the seas. Following these recommendations, the assembly of IMCO voted further amendments to the 1954 Oil Pollution Convention.

These amendments finally eliminated the zone concept and limited the rate of discharge of oil or oily mixture of ships other than tankers to an oil content of less than 100 parts per million and to discharge volumes less than 60 liters per nautical mile, varying with distance from shore but as far as practicable from land. Tankers were more stringently limited to total discharges of no more than one-fifteen-thousandth of the total cargo capacity and at a distance of greater than 50 miles from land. In addition, a simplified oil record book was required. Small tankers defined as less than 150 gross tons were still exempt.

Enforcement of the Convention is defective. Violations are punishable only under the laws of the state of registry of the offending vessel unless the violation occurs in the territorial waters of another nation. The injured coastal state obviously has a greater interest in prosecution than the state of registry, which is often nothing more than a matter of convenience. The amendments are not yet in force internationally. When they are signed into force they will approach, but not quite attain, the goal set by the United States in the 1920's.

1971 amendments.—In subsequent action, the Maritime Safety Committee recommended and IMCO adopted two other sets of amendments to the 1954 Convention. The first set adopted on October 12, 1971, provided special protection for Australia's Great Barrier Reef by redefining "nearest land" to include the area of the reef. The second set of amendments, adopted by the IMCO assembly on October 15, 1971, provided for tank arrangements and size limitations in the construction of new large tankers. The purpose of this set of amendments is to limit oil loss in the event of collision or stranding. The 1971 Amendments have yet to come into force internationally.

Geneva Conventions of 1958

The complexity of problems facing the marine environment demanded more than a piecemeal approach, yet that approach was characteristic of the four 1958 Geneva Conventions on the Law of the Sea.

Convention on the high seas.—Like the 1954 Convention which concentrated only on oil pollution, the 1958 Geneva Convention on the High Seas did not deal with pollution generally but concentrated on only two specific types of pollution. It again "obliged" signatory states to "draw up regulations to prevent pollution of the seas by the discharge of oil from ships or pipelines or resulting from the exploitation and exploration of the seabed and its subsoil, taking account of existing treaty provisions on the subject."³⁹ States were also obligated to "take measures to prevent pollution of the seas from the

³⁹ Convention on the High Seas, April 29, 1958, 13 U.S.T. 2312, T.I.A.S. No. 5200, art. 24.

dumping of radioactive waste" and to "cooperate with the competent international organizations in taking measures for the prevention of pollution of the seas or air space above, resulting from any activities with radioactive materials or other harmful agents."⁴⁰

There are several inadequacies in this convention, in part because it was drafted at a time when the magnitude and intensity of ocean pollution was not fully understood. The terms "other harmful agents" and "appropriate measures" have proven too broad to be effective. In addition, only those states which are parties to this Convention were obligated to "cooperate."

Convention on the territorial sea and the contiguous zone.—The Convention on the Territorial Sea and the Contiguous Zone permits the coastal State to "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" in a zone contiguous to its territorial sea not to exceed 12 miles from the baseline.⁴¹ If sanitary regulations can be interpreted as pollution control measures, a state may then exercise its authority 12 miles seaward. Even allowing pollution control jurisdiction to 100 or 200 miles as some states claim, this still affects only a small part of the oceans. Clearly this Convention does not adequately deal with marine pollution.

Convention on the Continental Shelf.—With regard to the seafloor of the continental shelf, the Convention on the Continental Shelf provides that the coastal state is obligated to take "all appropriate measures for the protection of the living resources of the sea from harmful agents."⁴² This convention also does not define "appropriate measures" and "harmful agents." Even the extent of the area of jurisdiction on the continental shelf is left somewhat ambiguous.

Convention on fishing and the conservation of living resources.—The fourth Convention affirms that a coastal state has a "special interest in the maintenance of the productivity of the living resources in any area of the high seas adjacent to its territorial sea."⁴³ The convention allows a state to take unilateral conservatory action if international agreements cannot be reached.

Conventions and Treaties Affecting Radioactive Pollution of the Seas

Five additional international agreements have been concluded which relate to marine pollution by radioactive materials. Some of these agreements are hindered by not being ratified by all nations possessing nuclear weapons or nuclear ships.

1. International Convention for the Safety of Life at Sea, June 17, 1960.

2. Convention on Third Party Liability in the Field of Nuclear Energy, 1960.

3. Convention on the Liability of Operators of Nuclear Ships, May 1962.

4. Treaty Banning Nuclear Weapons Tests in the Atmosphere, in Outer Space and Under Water, August 1963.

⁴⁰ *Ibid.*, art. 25.

⁴¹ Convention on the Territorial Sea and the Contiguous Zone, April 1, 1958, 2 U.S.T. 1606, 1612, T.I.A.S. No. 5639. (1964).

⁴² Convention on the Continental Shelf, April 29, 1958, T.I.A.S. 5578, 15 U.S.T. 471.

⁴³ Convention on Fishing and Conservation of the Living Resources of the High Seas, April 29, 1958, 1 U.S.T. 139, 141, T.I.A.S. No. 5969. (1966). art. 6.

5. Treaty on the Prohibition of the Emplacement of Nuclear Weapons, and other Weapons of Mass Destruction on the Seabed and Ocean Floor and on the Subsoil Thereof, 1971.

In addition to the above treaties and conventions, the International Atomic Energy Agency has periodically issued guidelines and regulations, in accordance with a resolution of the 1958 Law of the Sea Conference for the safe disposal of radioactive wastes into the sea. There is no international control on such waste disposal. Individual states are only obligated to control discharge from their own facilities. However, because of early public concern toward radioactive pollution, disposal of wastes from nuclear reactors is perhaps one of the best controlled and managed disposal systems now existing.

Intervention Convention of 1969

The *Torrey Canyon* disaster prompted two 1969 Brussels conventions dealing entirely with oil pollution from ships. The first of these, the International Convention relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, permits any party to take "such measures on the high seas as may be necessary to prevent, mitigate or eliminate grave and imminent danger to their coastline or related interests from pollution or threat of pollution of the sea by oil, following upon a maritime casualty or acts related to such a casualty, which may reasonably be expected to result in major harmful consequences."⁴⁴ Measures taken by the coastal state "shall be proportionate to the damage actual or threatened to it."⁴⁵ This convention is preventive in allowing signatory states to resort to self-help in emergencies to protect their own interests from oil pollution damage. The principle of self-help on the high seas is not new, but this is the first international convention to apply it to the purposes of protection of the marine environment.

Liability Convention of 1969

The second 1969 Brussels convention dealt with civil liability in the event of oil pollution damage. The International Convention on Civil Liability for Oil Pollution Damage established rules and procedures for determining liability and providing compensation for damage caused by oil pollution from ships.⁴⁶ The Liability Convention applies only to the territory or territorial sea of the signatory states and does not extend liability to damage occurring within the contiguous zone or on the high seas. Liability applies to the ship owner, not the charterer or cargo owner, and unlike the 1954 Oil Pollution Convention as amended, claims can be made in the courts of the damaged state. Liability, defined in *Poincare* francs, was at that time equivalent to a limit of \$134 per ton or up to \$14 million maximum. This Convention is primarily remedial rather than preventive, applying only to oil pollution *after* it causes damage to a limited area of the ocean.

TOVALOP and CRISTAL.—The Liability Convention has been supplemented by voluntary actions of two segments of private industry directly concerned with this matter, namely the tanker owners and the cargo owners. The Tanker Owners Voluntary Agreement concerning Liability for Oil Pollution (TOVALOP) is an international insur-

⁴⁴ International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, signed at Brussels November 29, 1969, art. 1.

⁴⁵ *Ibid.*, art. 5.

⁴⁶ International Convention on Civil Liability for Oil Pollution Damage, signed at Brussels November 29, 1969.

ance program requiring participating tanker owners to either clean up oil spills or reimburse the countries whose shorelines are damaged or threatened. The maximum liability under TOVALOP is \$10 million per vessel per incident. The other insurance program, Contract Regarding an Interim Supplement to Tanker Liability for Oil Pollution (CRISTAL), was developed by cargo owners to provide additional coverage to private citizens as well as governments. This contract, extending coverage to a limit of \$30 million per incident, was signed by the major oil companies January 14, 1971.

International Fund Convention of 1971

At the International Legal Conference on Marine Pollution Damage in Brussels in 1969, IMCO was charged to draft a compensation scheme based on an international fund. This was presented to the states signatory to the Liability Convention and adopted in Brussels in December 1971. The International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage is intended to provide compensation to any party who has been unable to obtain full and adequate compensation under the Liability Convention. The International Fund is to consist of mandatory contributions by oil importers in the contracting states based on the amount of oil received by each importer. The aggregate amount of compensation to be paid under the Liability Convention and the Fund is limited to 450 million *Poincare* francs, equivalent to \$30 million at that time.

Conference on the Human Environment of 1972

In June 1972 in Stockholm, the United Nations held a Conference on the Human Environment. The Conference had been preceded by a number of preparatory meetings of the International Working Group on Marine Pollution which produced detailed outlines of marine pollution problems and the information that was needed to be gathered. Draft proposals were submitted as to how to deal with these problems. The Stockholm Conference, however, concerned itself primarily with drafting, debating, and adopting a "Declaration on the Human Environment." Sections 86 through 94 of this Declaration are concerned specifically with marine pollution (Appendix IV). Among the recommendations are that Governments with the assistance of the appropriate U.N. bodies such as the Joint Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP) accept and implement controls on marine pollution; that Governments support marine research, particularly the Global Investigation of Pollution on Marine Environment (GIPME) and the integrated Global Ocean Station System (IGOSS); that GESAMP evaluate the toxicity of potential marine pollutants and their sources and pathways in the marine environment; and that Governments support the 1973 Law of the Sea and the IMCO Marine Pollution Conferences. Perhaps the major achievement of the Stockholm Conference was the creation of a "World Environmental Body" to coordinate world studies in the field and an "Environmental Fund" made up of voluntary contributions from governments to help finance international environmental activities.

The U.N. Environmental Program (UNEP) is now over two years old. The budget of \$5.5 million adopted for the 1973-1974 biennium provided only \$0.6 million (11%) for environmental problems of the ocean (71% of the earth's surface).

Convention on Marine Pollution by Dumping of Wastes and Other Matter of 1972

In June 1971 at a meeting of the International Working Group on Marine Pollution in London, the United States submitted a draft convention for the regulation of ocean dumping intending to bring a revised international version before the Stockholm Conference in June 1972 for consideration and signing. However, this timetable could not be kept. A second preliminary meeting at Ottawa in November 1971 developed a draft convention with input from several other nations, but there were further suggestions submitted for improvements leading to a third meeting in Reykjavik in April 1972. A draft Convention for the Prevention of Marine Pollution by Dumping was prepared, but again there were certain objections from delegates. Two provisions of the Reykjavik Draft are of particular note: (1) parties "with common interests to protect in the marine environment in a given geographical area should endeavor to enter into agreements on a regional level,"⁴⁷ and (2) the parties "recognize that in accordance with the principles of international law, States bear responsibility for damage to the environment of other States or to areas beyond the limits of national jurisdiction caused by dumping and undertake to develop procedures for the assessment of liability and for the settlement of disputes."⁴⁸

Another meeting was held in London in May 1972, but agreement still could not be reached. The Stockholm Conference recognized the draft convention, but no official action was taken to adopt it. Finally, the United Kingdom issued invitations to convene in London in October 1972 to take action on the draft convention. Representatives of 92 nations assembled, and the text of the Convention was finally agreed to on November 13, 1972, and opened for signature on December 29, 1972.

The objective of the Convention is to establish in all states similar regulations controlling the disposal of wastes and other matter at sea. In Articles I and II, parties pledge to promote effective marine pollution control and to act individually and collectively in regulating ocean dumping. Article IV prohibits the dumping of any materials listed in Annex I (Appendix V) which includes oil and highly radioactive and toxic materials. A second annex lists substances requiring special care for which permits are required. Parties are to designate an appropriate authority to issue permits and keep records of matter dumped. A third annex lists factors to be considered in issuing permits such as the characteristics and composition of the matter, characteristics of the dumping site and method of deposit, and certain other general considerations. Enforcement of dumping regulations is the responsibility of each Party.

The regulation of ocean dumping offers at best the management of approximately 10 percent of the pollutants entering the world's oceans. This fraction is a significant step, however, toward the goal of international management of the common global resource.

⁴⁷ Report of the Intergovernmental Meeting on Ocean Dumping, adopted at Reykjavik, Iceland, April 15, 1972. Doc IMOD/4, art. 7.

⁴⁸ *Ibid.*, art. 10.

International Convention for the Prevention of Pollution From Ships of 1973

Aware of the growing problems of marine pollution, the IMCO Assembly, in October 1971, resolved to achieve by 1975, or the end of the decade at the latest, complete elimination of the willful and intentional pollution of the sea by oil and other noxious substances and the minimization of accidental spills. To this end, an International Conference on Marine Pollution was scheduled to convene in London in October 1973. Two years of preliminary work culminated when the Conference adopted the International Convention for the Prevention of Pollution from Ships on November 2, 1973.

Compared to the Oil Pollution Convention as amended, the regulations prescribed in the 1973 Convention cut the maximum permissible quantity of oil which may be discharged by new oil tankers from 1/15,000 to 1/30,000 of the cargo-carrying capacity. Refined products and other liquid noxious substances are now included and all oil-carrying ships will be required to operate under the "load on top" system. Tankers constructed after December 31, 1975, must have segregated ballast tanks. Sewage and garbage disposal from ships is also regulated. The flag state is also required to prosecute all violations of its vessels wherever they occur.

Concurrently, the eighth IMCO Assembly meeting in November 1973 adopted the United States proposal to form a Marine Environmental Protection Committee (MEPC) and designated this committee as the appropriate IMCO body to deal with amendments to the new Convention. Table XVII is a comparison of the major features of International Conventions for the Prevention of Pollution from Ships. The text of the Convention including lists and pollution categories of oils and noxious liquid substances carried in bulk is given in Appendix VI. This Convention will enter into force twelve months after ratification by not less than fifteen states representing not less than fifty percent of the world's shipping.

Third U.N. Law of the Sea Conference

The 25th U.N. General Assembly passed Resolution 2570 C to convene a Conference on the Law of the Sea beginning in 1973. The Committee on the Peaceful Uses of the Seabed and the Ocean Floor Beyond the Limits of National Jurisdiction was established to prepare the groundwork for the Conference. Ninety-one nations were represented on this committee which held its sixth preparatory session in Geneva July 2nd to August 24th, 1973. This Committee divided its work among three subcommittees with preservation of the marine environment delegated to Subcommittee III. A working group within Subcommittee III was formed to draft articles regarding preservation of the marine environment and the prevention of marine pollution. These articles focused on the general obligation of states to preserve and protect the marine environment, to adopt measures to prevent pollution, and to prevent damage to the marine environment.

An organizational session of the Law of the Sea Conference was held in New York City in December 1973 to establish voting procedures and elect Conference officials. Substantive work began as the Third United Nations Law of the Sea Conference convened in Caracas, Venezuela, for a 10-week session beginning June 20, 1974. The second substantive session of the Conference is being held in Geneva from 17 March to 10 May 1975. Over one hundred fifty nations are participating in the Third Conference, many of which did not exist when the First and Second Conferences were held in 1958 and 1960. The Third Law of the Sea Conference will be the most ambitious international undertaking ever attempted for dealing with the problems of the marine environment.

TABLE XVII. - COMPARISON OF CERTAIN MAJOR FEATURES OF INTERNATIONAL CONVENTIONS FOR PREVENTION OF POLLUTION FROM SHIPS

	1954 (as amended in 1962)	1973
Applicability as regards carriage of oil	1. Seagoing tankers over 150 gross tons. 2. Other seagoing ships over 300 gross tons.	1. All tankers over 150 gross tons. 2. All other ships over 400 gross tons including novel craft and fixed and floating platforms.
Dispute settlement	1. Referred to International Court of Justice unless all parties agree to arbitration.	1. Compulsory arbitrations by specially formed tribunals upon application of any party to dispute.
Amendment procedure	1. Effective only upon specific acceptance via IMCO assembly and contracting States.	1. Speedier method for annexes and appendices via IMCO committee and tacit acceptance procedures.
Survey and certification	1. No comparable provision.	1. Survey at 5 yr intervals and at intermediate (midperiod) intervals. 2. Equipment must be approved administration (monitors, filters, separators, interference detectors). 3. Administration issues certificate attesting to compliance by its ships, which certificate shall be accepted except when there are clear grounds to believe the ship is not in compliance.
Definition of oil	1. Limited to crude, fuel, heavy diesel and lubricating oils. 2. Does not include bilge slops and fuel and lube oil purification residues.	1. Includes all petroleum oils except petrochemicals (which are regulated by annex 11). 2. Prohibits discharges which leave visible traces unless it can be established by installed instruments that the concentration discharged was less than 15 parts per million.
Discharge criteria in prohibited zones (this term does not appear in the 1973 convention which uses a distance from land criterion).	1. Prohibits discharges by all ships in concentrations in excess of 100 parts per million within the prohibited zones. 2. Prohibited zone generally 50 miles or greater from nearest land for tankers. Prohibited zone applies to other ships unless proceeding to a port not provided with adequate reception facilities.	2. For tanker cargo slops, discharge is prohibited within 50 miles from nearest land. For other ships slops, and other tanker slops, discharge is prohibited within 12 miles from the nearest land.
Discharge criteria outside of the prohibited zones.	1. No restriction on discharges from a ship less than 20,000 gross tons. Vessels over 20,000 gross tons are limited to discharges whose concentrations are 100 parts per million or less, unless when in the opinion of the master, circumstances make it unreasonable or impractical to retain the higher concentrated slops on board.	1. Tankers must meet all the following conditions: (a) Ship is proceeding en route. (b) Discharge is limited to 60 per mile instantaneous rate. (c) Total quantity discharged is limited to 175,000 of cargo last carried for existing tankers and 130,000 of cargo last carried for new tankers. (d) Tanker bilges, except pump rooms, shall be treated same as other slops.

2. Other ships must meet all of the following conditions:

- (a) Ship is proceeding en route.
 - (b) Oil content of the effluent must not exceed 100 parts per million.
1. Requires that the monitoring and control system be in operation and a permanent record made any time oily effluent is being discharged, except for clean or segregated ballast.
 1. Segregated ballast is mandatory for new tankers of 70,000 dwt and greater, and is optional for tankers of less than 70,000 dwt. Note that "new" tankers are defined by tonnage dates and are therefore not dependent upon entry into force of this convention.
 2. Retention of oil on board (LOT) is mandatory for all tankers.
 3. Mandatory installation of effluent monitor and control system, provision of slop tanks, and provision of oil water interface detectors. Effluent must comply with discharge criteria or be transferred to reception facility.
 4. Other ships require sludge tank installations, oil water separator and/or filters dependent upon ship size.
 1. Expanded provision to undertake to insure availability and adequacy at oil loading ports, repair ports and at other ports according to the needs of ships.
 1. Expands requirements to provide entries for more specific operations and in greater detail to aid in enforcement.
 1. Establishes damage assumptions and methods of calculation of the amount of hypothetical oil outflow for tankers.
 2. Establishes tank arrangement and size limitations for the cargo tanks of tankers.
 3. Establishes subdivision and damage stability criteria to be applied to tankers to increase survivability in the event of accident.
 1. Annex II details mandatory requirements for construction of chemical tankers and discharge criteria for liquid noxious substances in bulk.
 2. Annex III contains regulations for the prevention of pollution by harmful substances carried at sea in packaged form, or in freight containers, portable tanks, or road and rail tank cars.
 3. Annex IV contains regulations for the prevention of pollution by sewage from ships.
 4. Annex V contains regulations for the prevention of pollution by garbage from ships.

1. No comparable provision

do

Enforcement mechanism

Construction and equipment requirements to control operational discharges of oily mixtures.

1. Provision to promote according to need of ships using ports

1. Establishes basic requirement to provide oil record book and requires entries for specific operations.

1. No comparable provision

Construction requirements to limit the amount of oil discharge in case of accidents.

do

Additional annexes for substances other than oil. Annex II is mandatory and annexes III, IV, and V may be adopted at the option of contracting states.

VIII. U.S. ACTIVITIES FOR CONTROLLING OCEAN POLLUTION

The United States was early to recognize the potential danger of pollution of the marine environment. This nation was one of the first to enact pollution control measures within its territorial waters in addition to actively promoting international cooperation in pollution control on the high seas.

Rivers and Harbors Act of 1899

Early Congressional interest in controlling the pollution of the Nation's waters was concerned primarily with internal waters. One of the earliest pieces of legislation, which still stands as a landmark to pollution abatement in navigable waters, was the Rivers and Harbors Act of 1899 (Public Law 55-425). This Act states that "it shall not be lawful to throw, discharge, or deposit, or cause, suffer, or procure to be thrown, discharged, or deposited either from or out of any ship, barge, or other floating craft of any kind, or from the shore, wharf, manufacturing establishment, or mill of any kind, any refuse matter of any kind or description whatever other than that flowing from streets and sewers and passing therefrom in a liquid state, into any navigable water of the United States, or into any tributary of any navigable water from which the same shall float or be washed into such navigable water." Since much of the pollution found in the oceans is brought there by the rivers and streams flowing out of the surrounding land masses, this legislation, passed nearly three-quarters of a century ago, can be regarded as the first step toward U.S. legislative action to prevent ocean pollution.

Oil Pollution Control Act of 1924

Shortly following World War I, with the increased use and development of oil-fueled and oil-carrying ships, Congress enacted Public Law 68-238. This law, titled the Oil Pollution Control Act of 1924, prohibited the willful discharge of oil into the coastal waters of the United States. Fines up to \$2,500 and imprisonment up to one year were provided for persons guilty of this offense. Discharge was permitted under certain conditions provided it was deemed not deleterious to health, sea food, a menace to navigation, or dangerous to persons or property engaged in commerce on such waters. This Act was updated and strengthened by amendments in 1966 making the guilty party liable for the cost of cleaning up an oil discharge, and revising the fines to a maximum of \$2,500 per person and \$10,000 per vessel.

Federal Water Pollution Control Act of 1961

Water pollution control gained new impetus in 1948 when legislative action targeted this as a primary national concern. The first bill passed was Public Law 80-845 which provided measures for restoring

and preserving the Nation's water resources. However, these provisions were restricted to interstate waters. Following extensions and amendments of this Act in 1952 and 1956, an amendment titled The Federal Water Pollution Control Act of 1961 (Public Law 87-88) extended pollution abatement procedures to all navigable waters including coastal waters. This Act provides grants to local communities for sewage control and funds for research and development of pollution control and treatment. Enforcement of pollution control measures is left to the states, but provision is made for limited Federal enforcement in the case of pollution endangering the health or welfare of persons where the State has not taken action.

Oil Pollution Control Act of 1961

An additional major piece of environmental legislation passed in 1961 was the Oil Pollution Act (Public Law 87-167) which implemented the provisions of the International Convention for the Prevention of the Pollution of the Sea by Oil, 1954. The 1954 Oil Pollution Convention provided for signatory countries to enact enabling legislation in ratification of the Convention. Through the Oil Pollution Control Act, Congress provided specific penalties for noncompliance with the provisions of the Convention within U.S. jurisdiction. The United States became party to the Convention on December 8, 1961. In 1966, amendments to the 1961 Oil Pollution Control Act were enacted (Public Law 89-551) to implement amendments to the 1954 Oil Pollution Convention adopted in London April 11, 1962 (The amendments to the Convention were discussed in the previous chapter). The 1966 Amendments to the Oil Pollution Control Act also provided penalties for violations occurring within the U.S. jurisdiction.

Marine Resources and Engineering Development Act of 1966

In June 1966, Congress passed the Marine Resources and Engineering Development Act which became Public Law 89-454. This Act provided for a comprehensive, long-range, and coordinated national program in marine science, and established a National Council on Marine Resources and Engineering Development in the Executive Office of the President. In addition to the Council, a Commission on Marine Science, Engineering and Resources was formed to recommend an organizational structure suitable for fulfilling the aims of the national oceanographic program set forth in this Act. The duties of the Council were to assist and advise the President in surveying all marine science activities, develop a program in marine activities including exploitation and conservation of the resources of the marine environment, and to aid in coordinating marine activities of Federal agencies. For the purposes of this Act the term "marine environment" was defined to include the oceans, Continental Shelf of the United States, the Great Lakes, the seabed and subsoil of the submarine areas adjacent to the coasts of the United States to a depth of 200 meters or beyond to the limit of exploitation.

This Act was amended in January 1968 (Public Law 90-242) to extend the lifetime of both the Council and Commission to allow additional time to complete their work. The Commission's task was completed with the publication of its final report titled *Our Nation and the Sea*, which was submitted to Congress in January 1969. It was

the most comprehensive assessment of the goals and policies of the United States with regard to the marine environment and resources that had been prepared to date. The report included over one hundred findings and recommendations for specific actions and recommended whether the actions should be legislative, administrative, international, national, state, or local. Rather than discussing pollution in coastal waters, estuaries, and the ocean as a separate topic, the report examined these problems as they related to specific marine activities.

The Marine Resources Act was further amended in May 1969 (Public Law 91-15) and September 1970 (Public Law 91-414) to extend the expiration date of the Council pending the establishment of a permanent Federal ocean agency. The National Oceanic and Atmospheric Administration (NOAA) was finally established on October 3, 1970, as a dependent organization within the Department of Commerce. NOAA brought together nine related atmospheric and sea programs from five departments and agencies.

Sea Grant and College Program Act of 1966

The year 1966 was a year of legislative action dealing with marine environmental concerns. In October, the Sea Grant College and Program Act (Public Law 89-688) was passed, providing much needed funding support in the marine sciences. The Act encompassed three main objectives, namely, research, training of manpower, and information transfer of new discoveries and technology to ocean related applications such as shipping, food and minerals from the sea, defense, extraction of drugs from the sea, transportation, recreation, weather prediction, and other activities. This Act later became incorporated as title II of the Marine Resources and Engineering Development Act. Administration of the Act was originally delegated to the National Science Foundation. Federal funds were provided on a two to one basis; that is, the recipient must provide one-third of the total. While the main emphasis is on the "development of marine resources," this is defined to include conservation and management of these resources and the social, legal, medical, and economic problems that might arise from their development, recovery and use. The marine environment was again defined to include the oceans and the seabed and subsoil of the Continental Shelf of the United States to a depth of 200 meters or beyond to the limits of exploitation. Other amendments to this Act have authorized continued appropriations.

Clean Water Restoration Act of 1966

Further amendments to the Federal Water Pollution Control Act were enacted in 1965 and 1966. The 1965 amendments (Public Law 89-234) primarily provided for Federal administrative reorganization and grants for research, development, and construction of sewage treatment works. States were given the opportunity to establish adequate water quality standards and enforcement procedures for their interstate waters. If a state did not take action by June 30, 1967, the Federal government would establish standards. The 1966 amendments, titled The Clean Water Restoration Act of 1966 (Public Law 89-753), extended the definition of coverage of the Act to specifically include rivers, coastal waters, sounds, estuaries, bays, and harbors. In addition, massive Federal support was authorized for grants for the construction of sewage treatment facilities.

National Environment Policy Act of 1969

In January 1969, a blowout from an oil drilling platform in the Santa Barbara Channel resulted in massive pollution of beaches and waterfront property, decreased recreational attractions along the coast, and destroyed much wildlife. This and other actions such as the Army's disposal of obsolete toxic chemical munitions off the New Jersey and Florida coasts alarmed Congressional leaders and contributed to continuing legislative action expressing the concern of Congress for marine pollution and the deterioration of man's environment. One result of this action was the National Environmental Policy Act of 1969 (Public Law 91-190). This Act established a national policy to encourage productive and enjoyable harmony between man and his environment, promote efforts to prevent and eliminate damage to the biosphere, stimulate the health and welfare of man, and enrich the understanding of ecological systems and natural resources important to the nation. In addition, the Act required a statement to be prepared detailing the environmental impact of any proposed major Federal actions significantly affecting the quality of the human environment. A Council on Environmental Quality was created in the Executive Office of the President to review Federal programs and advise on matters covered under this broad mandate. An annual Environmental Quality Report is to be submitted by the President to Congress covering all aspects of the environment including air, marine, estuarine, fresh water, and terrestrial.

Water Quality Improvement Act of 1970

With the passage of the Water Quality Improvement Act of 1970 (Public Law 91-224), major amendments were made in the Federal Water Pollution Control Act. These amendments dealt with oil pollution of our national waters from ships and facilities, both on-shore and off-shore, Federal permits and licenses, sewage pollution from vessels, and hazardous substances. Jurisdiction was extended into the contiguous zone which was defined as "the entire zone established or to be established by the United States under article 24 of the Convention on the Territorial Sea and the Contiguous Zone."⁴⁹ An owner or operator guilty of violating this Act can be fined \$10,000 and be liable for up to \$14,000,000 in clean-up costs. In addition to oil, discharge of any substance deemed hazardous to health and welfare including fish, shellfish, wildlife, shorelines, and beaches is prohibited. Enforcement procedures of standards and regulations for marine pollution by sewage and garbage from vessels was also detailed. Title II of the Act, cited as the Environmental Quality Improvement Act of 1970, provided staff support for the Council of Environmental Quality to monitor Federal pollution control efforts. An Office of Environmental Quality was established in the Executive Office of the President.

Federal Water Pollution Control Act Amendments of 1972

After extensive hearings, during which testimony was received from more than 400 witnesses, Congress passed the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500) setting as a goal the complete elimination of pollution from America's waters by 1985. Secondary treatment facilities are required for all municipal

⁴⁹ Public Law 91-224 sec. 11(a)(9).

wastes by mid-1977 and more advanced disposal methods by mid-1983. Grants for research, development and construction of treatment facilities are provided. Strict standards and regulations for industrial pollution are provided and are backed up by enforcement procedures and penalties including fines and imprisonment for violators. Permits and guidelines are provided for any discharge into the territorial sea, the waters of the contiguous zone, or the oceans. The issuance of such permits are contingent on compliance with strict regulations prohibiting damage to the marine environment. This would include the effects of disposal or alternate ocean uses such as mineral exploitation and scientific study on human health or welfare; marine life including bioconcentration and transfer of pollutants; esthetic, recreation, and economic values; and alternative means or locations of disposal. President Nixon vetoed the measure because he considered its \$24.6 billion authorization too high, but it was enacted into law over his veto by overwhelming margins in both Houses.

Marine Protection, Research, and Sanctuaries Act of 1972

The 92nd Congress was active in marine legislation. Prompted by U.S. Army disposal of explosives and toxic chemicals off the Atlantic coast, damage to beaches from industrial and municipal wastes, and the Santa Barbara offshore oil spill, several bills were introduced to regulate ocean waste disposal and control marine pollution. Furthermore, a study undertaken by the Council on Environmental Quality revealed that there were over 246 dumping sites off the coasts of the United States. Marine life in these areas suffered from habitat loss, toxic poisoning, oxygen depletion, shock, diseases, and biostimulation (accelerated plant growth).

Two Administration-backed bills were introduced, H.R. 4723 and S. 1238. In the House, joint hearings were held by the Subcommittee on Oceanography and the Subcommittee on Fisheries and Wildlife Conservation of the House Committee on Merchant Marine and Fisheries. Finally, a clean bill, H.R. 9727, which was essentially H.R. 4723 amended, was reported out.

In the Senate, hearings were held by the Subcommittee on Air and Water Pollution of the Committee on Public Works and the Subcommittee on Oceans and Atmosphere of the Senate Committee on Commerce. This latter Subcommittee also held an "International Conference on Ocean Pollution." On August 4, 1971, the Subcommittee on Oceans and Atmosphere ordered H.R. 9727, the companion bill to S. 1238, to be reported to the full Committee on Commerce. With acceptance of several amendments of a technical nature, H.R. 9727 was passed by the Senate on November 24, 1971.

A Conference Committee was appointed to settle the differences between the House and Senate versions of H.R. 9727. Conferees appointed from the Senate included Senators Magnuson, Hollings, Hart, and Stevens, all members of the Senate Committee on Commerce. The issues which absorbed most of the conference time concerned permits for discharge of dredge spoil into the oceans, the geographical coverage of the bill, and the question of marine sanctuaries. It was decided that the Corps of Engineers would retain authority to issue permits for the disposal of dredge material, subject to a veto from the Environmental Protection Agency. Senator Holl-

ings regarded this compromise as essentially favorable to the Senate position since the Environmental Protection Agency would prevail in the event of disagreement. On the other issues, the Senate yielded to the House. The House favored control of discharges into all ocean waters and the Senate covered only those discharges three miles from the coast and beyond. On the question of marine sanctuaries, Title III was restored as described below.

The Marine Protection, Research, and Sanctuaries Act of 1972 (Public Law 92-532) was passed on October 23, 1972. This Act regulates all ocean dumping by U.S. nationals and "the transportation of material from the United States for dumping into ocean waters, and the dumping of material, transported from outside the United States, if the dumping occurs in ocean waters over which the United States has jurisdiction or over which it may exercise control, under accepted principles of international law, in order to protect its territory or territorial sea."⁵⁰ Any type of materials that adversely affects human health, welfare, or amenities, or the marine environment, ecological systems or economic potentialities is regulated by this Act. Radiological, chemical or biological warfare agents and high-level radioactive wastes are specifically mentioned. Penalties and fines up to \$50,000 are prescribed for violations. Funds for comprehensive research on ocean dumping were authorized to be appropriated for 3 years. Title III authorized the establishment of marine sanctuaries as far seaward as the edge of the Continental Shelf for the purpose of preserving or restoring such areas for their conservation, recreation, ecological, or esthetic values.

Amendments to this Act were adopted on March 22, 1974 (P.L. 93-254) to implement the provisions of the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter pursuant to the policy of Congress that the President seek effective international action in this area. These amendments were embodied in S. 1351 introduced by Senator Warren G. Magnuson and H.R. 5450 the companion bill introduced by Congresswoman Leonor K. Sullivan.

Coastal Zone Management Act of 1972

Congressional interest in the coastal zone was aroused after the publication of the report entitled *Our Nation and the Sea* by the Commission on Marine Science, Engineering and Resources in January 1969. The report recommended, among other things, "that a Coastal Management Act be enacted which will provide policy objectives for the coastal zone and authorize Federal grants-in-aid to facilitate the establishment of State Coastal Zone Authorities empowered to manage the coastal waters and adjacent land."⁵¹

Legislation on coastal zone management was introduced in both Houses in the 91st Congress. The forerunner of legislation enacted in the 92nd Congress, S. 2802, was introduced late in the first session of the 91st Congress by Senator Warren G. Magnuson. Later, an administration-backed bill, S. 3183, was introduced, based on recommendations made in another report, *The National Estuarine Pollution Study*.⁵² This study was undertaken by the Department of the In-

⁵⁰ Public Law 92-532 sec. 2.

⁵¹ *Our Nation and the Sea*. Report of the Commission on Marine Science, Engineering and Resources. January 1969. Washington: U.S. Government Printing Office, 1969. p. 57.

⁵² U.S. Congress. *The National Estuarine Pollution Study*. Report of the Interior to the United States Congress Pursuant to P.L. 89-753, The Clean Water Restoration Act of 1966. 91st Congress, 2nd session Document No. 91-58. March 25, 1970. Washington: U.S. Government Printing Office, 1970. 633 p.

terior, pursuant to P.L. 89-753, to conduct an inventory and study of the Nation's estuaries and their natural resources. The Senate Subcommittee on Oceanography held several days of hearings on these bills in the spring of 1970, and favorably reported S. 3183 to the Senate Commerce Committee after amending it to include concepts from *Our Nation and the Sea* and the *National Estuarine Pollution Study*. However, Congress adjourned before further action was taken on the bill.

In the 92d Congress, Senator Ernest F. Hollings introduced S. 582 which was the bill approved by the Senate Subcommittee on Oceans and Atmosphere (formerly the Subcommittee on Oceanography) during the previous Congress. Hearings were held on several related bills in May 1971, and S. 582 was reported out on December 1, 1971. However, several objections were raised, and Senator Hollings re-committed the bill to the Commerce Committee for amendments. Subsequently, a clean bill, S. 3507, was reported on April 11, 1972, which was passed unanimously by the Senate after approval of several floor amendments.

On the House side, hearings were held on three similar bills by the Committee on Merchant Marine and Fisheries, Subcommittee on Oceanography. Eventually, a clean bill, H.R. 14146, was reported out by the Committee on May 5, 1972. On the floor of the House controversy centered around the agency designated to have administrative jurisdiction, the Department of the Interior or the Department of Commerce (through the National Oceanic and Atmospheric Administration, NOAA). Agreement was finally reached placing jurisdiction in the Department of the Interior.

The conference report reflected several compromises. The Senate Conferees succeeded in retaining administrative jurisdiction of the coastal zone program in NOAA under the Secretary of Commerce, but the Secretary of the Interior must first concur on any land-use elements. S. 3507 was signed into law on October 27, 1972 (Public Law 92-583).

Briefly, the Coastal Zone Management Act declares that the land and water resources of the coastal zone should be preserved, protected, responsibly developed, and restored where possible. The Secretary of Commerce is given authority to provide planning and administrative grants to encourage state and local governments to establish coastal management programs. All Federal agencies engaged in programs affecting the coastal zones are required to cooperate and participate with state and local governments in implementing management programs. The Secretary of Commerce is further authorized to create a Coastal Zone Management Advisory Committee to assist him on policy matters relating to the coastal zone. Within the Department of Commerce, the National Oceanic and Atmospheric Administration has administrative authority over the program.

Oil Pollution Act Amendments of 1973

In 1969 and 1971, the IMCO assembly adopted further amendments to the 1954 Oil Pollution Convention. These amendments tightened existing controls and regulated tanker compartment size and construction. In order to implement these amendments, Senator Warren G. Magnuson introduced S. 1067 on March 1, 1973. On June 12, 13, and 28, 1973, extensive hearings on ocean pollution were

held before the Committee on Commerce, Subcommittee on Oceans and Atmosphere pursuant to this bill and two others introduced by Senator Magnuson also related to International Conventions on ocean pollution.⁵³ These hearings pointed out the growing concern regarding the worldwide effects of marine pollution.

On the House side, Congresswoman Leonor K. Sullivan introduced a companion bill, H.R. 5451, on March 8, 1973. On May 8, 1973 this bill passed the House amended and was referred to the Senate Committee on Commerce. Senator Warren G. Magnuson reported the House bill to the Senate without amendment on September 21, 1973, and it was subsequently signed into law on October 4, 1973 (Public Law 93-119). The Oil Pollution Act Amendments of 1973 established as United States law the provisions of the IMCO amendments described in the previous chapter.

Intervention on the High Seas Act of 1974

In order to implement the International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties of 1969, Senator Warren G. Magnuson introduced S. 1070 on March 1, 1973. This measure was reported to the Senate on November 2, 1973, and passed the Senate on November 5th. Following subsequent deliberation in the House, Congress enacted the Intervention on the High Seas Act (Public Law 93-248), signed into law on February 5, 1974. This Act closely follows the measures prescribed in the Convention and establishes liabilities and penalties for violating the provisions of the Act.

Proposed Act Concerning Compensation for Oil Pollution Damage

The case for establishing clear liability and providing compensation to innocent parties suffering damage from an oil spill was dramatized following the Santa Barbara Channel blowout and the *Torrey Canyon* disaster. These widely publicized mishaps focused much attention on the massive cleanup efforts and attempts to control the oil spills. These efforts cost millions of dollars and, in the case of the *Torrey Canyon*, suggested the benefits of international agreements on assigning liability and compensation.

S. 841, introduced by Senator Ernest F. Hollings on February 8, 1973, was designed to incorporate into national law the provisions of two international Conventions concluded at IMCO assemblies in 1969 and 1971. This enabling legislation was referred to the Senate Committee on Foreign Relations for consideration in conjunction with the Executive Communications describing the Conventions. The International Convention on Civil Liability for Oil Pollution Damage was reported out of the Senate Foreign Relations Committee, but action on the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage was postponed pending enactment of proposed amendments to S. 841. These amendments would raise the liability limits of the Fund from the maximum of \$32,400,000 set by the International Convention up to a maximum of \$100,000,000 by contributions levied on receivers of oil imported into the United States. These contributions would be based on a fixed sum per ton of oil and adjusted as needed from time to time.

⁵³ U.S. Congress. Senate. Committee on Commerce. Subcommittee on Oceans and Atmosphere. Ocean Pollution. Hearings, 93rd Cong., 1st sess., on S. 1067, S. 1070 (and) S. 1351. June 12-13, 28, 1973. Washington. U.S. Govt. Print. Off., 1974. 393 p. "Serial no. 93-46."

On the House side, the provisions of both conventions were embodied in H.R. 4394 referred to the Committee on Foreign Affairs. Title I of this bill implemented the Liability Convention and Title II implemented the Compensation Fund. Title III covered procedures for subrogation and apportionment of claims where applicable limits may be exceeded. It also empowered District Courts to provide for the distribution of monies in such cases. Both Conventions were described in the preceeding chapter. Final action was not taken on either bill by the 93d Congress, and these measures will be reintroduced into the 94th Congress.



IX. TECHNOLOGY FOR ABATING OCEAN POLLUTION

The sources and types of marine pollutants have been mentioned, and institutional proceedings have been documented. Legislation directed at limiting or preventing marine pollution has been enacted. Other measures are continually being drafted as legislators determine and evaluate their necessity. Prevention of pollution, where possible, is preferable to clean up and control; however, it is recognized that unavoidable or deliberate marine pollution is a continuing problem that must be met. Often this requires development of specialized technology. Research for dealing with ocean pollution is progressing along three lines: prevention of willful chronic discharge, prevention of accidental pollution, and pollution cleanup.

Prevention of Chronic Discharge

Control of ocean pollution is not entirely a matter of legislating and enforcing restrictions to prevent willful discharge of pollutants. In some cases, willful discharge results from inability to deal with a pollutant in a more responsible manner. This inability may be derived from the lack of technical development to provide any alternative means of disposal or recovery. For example, oil-water separation equipment on offshore oil production platforms must be capable of separations to 50 ppm oil in water in order to prevent discharges of unacceptable amounts of oil. Technology has been developed to accomplish this. Improved technology for more efficient conversion of thermal energy to electricity has and can continue to cut down on thermal pollution from power plants. Improved technology in treating and developing new uses for municipal wastes has helped decrease the problems of municipal waste disposal which, if widely adopted, will eventually lead to less municipal waste pollution of the oceans. One such development is the use of garbage for fuel to heat and cool buildings.⁵⁴ Sewage treatment facilities are also being expanded and advanced treatment methods initiated. Sewage sludge can also be used directly as a fuel or converted to synthetic natural gas. The use of sewage as fertilizer for marine aquaculture has also been proposed.⁵⁵ Various solid debris have been used to construct artificial reeds for use as fish habitats. One technique for removing heavy metals from waste solutions is by precipitation as sulfides, insoluble sulfates or carbonates. Concentrations of heavy metals can be reduced to a trace by these methods before the metals are discharged into the marine environment.

Other methods of prevention of ocean pollution involve the discontinuance of use of hazardous substances. For example, mercury is no longer used as a slimicide in pulp and paper manufacture. The use of DDT is severely restricted in the United States in recognition

⁵⁴ Los Angeles Times, April 23, 1974, p. 1 and 14.

⁵⁵ Waldichuk, M. Coastal marine pollution and fish. *Ocean Management*, v. 2, March, 1974: 1-60.

of its biological persistence. The addition of lead to gasoline is being reduced, and its use in paints is being discontinued. The recognition and discontinued or restricted use of other hazardous substances will further help abate ocean pollution.

Prevention of Accidental Pollution

Technology is also advancing in the area of pollution prevention from accidental causes. Significant improvements in offshore drilling technology and blowout prevention have been made since the Santa Barbara blowout in 1969. Drilling in the stormy weather of the North Sea has presented a challenge that technology has, in general, been able to meet. While there have been losses of drilling rigs, these have been reduced with equipment improvements and pollution has been minimal. Development of offshore single bouy mooring systems may help prevent tanker groundings and reduce the possibilities of a major spill.

Pollution Control and Containment

For most of the specific marine pollutants mentioned in this report, there are currently no means of removal once they have been introduced into the marine environment. For example, it would be highly impractical to attempt to remove chlorinated hydrocarbons when they are present in low concentrations even if a physical or chemical method were available. Even a spill of these materials producing a locally high concentration would be essentially impossible to recover or contain, and dispersion would be rapid. Heavy metals in solution present much the same problem and currently are not recoverable when dispersed in low concentrations in the marine environment. Concentrations would have to be much higher than are necessary to produce harmful toxic effects on the marine ecosystem before recovery of the metal ions would be possible.

Petroleum is one of the few marine pollutants that is possible to contain or control in part if action is taken promptly after the spill occurs. This is mainly because oil floats and does not become immediately dispersed into the marine environment. Since oil spills are a fairly frequent occurrence, occasionally are of very large size, and represent a real threat to coastal areas, extensive research has gone into oil spill control. Most of the research has involved combating oil spills by variations on one or more of the following basic techniques:

(1) mechanical containment—booms and air-bubble barriers are generally less useful in rough seas or the open ocean although a major research effort by the U.S. Coast Guard has resulted in an open ocean barrier system capable of being easily transported by air and dropped where needed within four hours after notification of a spill incident. The system is designed to be effective in 5-foot seas, 20 mile per hour winds, and currents up to 1 knot and can survive 10-foot seas with 40 mile per hour winds.

(2) physical sinking methods—sinking agents have been developed and were used with some success in the *Torrey Canyon* disaster; however the effect of sunken oil on the ecology of benthic communities on the ocean floor appears to be deleterious although it is not well understood.

(3) chemical dispersion—the most extensively used technique especially for open ocean spills although many chemical dispersants are also toxic to marine life. Ongoing research has produced nontoxic dispersants.

(4) physical absorption—dispersal over the spill of inexpensive absorption materials such as processed garbage or waste paper fiber are promising methods. Additional effort must be expended to collect the oil-soaked material, but once this is accomplished the oil also can be recovered.

(5) combustion—this method is generally only successful immediately after the spill occurs when the more volatile components are still present. In some cases combustion may not be desired if a well is to be recovered and sealed or a ship salvaged. Problems in sustaining combustion are under research.

(6) oil skimmers—these methods allow recovery of the oil but are generally limited to conditions of relatively calm water. Several varieties of oil skimmers have been developed.

(7) biological degradation—seeding an oil spill with special bacterial cultures that feed on petroleum hydrocarbons is still in experimental stages.

X. OVERVIEW

More than two-thirds of the surface of the globe is covered by water. Most of the nations of the world border on the ocean. Control of pollution of the global ocean is a common international problem inextricably intertwined with the principles of international law. International marine law is not unequivocally formulated but is continually evolving. The activities and legislative concerns previously described have contributed greatly to the general principles accepted by the coastal states. These principles form the basis of the discussions and proposals now being prepared for the forthcoming Third Law of the Sea Conference. The outcome of these discussions may well determine the controls and regulations for the future utilization of the oceans' resources. It can be strongly argued that for the best interests of the United States and the world community to be served, a thorough policy study should be made of the utilization of the oceans resources.

On December 19, 1973, Senate Resolution 222 was introduced by Senator Warren G. Magnuson and cosponsored by 61 other Senators and was adopted on February 19, 1974. The purpose of this resolution was to provide for an ocean policy study to (1) determine current and prospective national capabilities in the oceans consistent with long-range national goals, (2) determine the adequacy of current Federal ocean-related programs to meet national needs, (3) establish policies for the management and full utilization of all ocean resources, coastal zone management, and protection of the global ocean environment, and (4) assess proposals for national and international jurisdiction over the oceans. This study comes at a time when the need is pressing for national and international understanding of the effects of man's activities on the marine environment. The international community is already aware of the necessity of taking positive action to control marine pollution, an awareness frequently tempered by economic, social, military, and other considerations. At the Stockholm Conference on the Human Environment, the "common conviction" was stated that "States shall take all possible steps to prevent pollution of the seas by substances that are liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea," and further, that "States shall ensure that international organization plays a co-ordinated efficient and dynamic role for the protection and improvement of the environment." Both the Stockholm Conference and the IMCO Assembly have stressed the urgency of ending intentional pollution from vessels by the middle of the present decade.

Any control programs to abate marine pollution by legislative action will require a considerable amount of scientific backing to justify the costs and to achieve the desired results. However, despite the best scientific research that can be carried out, there must be an effective mechanism for enforcement of any legislation that may be produced

whether national or international. It is hoped that the Law of the Sea Conference will achieve the necessary mechanisms for pollution control. According to Dr. Michael Waldichuk, past chairman of GESAMP, "There is no question that the freedom of the seas for many of the activities that have been conducted without control for centuries will be considerably curtailed."⁵⁶

Advances in controlling marine pollution globally are most likely to proceed through the following types of development:

(1) International conventions, with clearly-defined powers, for controlling dumping at sea, ships, exploitation activities on the sea-bed and in the subsoil, continental runoff, atmospheric emissions, effluent discharges by pipeline, and other shore-based activities. Agreements for controlling such pollution sources can arise from (a) the 1972 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, (b) the 1973 IMCO Conference on Marine Pollution, and (c) the Third Law of the Sea Conference.

(2) Research and monitoring activities on marine pollution by many nations (a) coordinated by the IOC's International Coordination Group on the Global Investigation of Pollution in the Marine Environment and (b) conducted through the Mechanism of (i) the IOC/WMO Integrated Global Ocean Station System, and possibly (ii) the Global Atmospheric Research Program. Regional programs, such as those of ICES, can beneficially be included in any global network.

(3) Scientific review for the adequacy of research and monitoring programs by GESAMP and the advisory bodies of IOC, i.e., SCOR, ACMRR, ECOR, and ACOMR.

(4) United Nations Environmental Program financial support of national marine pollution research and monitoring programs by Member State funding agencies, and of international programs, conducted by U.N. agencies and by approved national teams.

(5) Collaboration of developed and developing nations at all levels of marine pollution research, monitoring and control to bring about an effective system of environmental management.⁵⁷

APPENDIX I

HARMFUL SUBSTANCES IN THE SEA

The following Table is reproduced from the Report of the Fifth Session of the Joint Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP), which was held in Vienna from 18—23 June, 1973. The Report was published in October 1973, and contains views by experts acting in their individual capacities which may not necessarily correspond with the views of the Sponsoring Agencies (IMCO, FAO, UNESCO, WMO, WHO, IAEA and UN) of GESAMP.

⁵⁶ Waldichuk, M. International approach to the marine pollution problem. *Ocean Management*, v. 1, Nov. 1973: 211-261.

⁵⁷ *Ibid.*, p. 248-249.

Major categories of marine pollution ¹					Relative importance of the different routes by which pollutants enter the sea ²							
Category	Harm to living resources	Hazards to human health	Hindrance to maritime activities	Reduction of amenities	Manu- facture	Domestic	Agricul- ture, forestry, public health— via runoff from land	Deliberate dumping from ships	Opera- tional discharge from ships and sub- marine pipelines	Acci- dental release from ships and sub- marine pipelines	Exploita- tion of seabed mineral resources	Transfer from atmos- phere
					and use of industrial products— disposal outfalls and rivers	wastes— via direct outfalls and rivers						
(1) Domestic sewage.....	3	3	1	3	0	3	0	2	1	0	0	0
(2) Pesticides:												
Organochlorine compounds.....	3	1	0	0	2	2	2	0	0	P	0	3
Organophosphorus compounds.....	2	0	0	0	2	1	2	0	0	P	0	3
Carbamate compounds.....	2	1	0	0	2	1	2	0	0	P	0	7
Herbicides.....	2	1	0	0	2	1	2	0	0	P	0	7
Mercurial compounds.....	3	3	0	0	2	3	3	0	0	P	0	7
Miscellaneous metal-based compounds.....	2	2	0	0	2	1	1	0	0	P	0	7
PCB's.....	3	1	0	0	3	0	0	0	0	P	7	3
(3) Inorganic wastes:												
Acids and alkalis.....	1	0	2	0	3	0	0	2	1	P	0	0
Nutrients and ammonia.....	1	0	0	1	2	0	0	0	0	0	0	2
Sulphite.....	1	1	0	0	3	0	0	3	0	0	0	0
Cyanide.....	1	0	0	1	3	2	0	0	0	0	0	0
Titanium dioxide wastes.....	1	3	0	0	3	2	0	0	0	P	0	0
Mercury.....	3	3	0	0	2	1	0	7	0	0	0	3
Lead.....	1	7	0	0	3	2	1	1	0	0	0	0
Copper.....	2	0	0	0	3	2	0	1	0	0	0	0
Zinc.....	2	0	0	0	3	0	0	1	0	0	0	0
Chromium.....	1	7	0	0	3	0	0	1	0	0	0	7
Cadmium.....	1	7	0	0	3	0	1	1	0	0	0	7
Arsenic.....	1	0	0	0	3	0	1	1	0	P	0	0
(4) Radioactive materials.....	0	2	0	3	3	1	0	1	3	2	1	P ³
(5) Oil.....	2	7	2	3	3	0	0	1	0	0	0	7
(6) Organic chemicals:												
Acetone.....	0	0	0	0	3	0	0	1	0	0	0	0
Acrylonitrile.....	2	2	1	3	3	0	0	P	P	P	0	7
Benzene.....	1	0	1	0	3	0	0	P	P	P	0	7
Carbon disulphide.....	3	2	2	2	3	0	0	P	0	P	0	0
Carbon tetrachloride.....	2	2	0	2	3	0	0	P	0	P	0	7
Chlorobenzene.....	3	2	0	1	3	0	0	0	0	P	0	7
Chloroform.....	1	0	0	1	3	0	0	0	0	P	0	7
Cresol.....	2	0	0	2	3	2	2	1	1	P	0	0

See footnotes at end of table.

HARMFUL SUBSTANCES IN THE SEA—Continued

Major categories of marine pollution ¹				Relative importance of the different routes by which pollutants enter the sea ²								
Category	Harm to living resources	Hazards to human health	Hindrance to maritime activities	Reduction of amenities	Manu- facture and use of industrial products—disposal via direct outfalls and rivers	Domestic wastes—disposal via direct outfalls and rivers	Agriculture, forestry, public health—via runoff from land	Deliberate dumping from ships	Operational discharge from ships in course of duties	Accidental release from ships and submarine pipelines	Exploitation of seabed mineral resources	Transfer from atmosphere
(6) Organic chemicals—Continued												
Chloroacetaldehyde.....	2	2	1	2	3	0	0	0	0	P	0	0
Cumene.....	1	0	1	0	3	0	0	0	1	P	0	?
o-Dichlorobenzene.....	3	0	0	1	3	0	0	0	0	P	0	?
p-Dichlorobenzene.....	3	0	0	1	3	2	0	0	0	P	0	?
Epichlorohydrin.....	2	1	0	2	3	0	0	0	0	P	0	0
Ethyl alcohol.....	0	0	0	0	3	0	0	0	0	0	0	?
Ethyl benzene.....	1	0	1	0	3	0	0	0	0	P	0	?
Ethylene dichloride.....	1	0	0	1	3	1	0	1	2	P	0	?
Ethylene glycol.....	0	0	0	0	2	2	0	0	1	0	0	0
Methyl alcohol.....	0	0	0	0	3	0	0	0	0	0	0	?
Methylene chloride.....	1	0	0	0	3	0	0	1	0	0	0	0
Naphthene acid.....	2	0	0	0	3	0	0	0	0	0	0	?
Phenol.....	2	0	0	1	3	1	1	1	1	P	0	0
Phthalate esters.....	7	0	0	0	3	2	0	0	1	P	0	?
Styrene monomer.....	1	0	0	2	3	0	0	0	1	P	0	0
Toluene.....	1	0	1	0	3	0	0	0	P	P	0	?
Toluene diisocyanate.....	2	2	0	3	3	0	0	0	0	P	0	?
Trichlorobenzenes.....	3	0	0	1	3	0	0	0	0	P	0	?
Vinyl acetate.....	1	0	0	2	3	0	0	0	0	0	0	?
Vinyl chloride.....	0	1	0	1	3	0	0	0	0	0	0	?
Xylene.....	1	0	1	0	3	0	0	P	P	P	0	?
(7) Organic wastes:												
Pulp and paper wastes.....	3	0	1	2	3	0	0	0	0	0	0	0
Other high-BOD wastes.....	2	0	0	3	3	2	2	0	P	P	0	0
(8) Military wastes:												
Military wastes.....	7	?	0	0	7	0	0	7	?	?	0	0
Heat.....	2	0	0	0	3	0	0	0	0	0	0	0
Detergents.....	7	0	0	0	3	3	1	0	1	0	1	0
Solid objects.....	1	0	0	2	2	1	0	3	3	1	1	0
Dredging spoil and inert wastes.....	2	0	1	2	2	0	1	3	0	0	3	0

¹ Key to symbols: 3—important; 2—significant; 1—slight; ?—uncertain; 0—negligible; P—potentially important.

² Indication for control: In relation to the prevention and control of marine pollution, the symbols would generally imply the following: 3—restrictive or preventive measures recommended; 2—restrictive

or preventive measures should be considered; ?—further investigations required pending which caution is recommended; 1—no special action indicated; 0—no special action indicated.

³ Dependent on extent of weapons testing.

⁴ Relates to polymer.

APPENDIX II

SELECTED INTERNATIONAL ORGANIZATIONS AND CONFERENCES DEALING WITH MARINE POLLUTION

Organization and/or conference	Sponsoring international agencies and/or other bodies	Remarks
IOC Working Group on Marine Pollution.	IOC (UNESCO).....	Met only once in August 1967, then disbanded.
Joint Group of Experts on Scientific Aspects of Marine Pollution (GESAMP).	IMCO/FAO/UNESCO/WMO/WHO/IAEA /U.N.	Met for 1st time March 1969 and annually since to review marine pollution problems of international significance on an interdisciplinary basis.
International Coordination Group (ICG) for the Global Investigation of Pollution in the Marine Environment (GIPME).	IOC (UNESCO).....	Met for 1st time in April 1973 to coordinate globally marine pollution investigations under IOC's LEPOR program.
Integrated Global Ocean Station System (IGOSS).	IOC (UNESCO) WMO.....	Proposal for a pilot oil pollution monitoring project made in 1973 at the 3d session of the Group of Experts on Oceanographic Research as it Relates to IGOS (IRES).
Commission on Monitoring.....	ICSU/SCOPE.....	Prepared a report on global environmental monitoring for the U.N. Conference on the Human Environment, Stockholm, June 1972.
ACMRR/ACOMR/ECOR/ICES/SCOR Working Group on Marine Pollution Research (SCOR Working Group 45).	ACMRR/ACOMR/ECOR/ICES/SCOR....	Met for the 1st time in London on March 30, 1973, to develop terms of reference and a plan of activities. Advises the ICG for GIPME on Marine Pollution research.
ACMRR/IABO Working Party on Biological Effects of Pollutants.	ACMRR/IABO.....	Organized in 1973 to undertake reviews of bioassays and other aspects of biological effects of marine pollution.
ACMRR/IABO—Working Party on Ecological Indices for Measuring the State of Living Resources as Affected by Environmental Stresses.	ACMRR/IABO.....	Designated by parent bodies (FAO) and other affiliated groups (ICG for GIPME, SCOR) for this function in 1973.
WHO Group on Sublethal Effects of Pollutants on Marine Organisms.	WHO.....	Proposed in 1972 to examine long-term effects on aquatic organisms of the same suite of pollutants to which man may be exposed. Study on flounders in Oslo Fjord is one of first such investigations.
International Biological Program—Marine Productivity (IBP/PM).	Coordinated by an international IBP committee. Supported by national science funding agencies, such as National Science Foundation in the United States and the National Research Council in Canada.	Organized as a 5-year program, 1965–70, but was extended in some cases to 1974. Perturbation of the marine environment by activities of man were considered in some of the studies of this program.
Man and the Biosphere (MAB) Program.	UNESCO coordination; supported by national science funding agencies.	Only peripheral interest in the marine environment, i.e., estuaries and coastal zones.
International Decade of Ocean Exploration (IDOE).	IOC (UNESCO). Funded by national science funding agencies such as NSF's office of IDOE in the United States.	A program spearheading national U.S. activities in marine environmental studies.
International Council for the Exploration of the Sea (ICES).	Member states.....	Highly effective organization, started in 1901, to deal mainly with hydrography and fisheries in the North Sea, Baltic Sea, and Northeast Atlantic. Now membership extended to United States and Canada and area of interest may cover whole North Atlantic.
Cooperative Investigation of the Mediterranean (CIM).	Coordinated by the Joint IOC/ICSEM/GFCM Group for Technical Coordination of CIM.	Pollution interests are only peripheral. Emphasis is on oceanography and renewable aquatic resources.
Global Atmospheric Research Program (GARP).	WMO/ICSU Organizing Committee..	Transport of pollutants through the atmosphere and transfer to the sea will probably be part of the GARP Atlantic Tropical Experiment (GATE) as well as other GARP exercises.
International Association on Water Pollution Research (IAWPR).	Organized and coordinated by an international governing body.	1st International Conference on Water Pollution Research, held in London, England, during 1962. Conferences held every 2 years with the 7th conference scheduled for Paris, France, in September 1974. Proceedings of conferences published in series "Advances in Water Pollution Research," IAWPR also publishes "Water Research," an international journal covering the field of water pollution research. Marine pollution research is 1 of 3 main interests.

SELECTED INTERNATIONAL ORGANIZATIONS AND CONFERENCES DEALING WITH MARINE POLLUTION—Con.

Organization and/or conference	Sponsoring international agencies and/or other bodies	Remarks
U.N. Conference on the Human Environment, Stockholm, Sweden, June 5-16, 1972.	U.N.-----	Adopted 26 principles and 109 recommendations for environmental action.
Intergovernmental Conference on the Convention on the Dumping of Wastes at Sea, London, England, Oct. 30-Nov. 10, 1972.	Participating states-----	Convention adopted on Nov. 13, 1972. Instruments of ratification deposited with United Kingdom Government until other arrangements formulated.
International Conference on Marine Pollution, London, England, Oct. 8-Nov. 2, 1973.	IMCO-----	New convention to be negotiated on control of pollution by oil and other noxious substances from ships, including ship-generated garbage and sewage.
International Law of the Sea Conference, Santiago, Chile, April-May 1974.	U.N.-----	New conventions to be negotiated on: Territorial seas; fishing zones; pollution control and exploration and exploitation of the seabed and ocean floor beyond the limits of national jurisdiction.
United Nations Environment Program (UNEP).	Member states provide contributions to the Environmental Fund. Administered by the U.N. Environmental Secretariat under the Governing Council.	Funds are already being allocated for environmental projects proposed by U.N. agencies, fulfilling components of the action plan.

Adopted from: Waldichuk, op. cit. p 240-243.

APPENDIX III

INTERNATIONAL CONVENTIONS AND OTHER AGREEMENTS FOR CONTROL OF MARINE POLLUTION

Conventions, treaties, protocols, regulations and standards	Pollutant	Responsible body	Remarks
International Convention for the Prevention of Pollution of the Sea by Oil, 1954.	Oil-----	United Kingdom until establishment of IMCO in 1958.	Ratified and in force 1958.
Amendments to the International Convention for the Prevention of Pollution of the Sea by Oil, 1962.	-----do-----	IMCO-----	Ratified and in force 1967.
Amendments to the International Convention for the Prevention of Pollution of the Sea by Oil, 1969.	-----do-----	IMCO-----	Signed but not yet enforced.
International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, 1969.	-----do-----	IMCO-----	Do.
International Convention on Civil Liability for Oil Pollution Damage, 1969.	-----do-----	IMCO-----	Do.
International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1971.	-----do-----	IMCO-----	Do.
Convention on the International Regulations for Preventing Collisions at Sea, 1972.	Oil and other substances---	IMCO-----	Not yet enforced.
Protocol Relating to Intervention on the High Seas in Cases of Marine Pollution by Substances Other Than Oil.	Other substances than oil---	IMCO-----	In preparation.
Convention on the Territorial Sea and Contiguous Zone, 1958.	Various-----	U.N.-----	Signed and ratified, 1964.
Convention on the High Seas, 1958.	Oil; wastes from exploration and exploitation of the seabed and its sub-soil; and radioactive wastes.	U.N.-----	Signed and ratified, 1962.
Convention on the Continental Shelf, 1958.	Any harmful agents-----	U.N.-----	Signed and ratified, 1964.
Convention on Fishing and Conservation of the Living Resources of the High Seas, 1958.	All deleterious substances---	U.N.-----	Signed but not in force.

INTERNATIONAL CONVENTIONS AND OTHER AGREEMENTS FOR CONTROL OF MARINE POLLUTION—Continued

Conventions, treaties, protocols, regulations and standards	Pollutant	Responsible body	Remarks
Convention on Third Party Liability in the Field of Nuclear Energy, 1960.	Radioactive materials	U.N., IAEA	Ratified.
Convention on the Liability of Operators of Nuclear Ships, 1962.	do	U.N., IAEA, IMCO	Signed but not yet in force.
Treaty Banning Nuclear Weapons Tests in the Atmosphere, in Outer Space and Underwater, 1963.	do	U.N., IAEA	Ratified and in force, 1964.
Treaty on the Prohibition of the Emplacement of Nuclear Weapons, and other Weapons of Mass Destruction on the Seabed and Ocean Floor and on the Subsoil Thereof, 1971.	do	U.N., IAEA	Signed. Prohibits emplacement of such weapons in waters beyond 12 miles from shore. In force 1972.
Regulations for the Safe Transport of Radioactive Materials.	do	IAEA	Adopted.
Do	do	IAEA	Do.
Basic Safety Standards for Radiation Protection.	do	IAEA	Do.
Standardization of Radioactive Waste Categories.	do	IAEA	Do.
Regulations for the Safe Transport of Radioactive Materials.	do	IAEA	Do.
Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft.	All wastes and other substances dumped at sea.	Instruments placed with Norwegian Government.	Signed; known as the "Oslo Convention." Involves countries of Northwestern Europe.
Convention for the Prevention of Marine Pollution by Dumping of Wastes and Other Matter.	All wastes and other matter dumped at sea.	Instruments placed with Government of Great Britain and Northern Ireland inter alia.	Signed but not ratified.

Adopted from: Waldichuk, op. cit. p. 226-227.

APPENDIX IV

RECOMMENDATIONS OF THE UN CONFERENCE ON THE HUMAN ENVIRONMENT, STOCKHOLM, SWEDEN, 5-16 JUNE 1972 (UNGA, MS, 1972), RELEVANT TO THE GLOBAL POLLUTION PROBLEM

"70. *It is recommended* that Governments be mindful of activities in which there is an appreciable risk of effects on climate, and to this end:

(a) Carefully evaluate the likelihood and magnitude of climatic effects and disseminate their findings to the maximum extent feasible before embarking on such activities;

(b) Consult fully other interested States when activities carrying a risk of such effects are being contemplated or implemented.

71. *It is recommended* that Governments use the best practicable means available to minimize the release to the environment of toxic or dangerous substances, especially if they are persistent substances such as heavy metals and organo-chlorine compounds, until it has been demonstrated that their release will not give rise to unacceptable risks or unless their use is essential to human health or food production, in which case appropriate control measures should be applied.

72. *It is recommended* that in establishing standards for pollutants of international significance, Governments take into account the relevant standards proposed by competent international organizations, and concert with other concerned Governments and the competent international organizations in planning and carrying out control programmes for pollutants distributed beyond the national jurisdiction from which they are released.

73. *It is recommended* that Governments actively support, and contribute to, international programmes to acquire knowledge for the assessment of pollutant sources, pathways, exposures and risks and that those Governments in a position to do so provide educational, technical and other forms of assistance to facilitate broad participation by countries regardless of their economic or technical advancement.

74. *It is recommended* that the Secretary-General, drawing on the resources of the entire UN system, and with the active support of Governments and appropriate scientific and other international bodies:

(a) Increase the capability of the UN system to provide awareness and advance warning of deleterious effects to human health and well-being from man-made pollutants;

(b) Provide this information in a form which is useful to policy-makers at the national level;

(c) Assist those Governments which desire to incorporate these and other environmental factors into national planning processes;

(d) Improve the international acceptability of procedures for testing pollutants and contaminants by:

i International division of labour in carrying out the large-scale testing programmes needed;

ii Development of international schedules of tests for evaluation of the environmental impact potential of specific contaminants or products. Such a schedule of tests should include consideration of both short-term and long-term effects of all kinds, and should be reviewed and brought up to date from time to time to take into account new knowledge and techniques;

iii Development and implementation of an international intercalibration programme for sampling and analytical techniques to permit more meaningful comparisons of national data;

iv Develop plans for an International Registry of Data on Chemicals in the Environment based on a collection of available scientific data on the environmental behaviour of the most important man-made chemicals and containing production figures of the potentially most harmful chemicals, together with their pathways from factory via utilization to ultimate disposal or recirculation.

75. *It is recommended* that, without reducing in any way their attention to non-radioactive pollutants, Governments should:

(a) Explore with IAEA and WHO the feasibility of developing a registry of releases to the biosphere of significant quantities of radioactive materials;

(b) Support and expand, under IAEA and appropriate international organizations, international co-operation on radioactive waste problems, including problems of mining and tailings and also including co-ordination of plans for the siting of fuel-reprocessing plants in relation to the siting of the ultimate storage areas, considering also the transportation problems.

76. *It is recommended:*

(a) That a major effort be undertaken to develop monitoring and both epidemiological and experimental research programmes providing data for early warning and prevention of the deleterious effects of the various environmental agents, acting singly or in combination, to which man is increasingly exposed, directly or indirectly, and for the assessment of their potential risks to human health, with particular regard to the risks of mutagenicity, teratogenicity and carcinogenicity. Such programmes should be guided and co-ordinated by WHO;

(b) That WHO co-ordinate the development and implementation of an appropriate international collection and dissemination system to correlate medical, environmental and family-history data;

(c) That Governments actively support and contribute to international programmes for research and development of guidelines concerning environmental factors in the work environment.

77. *It is recommended* that WHO, in collaboration with the relevant agencies, in the context of an approved programme, and with a view to suggesting necessary action, assist Governments, particularly those of developing countries, in undertaking co-ordinated programmes of monitoring of air and water and in establishing monitoring systems in areas where there may be a risk to health from pollution.

78. *It is recommended* that internationally co-ordinated programmes of research and monitoring of food contamination by chemical and biological agents be established and developed jointly by FAO and WHO, taking into account national programmes, and that the results of monitoring be expeditiously assembled, evaluated and made available so as to provide early information on rising trends of contamination and on levels that may be considered undesirable or may lead to unsafe human intakes.

79. *It is recommended:*

(a) That approximately 10 baseline stations be set up, with the consent of the States involved, in areas remote from all sources of pollution in order to monitor long-term global trends in atmospheric constituents and properties which may cause changes in meteorological properties, including climatic changes;

(b) That a much larger network of not less than 100 stations be set up, with the consent of the States involved, for monitoring properties and constituents of the atmosphere on a regional basis and especially changes in the distribution and concentration of contaminants;

(c) That these programmes be guided and co-ordinated by WMO;

(d) That WMO, in co-operation with ICSU, continue to carry out the Global Atmospheric Research Programme, and if necessary establish new programmes to understand better the general circulation of the atmosphere and the causes of climatic changes whether these causes are natural or the result of man's activities.

81. *It is recommended* that WHO, together with the international organizations concerned, continue to study and establish primary standards for the protection of the human organism, especially from pollutants that are common to air, water and food, as a basis for the establishment of derived working limits.

82. *It is recommended* that increased support be given to the Codex Alimentarius Commission to develop international standards for pollutants in food and a code of ethics for international food trade, and that the capabilities of FAO and WHO to assist materially and to guide developing countries in the field of food control be increased.

83. *It is recommended* that the appropriate UN agencies develop agreed procedures for setting derived working limits for common air and water contaminants.

84. *It is recommended* that Governments make available, through the International Referral System established in pursuance of recommendation 101 of this Conference, such information as may be requested on their pollution research and pollution control activities, including legislative and administrative arrangements, research on more efficient pollution control technology, and cost-benefit methodology.

85. *It is recommended* that any mechanism for co-ordinating and stimulating the actions of the different UN organs in connection with environmental problems include among its functions:

(a) Development of an internationally accepted procedure for the identification of pollutants of international significance and for the definition of the degree and scope of international concern;

(b) Consideration of the appointment of appropriate inter-governmental expert bodies to assess quantitatively the exposures, risks, pathways and sources of pollutants of international significance;

(c) Review and co-ordination of international co-operation for pollution control, ensuring in particular that needed measures shall be taken and that measures taken in regard to various media and sources shall be consistent with one another;

(d) Examination of the needs for technical assistance to Governments in the study of pollution problems, in particular those involving international distribution of pollutants;

(e) Encouragement of the establishment of consultation mechanisms for speedy implementation of concerted abatement programmes with particular emphasis on regional activities.

86. *It is recommended* that Governments, with the assistance and guidance of appropriate UN bodies, in particular the Joint Group of Experts on the Scientific Aspects of Marine Pollution:

(a) Accept and implement available instruments on the control of the maritime sources of marine pollution;

(b) Ensure that the provisions of such instruments are complied with by ships flying their flags and by ships operating in areas under their jurisdiction and that adequate provisions are made for reviewing the effectiveness of, and revising, existing and proposed international measures for control marine pollution;

(c) Ensure that ocean dumping by their nationals anywhere, or by any person in areas under their jurisdiction, is controlled and that Governments shall continue to work towards the completion of, and bringing into force as soon as possible of, an over-all instrument for the control of ocean dumping as well as needed regional agreements within the framework of this instrument, in particular for enclosed and semi-enclosed seas, which are more at risk from pollution;

(d) Refer the draft articles and annexes contained in the reports of the inter-governmental meetings at Reykjavik, Iceland, in April 1972 and in London in May 1972 to the UN Committee on the Peaceful Uses of the Seabed and the Ocean Floor beyond the Limits of National Jurisdiction at its session in July/August 1972 for information and comments and to a conference of governments to be convened by the Government of the United Kingdom of Great Britain and Northern Ireland in consultation with the Secretary-General before November 1972 for further consideration, with a view to opening the proposed convention for signature at a place to be decided by that conference, preferably before the end of 1972;

(e) Participate fully in the 1973 (IMCO) Conference on Marine Pollution and the UN Conference on the Law of the Sea scheduled to begin in 1973, as well as in regional efforts, with a view to bringing all significant sources of pollution within the marine environment, including radioactive pollution from nuclear surface ships and submarines, and in particular in enclosed and semi-enclosed seas, under appropriate controls and particularly to complete elimination of deliberate pollution by oil from ships, with a goal of achieving this by the middle of the present decade;

(f) Strengthen national controls over land-based sources of marine pollution, in particular in enclosed and semi-enclosed seas, and recognize that, in some circumstances, the discharge of residual heat from nuclear and other power-stations may constitute a potential hazard to marine ecosystems.

87. *It is recommended* that Governments:

(a) Support national research and monitoring efforts that contribute to agreed international programmes for research and monitoring in the marine environment, in particular the Global Investigation of Pollution in the Marine Environment and the Integrated Global Ocean Station System.

(b) Provide to the UN, FAO and UNCTAD, as appropriate to the data-gathering activities of each, statistics on the production and use of toxic or dangerous substances that are potential marine pollutants, especially if they are persistent

(c) Expand their support to components of the UN system concerned with research and monitoring in the marine environment and adopt the measures required to improve the constitutional, financial and operational basis under which the IOC is at present operating so as to make it an effective joint mechanism for the Governments and UN organizations concerned (UNESCO, FAO, WMO, IMCO, ESA) and in order that it may be able to take on additional responsibilities and co-ordination of scientific programmes and services.

88. *It is recommended* that the Secretary-General, together with the sponsoring agencies, make it possible for the Joint Group of Experts on the Scientific Aspects of Marine Pollution:

(a) To re-examine annually, and revise as required, its "Review of Harmful Chemical Substances", with a view to elaborating further its assessment of sources, pathways and resulting risks of marine pollutants;

(b) To assemble, having regard to other work in progress, scientific data and to provide advice on scientific aspects of marine pollution, especially those of an interdisciplinary nature.

89. *It is recommended* that the Secretary-General ensure:

(a) That mechanisms for combining world statistics on mining, production, processing, transport and use of potential marine pollutants shall be developed along with methods for identifying high-priority marine pollutants based in part on such data;

(b) That the Joint Group of Experts on the Scientific Aspects of Marine Pollution, in consultation with other expert groups, propose guidelines for test programmes to evaluate toxicity for potential marine pollutants;

(c) That FAO, WHO, IOC and IAEA encourage studies of the effects of high-priority marine pollutants on man and other organisms with appropriate emphasis on chronic, low-level exposures;

(d) That IOC, with FAO and WHO explore the possibility of establishing an international institute for tropical marine studies, which would undertake training as well as research.

90. *It is recommended* that IOC, jointly with WMO and, as appropriate, in co-operation with other interested inter-governmental bodies promote the monitoring of marine pollution, preferably within the framework of the Integrated Global Ocean Station System, as well as the development of methods for monitoring high-priority marine pollutants in the water, sediments and organisms, with advice from the Joint Group of Experts on the Scientific Aspects of Marine Pollution on intercomparability of methodologies.

91. *It is recommended* that IOC:

(a) Ensure that provision shall be made in international marine research, monitoring and related activities for the exchange, dissemination, and referral to sources of data and information on baselines and on marine pollution and that attention shall be paid to the special needs of developing countries;

(b) Give full consideration, with FAO, WMO, the IMCO, WHO, IAEA, IHO and ICES and other interested and relevant organizations, to the strengthening of on-going marine and related data and information exchange and dissemination activities;

- (c) Support the concept of development of an interdisciplinary and inter-organizational system primarily involving centres already in existence;
- (d) Initiate an interdisciplinary marine pollution data and scientific information referral capability.

92. *It is recommended:*

- (a) That Governments collectively endorse the principles set forth in paragraph 197 of Conference document A/CONF. 48/8 as guiding concepts for the UN Conference on the Law of the Sea and the Marine Pollution Conference scheduled to be held in 1973 and also the statement of objectives agreed on at the second session of the Inter-Governmental Working Group on Marine Pollution, which reads as follows:

The marine environment and all the living organisms which it supports are of vital importance to humanity, and all people have an interest in assuring that this environment is so managed that its quality and resources are not impaired. This applies especially to coastal area resources. The capacity of the sea to assimilate wastes and render them harmless and its ability to regenerate natural resources are not unlimited. Proper management is required and measures to prevent and control marine pollution must be regarded as an essential element in this management of the oceans and seas and their natural resources.; and that, in respect of the particular interest of coastal States in the marine environment and recognizing that the resolution of this question is a matter for consideration at the Conference on the Law of the Sea, they take note of the principles on the rights of coastal States discussed but neither endorsed nor rejected at the second session of the Inter-Governmental Working Group on Marine Pollution and refer those principles to the 1973 IMCO Conference for information and to the 1973 Conference on the Law of the Sea for such action as may be appropriate;

- (b) That Governments take early action to adopt effective national measures for the control of all significant sources of marine pollution, including land-based sources, and concert and co-ordinate their actions regionally and where appropriate on a wider international basis;

- (c) That the Secretary-General, in co-operation with appropriate international organizations, endeavours to provide guidelines which Governments might wish to take into account when developing such measures.

93. *It is recommended* that any mechanism for co-ordinating and stimulating the actions of the different United Nations organs in connection with environmental problems include among its functions over-all responsibility for ensuring that needed advice on marine pollution problems shall be provided to Governments.

94. *It is recommended* that the Secretary-General, with the co-operation of UN bodies, takes steps to secure additional financial support to those training and other programmes of assistance that contribute to increasing the capacity of developing countries to participate in international marine research, monitoring and pollution-control programmes."

"101. *It is recommended* that the Secretary-General takes the appropriate steps, including the convening of an expert meeting, to organize an International Referral Service for sources of environmental information, taking into account the model described in paragraphs 129 to 136 of the report on educational, informational, social and cultural aspects of environmental issues (A/CONF. 48/9), in order to assist in the successful implementation of all the recommendations made in respect of those aspects of environmental issues and of most of the recommendations envisaged in the other substantive subject areas covered in the Conference agenda."

Appendix V

CONVENTION ON THE PREVENTION OF MARINE POLLUTION BY DUMPING
OF WASTES AND OTHER MATTER

The Contracting Parties to this Convention,

Recognizing that the marine environment and the living organisms which it supports are of vital importance to humanity, and all people have an interest in assuring that it is so managed that its quality and resources are not impaired;

Recognizing that the capacity of the sea to assimilate wastes and render them harmless, and its ability to regenerate natural resources, is not unlimited;

Recognizing that States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction;

Recalling Resolution 2749 (XXV) of the General Assembly of the United Nations on the principles governing the sea-bed and the ocean floor and the subsoil thereof, beyond the limits of national jurisdiction;

Noting that marine pollution originates in many sources, such as dumping and discharges through the atmosphere, rivers, estuaries, outfalls and pipelines, and that it is important that States use the best practicable means to prevent such pollution and develop products and processes which will reduce the amount of harmful wastes to be disposed of;

Being convinced that international action to control the pollution of the sea by dumping can and must be taken without delay but that this action should not preclude discussion of measures to control other sources of marine pollution as soon as possible; and

Wishing to improve protection of the marine environment by encouraging States with a common interest in particular geographical areas to enter into appropriate agreements supplementary to this Convention;

Have agreed as follows:

ARTICLE I

Contracting Parties shall individually and collectively promote the effective control of all sources of pollution of the marine environment, and pledge themselves especially to take all practicable steps to prevent the pollution of the sea by the dumping of waste and other matter that is liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea.

ARTICLE II

Contracting Parties shall, as provided for in the following Articles, take effective measures individually, according to their scientific, technical and economic capabilities, and collectively, to prevent marine pollution caused by dumping and shall harmonize their policies in this regard.

ARTICLE III

For the purposes of this Convention:

1. (a) "Dumping" means:
 - (i) any deliberate disposal at sea of wastes or other matter from vessels, aircraft, platforms or other man-made structures at sea;
 - (ii) any deliberate disposal at sea of vessels, aircraft, platforms or other man-made structures at sea.
- (b) "Dumping" does not include:
 - (i) the disposal at sea of wastes or other matter incidental to, or derived from the normal operations of vessels, aircraft, platforms or other man-made structures at sea and their equipment, other than wastes or other matter transported by or to vessels, aircraft, platforms or other man-made structures at sea, operating for the purpose of disposal of such matter or derived from the treatment of such wastes or other matter on such vessels, aircraft, platforms or structures;
 - (ii) placement of matter for a purpose other than the mere disposal thereof, provided that such placement is not contrary to the aims of this Convention.
- (c) The disposal of wastes or other matter directly arising from, or related to the exploration, exploitation and associated off-shore processing of sea-bed mineral resources will not be covered by the provisions of this Convention.
2. "Vessels and aircraft" means waterborne or airborne craft of any type whatsoever. This expression includes air cushioned craft and floating craft, whether self-propelled or not.
3. "Sea" means all marine waters other than the internal waters of States.
4. "Wastes or other matter" means material and substance of any kind, form or description.
5. "Special permit" means permission granted specifically on application in advance and in accordance with Annex II and Annex III.
6. "General permit" means permission granted in advance and in accordance with Annex III.
7. "The Organisation" means the Organisation designated by the Contracting Parties in accordance with Article XIV (2).

ARTICLE IV

1. In accordance with the provisions of this Convention Contracting Parties shall prohibit the dumping of any wastes or other matter in whatever form or condition except as otherwise specified below:

- (a) the dumping of wastes or other matter listed in Annex I is prohibited;

(b) the dumping of wastes or other matter listed in Annex II requires a prior special permit;

(c) the dumping of all other wastes or matter requires a prior general permit.

2. Any permit shall be issued only after careful consideration of all the factors set forth in Annex III, including prior studies of the characteristics of the dumping site, as set forth in Sections B and C of that Annex.

3. No provision of this Convention is to be interpreted as preventing a Contracting Party from prohibiting, insofar as that Party is concerned, the dumping of wastes or other matter not mentioned in Annex I. That Party shall notify such measures to the Organisation.

ARTICLE V

1. The provisions of Article IV shall not apply when it is necessary to secure the safety of human life or of vessels, aircraft, platforms or other man-made structures at sea in cases of *force majeure* caused by stress of weather, or in any case which constitutes a danger to human life or a real threat to vessels, aircraft, platforms or other man-made structures at sea, if dumping appears to be the only way of averting the threat and if there is every probability that the damage consequent upon such dumping will be less than would otherwise occur. Such dumping shall be so conducted as to minimise the likelihood of damage to human or marine life and shall be reported forthwith to the Organisation.

2. A Contracting Party may issue a special permit as an exception to Article IV(1)(a), in emergencies, posing unacceptable risk relating to human health and admitting no other feasible solution. Before doing so the Party shall consult any other country or countries that are likely to be affected and the Organisation which, after consulting other Parties, and international organisations as appropriate, shall in accordance with Article XIV promptly recommend to the Party the most appropriate procedures to adopt. The Party shall follow these recommendations to the maximum extent feasible consistent with the time within which action must be taken and with the general obligation to avoid damage to the marine environment and shall inform the Organisation of the action it takes. The Parties pledge themselves to assist one another in such situations.

3. Any Contracting Party may waive its rights under paragraph (2) at the time of, or subsequent to ratification of, or accession to this Convention.

ARTICLE VI

1. Each Contracting Party shall designate an appropriate authority or authorities to:

(a) issue special permits which shall be required prior to, and for, the dumping of matter listed in Annex II and in the circumstances provided for in Article V(2);

(b) issue general permits which shall be required prior to, and for, the dumping of all other matter;

(c) keep records of the nature and quantities of all matter permitted to be dumped and the location, time and method of dumping;

(d) monitor individually, or in collaboration with other Parties and competent International Organisations, the condition of the seas for the purposes of this Convention.

2. The appropriate authority or authorities of a Contracting Party shall issue prior special or general permits in accordance with paragraph (1) in respect of matter intended for dumping:

(a) loaded in its territory;

(b) loaded by a vessel or aircraft registered in its territory or flying its flag, when the loading occurs in the territory of a State not party to this Convention.

3. In issuing permits under sub-paragraphs (1) (a) and (b) above, the appropriate authority or authorities shall comply with Annex III, together with such additional criteria, measures and requirements as they may consider relevant.

4. Each Contracting Party, directly or through a Secretariat established under a regional agreement, shall report to the Organisation, and where appropriate to other Parties, the information specified in sub-paragraphs (c) and (d) of paragraph (1) above, and the criteria, measures and requirements it adopts in accordance with paragraph (3) above. The procedure to be followed and the nature of such reports shall be agreed by the Parties in consultation.

ARTICLE VII

1. Each Contracting Party shall apply the measures required to implement the present Convention to all:

(a) vessels and aircraft registered in its territory or flying its flag;

(b) vessels and aircraft loading in its territory or territorial seas matter which is to be dumped;

(c) vessels and aircraft and fixed or floating platforms under its jurisdiction believed to be engaged in dumping.

2. Each Party shall take in its territory appropriate measures to prevent and punish conduct in contravention of the provisions of this Convention.

3. The Parties agree to co-operate in the development of procedures for the effective application of this Convention particularly on the high seas, including procedures for the reporting of vessels and aircraft observed dumping in contravention of the Convention.

4. This Convention shall not apply to those vessels and aircraft entitled to sovereign immunity under international law. However each Party shall ensure by the adoption of appropriate measures that such vessels and aircraft owned or operated by it act in a manner consistent with the object and purpose of this Convention, and shall inform the Organisation accordingly.

5. Nothing in this Convention shall affect the right of each Party to adopt other measures, in accordance with the principles of international law, to prevent dumping at sea.

ARTICLE VIII

In order to further the objectives of this Convention, the Contracting Parties with common interests to protect in the marine environ-

ment in a given geographical area shall endeavour, taking into account characteristic regional features, to enter into regional agreements consistent with this Convention for the prevention of pollution, especially by dumping. The Contracting Parties to the present Convention shall endeavour to act consistently with the objectives and provisions of such regional agreements, which shall be notified to them by the Organisation. Contracting Parties shall seek to co-operate with the parties to regional agreements in order to develop harmonized procedures to be followed by Contracting Parties to the different conventions concerned. Special attention shall be given to co-operation in the field of monitoring and scientific research.

ARTICLE IX

The Contracting Parties shall promote, through collaboration within the Organisation and other international bodies, support for those Parties which request it for:

- (a) the training of scientific and technical personnel;
 - (b) the supply of necessary equipment and facilities for research and monitoring;
 - (c) the disposal and treatment of waste and other measures to prevent or mitigate pollution caused by dumping;
- preferably within the countries concerned, so furthering the aims and purposes of this Convention.

ARTICLE X

In accordance with the principles of international law regarding State responsibility for damage to the environment of other States or to any other area of the environment, caused by dumping of wastes and other matter of all kinds, the Contracting Parties undertake to develop procedures for the assessment of liability and the settlement of disputes regarding dumping.

ARTICLE XI

The Contracting Parties shall at their first consultative meeting consider procedures for the settlement of disputes concerning the interpretation and application of this Convention.

ARTICLE XII

The Contracting Parties pledge themselves to promote, within the competent specialised agencies and other international bodies, measures to protect the marine environment against pollution caused by:

- (a) hydrocarbons, including oil, and their wastes;
- (b) other noxious or hazardous matter transported by vessels for purposes other than dumping;
- (c) wastes generated in the course of operation of vessels, aircraft, platforms and other man-made structures at sea;
- (d) radio-active pollutants from all sources, including vessels;
- (e) agents of chemical and biological warfare;

(f) wastes or other matter directly arising from, or related to the exploration, exploitation and associated off-shore processing of sea-bed mineral resources.

The Parties will also promote, within the appropriate international organisation, the codification of signals to be used by vessels engaged in dumping.

ARTICLE XIII

Nothing in this Convention shall prejudice the codification and development of the law of the sea by the United Nations Conference on the Law of the Sea convened pursuant to Resolution 2750 C (XXV) of the General Assembly of the United Nations nor the present or future claims and legal views of any State concerning the law of the sea and the nature and extent of coastal and flag State jurisdiction. The Contracting Parties agree to consult at a meeting to be convened by the Organisation after the Law of the Sea Conference, and in any case not later than 1976, with a view to defining the nature and extent of the right and the responsibility of a coastal State to apply the Convention in a zone adjacent to its coast.

ARTICLE XIV

1. The Government of the United Kingdom of Great Britain and Northern Ireland as a depositary shall call a meeting of the Contracting Parties not later than three months after the entry into force of this Convention to decide on organisational matters.

2. The Contracting Parties shall designate a competent Organisation existing at the time of that meeting to be responsible for Secretariat duties in relation to this Convention. Any Party to this Convention not being a member of this Organisation shall make an appropriate contribution to the expenses incurred by the Organisation in performing these duties.

3. The Secretariat duties of the Organisation shall include:

(a) the convening of consultative meetings of the Contracting Parties not less frequently than once every two years and of special meetings of the Parties at any time on the request of two-thirds of the Parties;

(b) preparing and assisting, in consultation with the Contracting Parties and appropriate International Organisations, in the development and implementation of procedures referred to in sub-paragraph (4) (e) of this Article;

(c) considering enquiries by, and information from the Contracting Parties, consulting with them and with the appropriate International Organisations, and providing recommendations to the Parties on questions related to, but not specifically covered by the Convention;

(d) conveying to the Parties concerned all notifications received by the Organisation in accordance with Articles IV(3), V (1) and (2), VI(4), XV, XX and XXI.

Prior to the designation of the Organisation these functions shall, as necessary, be performed by the depositary, who for this purpose shall be the Government of the United Kingdom of Great Britain and Northern Ireland.

4. Consultative or special meetings of the Contracting Parties shall keep under continuing review the implementation of this Convention and may, *inter alia*:

(a) review and adopt amendments to this Convention and its Annexes in accordance with Article XV;

(b) invite the appropriate scientific body or bodies to collaborate with and to advise the Parties or the Organisation on any scientific or technical aspect relevant to this Convention, including particularly the content of the Annexes;

(c) receive and consider reports made pursuant to Article VI(4);

(d) promote co-operation with and between regional organisations concerned with the prevention of marine pollution;

(e) develop or adopt, in consultation with appropriate International Organisations, procedures referred to in Article V(2), including basic criteria for determining exceptional and emergency situations, and procedures for consultative advice and the safe disposal of matter in such circumstances, including the designation of appropriate dumping areas, and recommend accordingly;

(f) Consider any additional action that may be required.

5. The Contracting Parties at their first consultative meeting shall establish rules of procedure as necessary.

ARTICLE XV

1. (a) At meetings of the Contracting Parties called in accordance with Article XIV amendments to this Convention may be adopted by a two-thirds majority of those present. An amendment shall enter into force for the Parties which have accepted it on the sixtieth day after two-thirds of the Parties shall have deposited an instrument of acceptance of the amendment with the Organisation. Thereafter the amendment shall enter into force for any other Party 30 days after that Party deposits its instrument of acceptance of the amendment.

(b) The Organisation shall inform all Contracting Parties of any request made for a special meeting under Article XIV and of any amendments adopted at meetings of the Parties and of the date on which each such amendment enters into force for each Party.

2. Amendments to the Annexes will be based on scientific or technical considerations. Amendments to the Annexes approved by a two-thirds majority of those present at a meeting called in accordance with Article XIV shall enter into force for each Contracting Party immediately on notification of its acceptance to the Organisation and 100 days after approval by the meeting for all other Parties except for those which before the end of the 100 days make a declaration that they are not able to accept the amendment at that time. Parties should endeavour to signify their acceptance of an amendment to the Organisation as soon as possible after approval at a meeting. A Party may at any time substitute an acceptance for a previous declaration of objection and the amendment previously objected to shall thereupon enter into force for that Party.

3. An acceptance or declaration of objection under this Article shall be made by the deposit of an instrument with the Organisation. The

Organisation shall notify all Contracting Parties of the receipt of such instruments.

4. Prior to the designation of the Organisation, the Secretarial functions herein attributed to it, shall be performed temporarily by the Government of the United Kingdom of Great Britain and Northern Ireland, as one of the depositaries of this Convention.

ARTICLE XVI

This Convention shall be open for signature by any State at London, Mexico City, Moscow and Washington from 29 December 1972 until 31 December 1973.

ARTICLE XVII

This Convention shall be subject to ratification. The instruments of ratification shall be deposited with the Governments of Mexico, the Union of Soviet Socialist Republics, the United Kingdom of Great Britain and Northern Ireland, and the United States of America.

ARTICLE XVIII

After 31 December 1973, this Convention shall be open for accession by any State. The instruments of accession shall be deposited with the Governments of Mexico, the Union of Soviet Socialist Republics, the United Kingdom of Great Britain and Northern Ireland, and the United States of America.

ARTICLE XIX

1. This Convention shall enter into force on the thirtieth day following the date of deposit of the fifteenth instrument of ratification or accession.

2. For each Contracting Party ratifying or acceding to the Convention after the deposit of the fifteenth instrument of ratification or accession, the Convention shall enter into force on the thirtieth day after deposit by such Party of its instrument of ratification or accession.

ARTICLE XX

The depositaries shall inform Contracting Parties:

(a) of signatures to this Convention and of the deposit of instruments of ratification, accession or withdrawal, in accordance with Articles XVI, XVII, XVIII and XXI, and

(b) of the date on which this Convention will enter into force, in accordance with Article XIX.

ARTICLE XXI

Any Contracting Party may withdraw from this Convention by giving six months' notice in writing to a depositary, which shall promptly inform all Parties of such notice.

ARTICLE XXII

The original of this Convention of which the English, French, Russian and Spanish texts are equally authentic, shall be deposited with

the Governments of Mexico, the Union of Soviet Socialist Republics, the United Kingdom of Great Britain and Northern Ireland and the United States of America who shall send certified copies thereof to all States.

IN WITNESS WHEREOF the undersigned Plenipotentiaries, being duly authorised thereto by their respective Governments have signed the present Convention.

DONE in quadruplicate at London, Mexico City, Moscow and Washington, this twenty-ninth day of December, 1972.

ANNEXES

ANNEX I

1. Organohalogen compounds.
2. Mercury and mercury compounds.
3. Cadmium and cadmium compounds.
4. Persistent plastics and other persistent synthetic materials, for example, netting and ropes, which may float or may remain in suspension in the sea in such a manner as to interfere materially with fishing, navigation or other legitimate uses of the sea.
5. Crude oil, fuel oil, heavy diesel oil, and lubricating oils, hydraulic fluids, and any mixtures containing any of these, taken on board for the purpose of dumping.
6. High-level radio-active wastes or other high-level radio-active matter, defined on public health, biological or other grounds, by the competent international body in this field, at present the International Atomic Energy Agency, as unsuitable for dumping at sea.
7. Materials in whatever form (e.g. solids, liquids, semi-liquids, gases or in a living state) produced for biological and chemical warfare.
8. The preceding paragraphs of this Annex do not apply to substances which are rapidly rendered harmless by physical, chemical or biological processes in the sea provided they do not:
 - (i) make edible marine organisms unpalatable, or
 - (ii) endanger human health or that of domestic animals.

The consultative procedure provided for under Article XIV should be followed by a Party if there is doubt about the harmlessness of the substance.

9. This Annex does not apply to wastes or other materials (e.g. sewage sludges and dredged spoils) containing the matters referred to in paragraphs 1-5 above as trace contaminants. Such wastes shall be subject to the provisions of Annexes II and III as appropriate.

ANNEX II

The following substances and materials requiring special care are listed for the purposes of Article VI(1) (a).

A Wastes containing significant amounts of the matters listed below :

arsenic	} and their compounds
lead	
copper	
zinc	
organosilicon compounds	
cyanides	
fluorides	
pesticides and their by-products not covered in Annex I.	

B. In the issue of permits for the dumping of large quantities of acids and alkalis, consideration shall be given to the possible presence in such wastes of the substances listed in paragraph A and to the following additional substances:

beryllium	} and their compounds
chromium	
nickel	
vanadium	

C. Containers, scrap metal and other bulky wastes liable to sink to the sea bottom which may present a serious obstacle to fishing or navigation.

D. Radio-active wastes or other radio-active matter not included in Annex I. In the issue of permits for the dumping of this matter, the Contracting Parties should take full account of the recommendations of the competent international body in this field, at present the International Atomic Energy Agency.

ANNEX III

Provisions to be considered in establishing criteria governing the issue of permits for the dumping of matter at sea, taking into account Article IV (2), include:

A. Characteristics and composition of the matter

1. Total amount and average composition of matter dumped (e.g. per year).
2. Form, e.g. solid, sludge, liquid, or gaseous.
3. Properties: physical (e.g. solubility and density), chemical and biochemical (e.g. oxygen demand, nutrients) and biological (e.g. presence of viruses, bacteria, yeasts, parasites).
4. Toxicity.
5. Persistence: physical, chemical and biological.
6. Accumulation and biotransformation in biological materials or sediments.
7. Susceptibility to physical, chemical and biochemical changes and interaction in the aquatic environment with other dissolved organic and inorganic materials.
8. Probability of production of taints or other changes reducing marketability or resources (fish, shellfish, etc.).

B. Characteristics of dumping site and method of deposit

1. Location (e.g. co-ordinates of the dumping area, depth and distance from the coast), location in relation to other areas (e.g. amenity areas, spawning, nursery and fishing areas and exploitable resources).
2. Rate of disposal per specific period (e.g. quantity per day, per week, per month).
3. Methods of packaging and containment, if any.
4. Initial dilution achieved by proposed method of release.
5. Dispersal characteristics (e.g. effects of currents, tides and wind on horizontal transport and vertical mixing).
6. Water characteristics (e.g. temperature, pH, salinity, stratification, oxygen indices of pollution-dissolved oxygen (DO), chemical

oxygen demand (COD), biochemical oxygen demand (BOD)—nitrogen present in organic and mineral form including ammonia, suspended matter, other nutrients and productivity).

7. Bottom characteristics (e.g. topography, geochemical and geological characteristics and biological productivity).

8. Existence and effects of other dumpings which have been made in the dumping area (e.g. heavy metal background reading and organic carbon content).

9. In issuing a permit for dumping, Contracting Parties should consider whether an adequate scientific basis exists for assessing the consequences of such dumping, as outlined in this Annex, taking into account seasonal variations.

C. General considerations and conditions

1. Possible effects on amenities (e.g. presence of floating or stranded material, turbidity, objectionable odour discolouration and foaming).

2. Possible effects on marine life, fish and shellfish culture, fish stocks and fisheries, seaweed harvesting and culture.

3. Possible effects on other uses of the sea (e.g. impairment of water quality for industrial use, underwater corrosion of structures, interference with ship operations from floating materials, interference with fishing or navigation through deposit of waste or solid objects on the sea floor and protection of areas of special importance for scientific or conservation purposes).

4. The practical availability of alternative land-based methods of treatment, disposal or elimination, or of treatment to render the matter less harmful for dumping at sea.

Appendix VI

INTERNATIONAL CONVENTION FOR THE PREVENTION OF POLLUTION FROM SHIPS, 1973

Text of the Articles of the Convention as adopted by the Conference

The parties to the Convention, being conscious of the need to preserve the human environment in general and the marine environment in particular,

Recognizing that deliberate, negligent or accidental release of oil and other harmful substances from ships constitutes a serious source of pollution,

Recognizing also the importance of the International Convention for the Prevention of Pollution of the Sea by Oil, 1954, as being the first multilateral instrument to be concluded with the prime objective of protecting the environment, and appreciating the significant contribution which that Convention has made in preserving the seas and coastal environment from pollution,

Desiring to achieve the complete elimination of intentional pollution of the marine environment by oil and other harmful substances and the minimization of accidental discharge of such substances,

Considering that this object may best be achieved by establishing rules not limited to oil pollution having a universal purport,

Have agreed as follows:

Article 1

GENERAL OBLIGATIONS UNDER THE CONVENTION

(1) The Parties to the Convention undertake to give effect to the provisions of the present Convention and those Annexes thereof by which they are bound, in order to prevent the pollution of the marine environment by the discharge of harmful substances or effluents containing such substances in contravention of the Convention.

(2) Unless expressly provided otherwise, a reference to the present Convention constitutes at the same time a reference to its Protocols and to the Annexes.

Article 2

DEFINITIONS

For the purposes of the present Convention, unless expressly provided otherwise:

(1) "Regulations" means the Regulations contained in the Annexes to the present Convention.

(2) "Harmful substance" means any substance which, if introduced into the sea, is liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea, and includes any substance subject to control by the present Convention.

(3) (a) "Discharge", in relation to harmful substances or effluents containing such substances, means any release howsoever caused from a ship and includes any escape, disposal, spilling, leaking, pumping, emitting or emptying.

(b) "Discharge" does not include:

(i) dumping within the meaning of the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter done at London on 13 November 1972;

(ii) release of harmful substances directly arising from the exploration, exploitation and associated off-shore processing of sea-bed mineral resources; or

(iii) release of harmful substances for purposes of legitimate scientific research into pollution abatement or control.

(4) "Ship" means a vessel of any type whatsoever operating in the marine environment and includes hydrofoil boats, air-cushion vehicles, submersibles, floating craft and fixed or floating platforms.

(5) "Administration" means the Government of the State under whose authority the ship is operating. With respect to a ship entitled to fly a flag of any State, the Administration is the Government of that State. With respect to fixed or floating platforms engaged in exploration and exploitation of the sea-bed and subsoil thereof adjacent to the coast over which the coastal State exercises sovereign rights for the purposes of exploration and exploitation of their natural resources, the Administration is the Government of the coastal State concerned.

(6) "Incident" means an event involving the actual or probable discharge into the sea of a harmful substance, or effluents containing such a substance.

(7) "Organization" mean the Inter-Governmental Maritime Consultative Organization.

Article 3

APPLICATION

(1) The present Convention shall apply to:

(a) ships entitled to fly the flag of a Party to the Convention; and

(b) ships not entitled to fly the flag of a Party but which operate under the authority of a Party.

(2) Nothing in the present Article shall be construed as derogating from or extending the sovereign rights of the Parties under international law over the sea-bed and subsoil thereof adjacent to their coasts for the purposes of exploration and exploitation of their natural resources.

(3) The present Convention shall not apply to any warship, naval auxiliary or other ship owned or operated by a State and used, for the time being, only on government non-commercial service. However, each Party shall ensure by the adoption of appropriate measures not impairing the operations or operational capabilities of such ships owned or operated by it, that such ships act in a manner consistent, so far as is reasonable and practicable, with the present Convention.

Article 4

VIOLATION

(1) Any violation of the requirements of the present Convention shall be prohibited and sanctions shall be established therefor under the law of the Administration of the ship concerned wherever the violation occurs. If the Administration is informed of such a violation and is satisfied that sufficient evidence is available to enable proceedings to be brought in respect of the alleged violation, it shall cause such proceedings to be taken as soon as possible, in accordance with its law.

(2) Any violation of the requirements of the present Convention within the jurisdiction of any Party to the Convention shall be prohibited and sanctions shall be established therefor under the law of that Party. Whenever such a violation occurs, that Party shall either:

(a) cause proceedings to be taken in accordance with its law; or

(b) furnish to the Administration of the ship such information and evidence as may be in its possession that a violation has occurred.

(3) Where information or evidence with respect to any violation of the present Convention by a ship is furnished to the Administration of that ship, the Administration shall promptly inform the Party which has furnished the information or evidence, and the Organization, of the action taken.

(4) The penalties specified under the law of a Party pursuant to the present Article shall be adequate in severity to discourage violations of the present Convention and shall be equally severe irrespective of where the violations occur.

Article 5

CERTIFICATES AND SPECIAL RULES ON INSPECTION OF SHIPS

(1) Subject to the provisions of paragraph (2) of the present Article a certificate issued under the authority of a Party to the Convention in accordance with the provisions of the Regulations shall be accepted by the other Parties and regarded for all purposes covered by the present Convention as having the same validity as a certificate issued by them.

(2) A ship required to hold a certificate in accordance with the provisions of the Regulations is subject while in the ports or off-shore terminals under the jurisdiction of a Party to inspection by officers duly authorized by that Party. Any such inspection shall be limited to verifying that there is on board a valid certificate, unless there are clear grounds for believing that the condition of the ship or its equipment does not correspond substantially with the particulars of that certificate. In that case, or if the ship does not carry a valid certificate, the Party carrying out the inspection shall take such steps as will ensure that the ship shall not sail until it can proceed to sea without presenting an unreasonable threat of harm to the marine environment. That Party may, however, grant such a ship permission to leave the port or off-shore terminal for the purpose of proceeding to the nearest appropriate repair yard available.

(3) If a Party denies a foreign ship entry to the ports or off-shore terminals under its jurisdiction or takes any action against such a ship for the reason that the ship does not comply with the provisions of the present Convention, the Party shall immediately inform the consul or diplomatic representative of the Party whose flag the ship is entitled to fly, or if this is not possible, the Administration of the ship concerned. Before denying entry or taking such action the Party may request consultation with the Administration of the ship concerned. Information shall also be given to the Administration when a ship does not carry a valid certificate in accordance with the provisions of the Regulations.

(4) With respect to the ships of non-Parties to the Convention, Parties shall apply the requirements of the present Convention as may be necessary to ensure that no more favourable treatment is given to such ships.

Article 6

DETECTION OF VIOLATIONS AND ENFORCEMENT OF THE CONVENTION

(1) Parties to the Convention shall co-operate in the detection of violations and the enforcement of the provisions of the present Convention, using all appropriate and practicable measures of detection and environmental monitoring, adequate procedures for reporting and accumulation of evidence.

(2) A ship to which the present Convention applies may, in any port or off-shore terminal of a Party, be subject to inspection by officers appointed or authorized by that Party for the purpose of verifying whether the ship has discharged any harmful substances in violation of the provisions of the Regulations. If an inspection indicates a violation of the Convention, a report shall be forwarded to the Administration for any appropriate action.

(3) Any Party shall furnish to the Administration evidence, if any, that the ship has discharged harmful substances or effluents containing such substances in violation of the provisions of the Regulations. If it is practicable to do so, the competent authority of the former Party shall notify the master of the ship of the alleged violation.

(4) Upon receiving such evidence, the Administration so informed shall investigate the matter, and may request the other Party to furnish further or better evidence of the alleged contravention. If the Administration is satisfied that sufficient evidence is available to enable proceedings to be brought in respect of the alleged violation, it shall cause such proceedings to be taken in accordance with its law as soon as possible. The Administration shall promptly inform the Party which has reported the alleged violation, as well as the Organization, of the action taken.

(5) A Party may also inspect a ship to which the present Convention applies when it enters the ports or off-shore terminals under its jurisdiction, if a request for an investigation is received from any Party together with sufficient evidence that the ship has discharged harmful substances or effluents containing such substances in any place. The report of such investigation shall be sent to the Party requesting it and to the Administration so that the appropriate action may be taken under the present Convention.

Article 7

UNDUE DELAY TO SHIPS

(1) All possible efforts shall be made to avoid a ship being unduly detained or delayed under Articles 4, 5 and 6 of the present Convention.

(2) When a ship is unduly detained or delayed under Articles 4, 5 and 6 of the present Convention, it shall be entitled to compensation for any loss or damage suffered.

Article 8

REPORTS ON INCIDENTS INVOLVING HARMFUL SUBSTANCES

(1) A report of an incident shall be made without delay to the fullest extent possible in accordance with the provisions of Protocol I to the present Convention.

(2) Each Party to the Convention shall:

(a) make all arrangements necessary for an appropriate officer or agency to receive and process all reports on incidents; and

(b) notify the Organization with complete details of such arrangements for circulation to other Parties and Member States of the Organization.

(3) Whenever a Party receives a report under the provisions of the present Article, that Party shall delay the report without delay to:

(a) the Administration of the ship involved; and

(b) any other State which may be affected.

(4) Each Party to the Convention undertakes to issue instructions to its maritime inspection vessels and aircraft and to other appropriate services, to report to its authorities any incident referred to in Protocol I to the present Convention. That Party shall, if it considers it appropriate, report accordingly to the Organization and to any other party concerned.

Article 9

OTHER TREATIES AND INTERPRETATION

(1) Upon its entry into force, the present Convention supersedes the International Convention for the Prevention of Pollution of the Sea by Oil, 1954, as amended, as between Parties to that Convention.

(2) Nothing in the present Convention shall prejudice the codification and development of the law of the sea by the United Nations Conference on the Law of the Sea convened pursuant to Resolution 2750 C(XXV) of the General Assembly of the United Nations nor the present or future claims and legal views of any State concerning the law of the sea and the nature and extent of coastal and flag State jurisdiction.

(3) The term "jurisdiction" in the present Convention shall be construed in the light of international law in force at the time of application or interpretation of the present Convention.

Article 10

SETTLEMENT OF DISPUTES

Any dispute between two or more Parties to the Convention concerning the interpretation or application of the present Convention shall, if settlement by negotiation between the Parties involved has not been possible, and if these Parties do not otherwise agree, be submitted upon request of any of them to arbitration as set out in Protocol II to the present Convention.

Article 11

COMMUNICATION OF INFORMATION

(1) The Parties to the Convention undertake to communicate to the Organization:

(a) the text of laws, orders, decrees and regulations and other instruments which have been promulgated on the various matters within the scope of the present Convention;

(b) a list of non-governmental agencies which are authorized to act on their behalf in matters relating to the design, construction and equipment of ships carrying harmful substances in accordance with the provisions of the Regulations;

(c) a sufficient number of specimens of their certificates issued under the provisions of the Regulations;

(d) a list of reception facilities including their location, capacity and available facilities and other characteristics;

(e) official reports or summaries of official reports in so far as they show the results of the application of the present Convention; and

(f) an annual statistical report, in a form standardised by the Organization, of penalties actually imposed for infringement of the present Convention.

(2) The Organization shall notify Parties of the receipt of any communications under the present Article and circulate to all Parties any information communicated to it under sub-paragraphs (1) (b) to (f) of the present Article.

Article 12

CASUALTIES TO SHIPS

(1) Each Administration undertakes to conduct an investigation of any casualty occurring to any of its ships subject to the provisions of the Regulations if such casualty has produced a major deleterious effect upon the marine environment.

(2) Each Party to the Convention undertakes to supply the Organization with information concerning the findings of such investigation, when its judges that such information may assist in determining what changes in the present Convention might be desirable.

Article 13

SIGNATURE, RATIFICATION, ACCEPTANCE, APPROVAL AND ACCESSION

(1) The present Convention shall remain open for signature at the Headquarters of the Organization from 15 January 1974 until 31 December 1974 and shall thereafter remain open for accession. States may become Parties to the present Convention by:

(a) signature without reservation as to ratification, acceptance or approval; or

(b) signature subject to ratification, acceptance or approval, followed by ratification, acceptance or approval; or

(c) accession.

(2) Ratification, acceptance, approval or accession shall be effected by the deposit of an instrument to that effect with the Secretary-General of the Organization.

(3) The Secretary-General of the Organization shall inform all States which have signed the present Convention or acceded to it of any signature or of the deposit of any new instrument of ratification, acceptance, approval or accession and the date of its deposit.

Article 14

OPTIONAL ANNEXES

(1) A State may at the time of signing, ratifying, accepting, approving or acceding to the present Convention declare that it does not accept any one or all of Annexes III, IV and V (hereinafter referred to as "Optional Annexes") of the present Convention. Subject to the above, Parties to the Convention shall be bound by any Annex in its entirety.

(2) A State which has declared that it is not bound by an Optional Annex may at any time accept such Annex by depositing with the Organization an instrument of the kind referred to in Article 13 (2).

(3) A State which makes a declaration under paragraph (1) of the present Article in respect of an Optional Annex and which has not subsequently accepted that Annex in accordance with paragraph (2) of the present Article shall not be under any obligation nor entitled to claim any privileges under the present Convention in respect of matters related to such Annex and all references to Parties in the present Convention shall not include that State in so far as matters related to such Annex are concerned.

(4) The Organization shall inform the States which have signed or acceded to the present Convention of any declaration under the present Article as well as the receipt of any instrument deposited in accordance with the provisions of paragraph (2) of the present Article.

Article 15

ENTRY INTO FORCE

(1) The present Convention shall enter into force twelve months after the date on which not less than 15 States, the combined merchant fleets of which

constitute not less than fifty per cent of the gross tonnage of the world's merchant shipping, have become parties to it in accordance with Article 13.

(2) An Optional Annex shall enter into force twelve months after the date on which the conditions stipulated in paragraph (1) of the present Article have been satisfied in relation to that Annex.

(3) The Organization shall inform the States which have signed the present Convention or acceded to it of the date on which it enters into force and of the date on which an Optional Annex enters into force in accordance with paragraph (2) of the present Article.

(4) For States which have deposited an instrument of ratification, acceptance, approval or accession in respect of the present Convention or any Optional Annex after the requirements for entry into force thereof have been met but prior to the date of entry into force, the ratification, acceptance, approval or accession shall take effect on the date of entry into force of the Convention or such Annex or three months after the date of deposit of the instrument whichever is the later date.

(5) For States which have deposited an instrument of ratification, acceptance, approval or accession after the date on which the Convention or an Optional Annex entered into force, the Convention or the Optional Annex shall become effective three months after the date of deposit of the instrument.

(6) After the date on which all the conditions required under Article 16 to bring an amendment to the present Convention or an Optional Annex into force have been fulfilled, any instrument of ratification, acceptance, approval or accession deposited shall apply to the Convention or Annex as amended.

Article 16

AMENDMENTS

(1) The present Convention may be amended by any of the procedures specified in the following paragraphs.

(2) Amendments after consideration by the Organization :

(a) any amendment proposed by a Party to the Convention shall be submitted to the Organization and circulated by its Secretary-General to all Members of the Organization and all Parties at least six months prior to its consideration ;

(b) any amendment proposed and circulated as above shall be submitted to an appropriate body by the Organization for consideration ;

(c) Parties to the Convention, whether or not Members of the Organization, shall be entitled to participate in the proceedings of the appropriate body ;

(d) amendments shall be adopted by a two-thirds majority of only the Parties to the Convention present and voting ;

(e) if adopted in accordance with sub-paragraph (d) above, amendments shall be communicated by the Secretary-General of the Organization to all the Parties to the Convention for acceptance ;

(f) an amendment shall be deemed to have been accepted in the following circumstances :

(i) an amendment to an Article of the Convention shall be deemed to have been accepted on the date on which it is accepted by two-thirds of the Parties, the combined merchant fleets of which constitute not less than fifty per cent of the gross tonnage of the world's merchant fleet ;

(ii) an amendment to an Annex to the Convention shall be deemed to have been accepted in accordance with the procedure specified in sub-paragraph (f) (iii) unless the appropriate body, at the time of its adoption, determines that the amendment shall be deemed to have been accepted on the date on which it is accepted by two-thirds of the Parties, the combined merchant fleets of which constitute not less than fifty per cent of the gross tonnage of the world's merchant fleet. Nevertheless, at any time before the entry into force of an amendment to an Annex to the Convention, a Party may notify the Secretary-General of the Organization that its express approval will be necessary before the amendment enters into force for it. The latter shall bring such notification and the date of its receipt to the notice of Parties ;

(iii) an amendment to an Appendix to an Annex to the Convention shall be deemed to have been accepted at the end of a period to be determined by the appropriate body at the time of its adoption, which period

shall be not less than ten months, unless within that period an objection is communicated to the Organization by not less than one-third of the Parties or by the Parties the combined merchant fleets of which constitute not less than fifty per cent of the gross tonnage of the world's merchant fleet whichever condition is fulfilled;

(iv) an amendment to Protocol I to the Convention shall be subject to the same procedures as for the amendments to the Annexes to the Convention, as provided for in sub-paragraphs (f) (ii) or (f) (iii) above;

(v) an amendment to Protocol II to the Convention shall be subject to the same procedures as for the amendments to an Article of the Convention, as provided for in sub-paragraph (f) (i) above;

(g) the amendment shall enter into force under the following conditions:

(i) in the case of an amendment to an Article of the Convention, to Protocol II, or to Protocol I or to an Annex to the Convention not under the procedure specified in sub-paragraph (f) (iii), the amendment accepted in conformity with the foregoing provisions shall enter into force six months after the date of its acceptance with respect to the Parties which have declared that they have accepted it;

(ii) in the case of an amendment to Protocol I, to an Appendix to an Annex or to an Annex to the Convention under the procedure specified in sub-paragraph (f) (iii), the amendment deemed to have been accepted in accordance with the foregoing conditions shall enter into force six months after its acceptance for all the Parties with the exception of those which, before that date, have made a declaration that they do not accept it or a declaration under sub-paragraph (f) (ii), that their express approval is necessary.

(3) Amendment by a Conference:

(a) Upon the request of a Party, concurred in by at least one-third of the Parties, the Organization shall convene a Conference of Parties to the Convention to consider amendments to the present Convention.

(b) Every amendment adopted by such a Conference by a two-thirds majority of those present and voting of the Parties shall be communicated by the Secretary-General of the Organization to all Contracting Parties for their acceptance.

(c) Unless the Conference decides otherwise, the amendment shall be deemed to have been accepted and to have entered into force in accordance with the procedures specified for that purpose in paragraph (2) (f) and (g) above.

(4) (a) In the case of an amendment to an Optional Annex, a reference in the present Article to a "Party to the Convention" shall be deemed to mean a reference to a Party bound by that Annex.

(b) Any Party which has declined to accept an amendment to an Annex shall be treated as a non-Party only for the purpose of application of that amendment.

(5) The adoption and entry into force of a new Annex shall be subject to the same procedures as for the adoption and entry into force of an amendment to an Article of the Convention.

(6) Unless expressly provided otherwise, any amendment to the present Convention made under this Article which relates to the structure of a ship shall apply only to ships for which the building contract is placed, or in the absence of a building contract, the keel of which is laid, on or after the date on which the amendment comes into force.

(7) Any amendment to a Protocol or to an Annex shall relate to the substance of that Protocol or Annex and shall be consistent with the Articles of the present Convention.

(8) The Secretary-General of the Organization shall inform all Parties of any amendments which enter into force under the present Article, together with the date on which each such amendment enters into force.

(9) An declaration of acceptance or of objection to an amendment under the present Article shall be notified in writing to the Secretary-General of the Organization. The latter shall bring such notification and the date of its receipt to the notice of the Parties to the Convention.

Article 17

PROMOTION OF TECHNICAL CO-OPERATION

The Parties to the Convention shall promote, in consultation with the Organization and other international bodies, with assistance and co-ordination by the

Executive Director of the United Nations Environment Programme, support for those Parties which request technical assistance for:

- (a) the training of scientific and technical personnel;
- (b) the supply of necessary equipment and facilities for reception and monitoring;
- (c) the facilitation of other measures and arrangements to prevent or mitigate pollution of the marine environment by ships; and
- (d) the encouragement of research.

preferably within the countries concerned, so furthering the aims and purposes of the present Convention.

Article 18

DENUNCIATION

(1) The present Convention or any Optional Annex may be denounced by any Parties to the Convention at any time after the expiry of five years from the date on which the Convention or such Annex enters into force for that Party.

(2) Denunciation shall be effected by notification in writing to the Secretary-General of the Organization who shall inform all the other Parties of any such notification received and of the date of its receipt as well as the date on which such denunciation takes effect.

(3) A denunciation shall take effect twelve months after receipt of the notification of denunciation by the Secretary-General of the Organization or after the expiry of any other longer period which may be indicated in the notification.

Article 19

DEPOSIT AND REGISTRATION

(1) The present Convention shall be deposited with the Secretary-General of the Organization who shall transmit certified true copies thereof to all States which have signed the present Convention or acceded to it.

(2) As soon as the present Convention enters into force, the text shall be transmitted by the Secretary-General of the Organization to the Secretary-General of the United Nations for registration and publication, in accordance with Article 102 of the Charter of the United Nations.

Article 20

LANGUAGES

The present Convention is established in a single copy in the English, French, Russian and Spanish languages, each text being equally authentic. Official translations in the Arabic, German, Italian and Japanese languages shall be prepared and deposited with the signed original.

In Witness Whereof the undersigned being duly authorized by their respective Governments for that purpose have signed the present Convention.

Done at London this second day of November, one thousand nine hundred and seventy-three.

INTER-GOVERNMENTAL MARITIME—CONSULTATIVE ORGANIZATION— INTERNATIONAL CONFERENCE ON MARINE POLLUTION, 1973. AGENDA ITEM 7

CONSIDERATION OF A DRAFT INTERNATIONAL CONVENTION FOR THE PREVENTION OF POLLUTION FROM SHIPS, 1973

Text of Protocols as agreed by the Drafting Committee

PROTOCOL TO ARTICLE 8 (PROTOCOL 1)—REGULATIONS CONCERNING REPORTS ON INCIDENTS INVOLVING HARMFUL SUBSTANCES

Regulation 1

DUTY TO REPORT

(1) The Master of a ship involved in an incident referred to in Regulation 3, or other person having charge of the ship, shall report the particulars of such

incident without delay and to the fullest extent possible in accordance with the provisions of this Protocol.

(2) In the event of the ship referred to in paragraph (1) of this Regulation being abandoned, or in the event of a report from such ship being incomplete or unobtainable, the owner, charterer, manager or operator of the ship, or their agents shall, to the fullest extent possible assume the obligations placed upon the Master under the provisions of this Protocol.

Regulation 2

METHODS OF REPORTING

(1) Each report shall be made by radio whenever possible, but in any case by the fastest channels available at the time the report is made. Reports made by radio shall be given the highest possible priority.

(2) Reports shall be directed to the appropriate officer or agency specified in paragraph (3) of Article 8.

Regulation 3

WHEN TO MAKE REPORTS

The report shall be made whenever an incident involves :

(a) A discharge permitted under the present Convention by virtue of the fact that: (i) it is for the purpose of securing the safety of a ship or saving life at sea ; or (ii) it results from damage to the ship or its equipment ; or

(b)¹ A discharge of a harmful substance for the purpose of combating a specific pollution incident or for purposes of legitimate scientific research into pollution abatement or control ; or

(c) A discharge other than as permitted under the present Convention ; or

(d) The probability of a discharge referred to in sub-paragraphs (a), (b) or (c) of this Regulation.

Regulation 4

CONTENTS OF REPORT

(1) Each report shall contain in general: (a) identity of ship; (b) the time and date of the occurrence of the incident; (c) the position of the ship when the incident occurred; (d) the wind and sea conditions prevailing at the time of the incident; and (e) relevant details respecting the condition of the ship.

(2) Each report shall contain, in particular: (a) a clear indication or description of the harmful substances involved, including if possible the correct technical names of such substances (trade names should not be used in place of the correct technical names); (b) a statement or estimate of the quantities, concentrations and likely conditions of harmful substances discharged or likely to be discharged into the sea, and where relevant; (c) a description of the packaging and identifying marks, and if possible; (d) the name of the consignor, consignee or manufacturer.

(3) Each report shall clearly indicate whether the harmful substance discharged, or likely to be discharged is oil, a noxious liquid substance, a noxious solid substance or a noxious gaseous substance and whether such substance was or is carried in bulk or contained in packaged form, freight containers, portable tanks, or road and rail tank wagons.

(4) Each report shall be supplemented as necessary by any other relevant information requested by a recipient of the report or which the person sending the report deems appropriate.

Regulation 5

SUPPLEMENTARY REPORT

Any person who is obligated under the provisions of this Protocol to send a report shall when possible; (a) supplement the initial report, as necessary, with

¹ Under the present Convention, such substances may only be used with the approval of the Administration and of the Government having the jurisdiction over the waters in which the substance is discharged.

information concerning further development; and (b) comply as fully as possible with requests from affected States for additional information concerning the incident.

PROTOCOL TO ARTICLE II (PROTOCOL 2)

ARBITRATION

Article I

Arbitration procedure, unless the Parties to the dispute decide otherwise, shall be in accordance with the rules set out in this Protocol.

Article II

(1) An Arbitration Tribunal shall be established upon the request of one Party to the Convention addressed to another in application of Article 10 of the present Convention. The request for arbitration shall consist of a statement of the case together with any supporting documents.

(2) The requesting Party shall inform the Secretary-General of the Organization of the fact that it has applied for the establishment of a Tribunal, of the names of the Parties to the dispute, and of the Articles of the Convention or Regulations over which there is in its opinion disagreement concerning their interpretation or application. The Secretary-General shall transmit this information to all Parties.

Article III

The Tribunal shall consist of three members: one Arbitrator nominated by each Party to the dispute, and a third Arbitrator who shall be nominated by agreement between the two first named, and shall act as its Chairman.

Article IV

(1) If, at the end of a period of sixty days from the nomination of the second Arbitrator, the Chairman of the Tribunal shall not have been nominated, the Secretary-General of the Organization upon request of either Party shall within a further period of sixty days proceed to such nomination, selecting from a list of qualified persons previously drawn up by the Council of the Organization.

(2) If, within a period of sixty days from the date of the receipt of the request, one of the Parties shall not have nominated the member of the Tribunal for whose designation it is responsible, the other Party may directly inform the Secretary-General of the Organization who shall nominate the Chairman of the Tribunal within a period of sixty days, selecting him from the list prescribed in paragraph (1) of the present Article.

(3) The Chairman of the Tribunal shall, upon nomination, request the Party which has not provided an Arbitrator, to do so in the same manner and under the same conditions. If the Party does not make the required nomination, the Chairman of the Tribunal shall request the Secretary-General of the Organization to make the nomination in the form and conditions prescribed in the preceding paragraph.

(4) The Chairman of the Tribunal, if nominated under the provisions of the present Article, shall not be or have been a national of one of the Parties concerned except with the consent of the other Party.

(5) In the case of the decease or default of an Arbitrator for whose nomination one of the Parties is responsible, the said Party shall nominate a replacement within a period of sixty days from the date of decease or default. Should the said Party not make the nomination, the arbitration shall proceed under the remaining Arbitrators. In case of the decease or default of the Chairman of the Tribunal, a replacement shall be nominated in accordance with the provisions of Article III above, or in the absence of agreement between the members of the Tribunal within a period of sixty days of the decease or default, according to the provisions of the present Article.

Article V

The Tribunal may hear and determine counter-claims arising directly out of the subject matter of the dispute.

Article VI

Each Party shall be responsible for the remuneration of its Arbitrator and connected costs and for the costs entailed by the preparation of its own case. Half of the remuneration of the Chairman of the Tribunal and of all general expenses incurred by the Arbitration shall be borne by each Party. The Tribunal shall keep a record of all its expenses and shall furnish a final statement thereof.

Article VII

Any Party to the Convention which has an interest of a legal nature which may be affected by the decision in the case may, after giving written notice to the Parties which have originally initiated the procedure, join in the arbitration procedure with the consent of the Tribunal.

Article VIII

Any Arbitration Tribunal established under the provisions of the present Protocol shall decide its own rules of procedure.

Article IX

(1) Decisions of the Tribunal both as to its procedure and its place of meeting and as to any question laid before it, shall be taken by majority vote of its members; the absence or abstention of one of the members of the Tribunal for whose nomination the Parties were responsible shall not constitute an impediment to the Tribunal reaching a decision. In cases of equal voting, the Chairman shall be decisive.

(2) The Parties shall facilitate the work of the Tribunal and in particular, in accordance with their legislation, and using all means at their disposal: (a) provide the Tribunal with the necessary documents and information; (b) enable the Tribunal to enter their territory, to hear witnesses or experts, and to visit the scene.

(3) Absence or default of one Party shall not constitute an impediment to the procedure.

Article X

(1) The Tribunal shall render its award within a period of five months from the time it is established unless it decides, in the case of necessity, to extend the time limit for a further period not exceeding three months. The award of the Tribunal shall be accompanied by a statement of reasons. It shall be final and without appeal and shall be communicated to the Secretary-General of the Organization. The Parties shall immediately comply with the award.

(2) Any controversy which may arise between the Parties as regards interpretation or execution of the award may be submitted by either Party for judgment to the Tribunal which made the award, or, if it is not available to another Tribunal constituted for this purpose, in the same manner as the original Tribunal.

INTERNATIONAL CONVENTION FOR THE PREVENTION OF POLLUTION FROM SHIPS, 1973

Text of Annex I of the Convention Adopted by the Conference

ANNEX I—REGULATIONS FOR THE PREVENTION OF POLLUTION BY OIL

CHAPTER I—GENERAL

Regulation 1

DEFINITIONS

For the purposes of this Annex:

(1) "Oil" means petroleum in any form including crude oil, fuel oil, sludge, oil refuse and refined products (other than petrochemicals which are subject to the provisions of Annex II of the present Convention) and, without limiting

the generality of the foregoing, includes the substances listed in Appendix I to this Annex.

(2) "Oily mixture" means a mixture with any oil content.

(3) "Oil fuel" means any oil used as fuel in connexion with the propulsion and auxiliary machinery of the ship in which such oil is carried.

(4) "Oil tanker" means a ship constructed or adapted primarily to carry oil in bulk in its cargo spaces and includes combination carriers and any "chemical tanker" as defined in Annex II of the present Convention when it is carrying a cargo or part cargo of oil in bulk.

(5) "Combination carrier" means a ship designed to carry either oil or solid cargoes in bulk.

(6) "New ship" means a ship: (a) for which the building contract is placed after 31 December 1975; or (b) in the absence of a building contract, the keel of which is laid or which is at a similar stage of construction after 30 June 1976; or (c) the delivery of which is after 31 December 1979; or (d) which has undergone a major conversion:

(i) for which the contract is placed after 31 December 1975; or

(ii) in the absence of a contract, the construction work of which is begun after 30 June 1976; or

(iii) which is completed after 31 December 1979.

(7) "Existing ship" means a ship is not a new ship.

(8) "Major conversion" means a conversion of an existing ship: (a) which substantially alters the dimensions or carrying capacity of the ship; or (b) which changes the type of the ship; or (c) the intent of which in the opinion of the Administration is substantially to prolong its life; or (d) which otherwise so alters the ship that if it were a new ship, it would become subject to relevant provisions of the present Convention not applicable to it as an existing ship.

(9) "Nearest land". The term "from the nearest land" means from the base-line from which the territorial sea of the territory in question is established in accordance with international law, except that, for the purposes of the present Convention "from the nearest land" off the north eastern coast of Australia shall mean from a line drawn from a point on the coast of Australia in latitude 11° South, longitude 142°08' East to a point in latitude 10°35' South, longitude 141°55' East—thence to a point latitude 10°00' South, longitude 142°00' East, thence to a point latitude 9°10' South, longitude 143°52' East, thence to a point latitude 9°00' South, longitude 144°30' East, thence to a point latitude 13°00' South, longitude 144°00' East, thence to a point latitude 15°00' South, longitude 146°00' East, thence to a point latitude 18°00' South, longitude 147°00' East, thence to a point latitude 21°00' South, longitude 153°00' East, thence to a point on the coast of Australia in latitude 24°42' South, longitude 153°15' East.

(10) "Special area" means a sea area where for recognized technical reasons in relation to its oceanographical and ecological condition and to the particular character of its traffic the adoption of special mandatory methods for the prevention of sea pollution by oil is required. Special areas shall include those listed in Regulation 10 of this Annex.

(11) "Instantaneous rate of discharge of oil content" means the rate of discharge of oil in litres per hour at any instant divided by the speed of the ship in knots at the same instant.

(12) "Tank" means an enclosed space which is formed by the permanent structure of a ship and which is designed for the carriage of liquid in bulk.

(13) "Wing tank" means any tank adjacent to the side shell plating.

(14) "Centre tank" means any tank inboard of a longitudinal bulkhead.

(15) "Slop tank" means a tank specifically designated for the collection of tank drainings, tank washings and other oily mixtures.

(16) "Clean ballast" means the ballast in a tank which since oil was last carried therein, has been so cleaned that effluent therefrom if it were discharged from a ship which is stationary into clean calm water on a clear day would not produce visible traces of oil on the surface of the water or on adjoining shore lines or cause a sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shore lines. If the ballast is discharged through an oil discharge monitoring and control system approved by the Administration, evidence based on such a system to the effect that the oil content of the effluent did not exceed 15 parts per million shall be determinative that the ballast was clean, notwithstanding the presence of visible traces.

(17) "Segregated ballast" means the ballast water introduced into a tank which is completely separated from the cargo oil and oil fuel system and which is permanently allocated to the carriage of ballast or to the carriage of ballast or cargoes other than oil or noxious substances as variously defined in the Annexes of the present Convention.

(18) "Length" (L) means 96 per cent of the total length on a waterline at 85 per cent of the least moulded depth measured from the top of the keel, or the length from the fore side of the stem to the axis of the rudder stock on that waterline, if that be greater. In ships designed with a rake of keel the waterline on which this length is measured shall be parallel to the designed waterline. The length (L) shall be measured in metres.

(19) "Forward and after perpendiculars" shall be taken at the forward and after ends of the length (L). The forward perpendicular shall coincide with the foreside of the stem on the waterline on which the length is measured.

(20) "Amidships" is at the middle of the length (L).

(21) "Breadth" (B) means the maximum breadth of the ship, measured amidships to the moulded line of the frame in a ship with a metal shell and to the outer surface of the hull in a ship with a shell of any other material. The breadth (B) shall be measured in metres.

(22) "Deadweight" (DW) means the difference in metric tons between the displacement of a ship in water of a specific gravity of 1.025 at the load water line corresponding to the assigned summer freeboard and the lightweight of the ship.

(23) "Lightweight" means the displacement of a ship in metric tons without cargo, oil fuel, lubricating oil, ballast water, fresh water and feedwater in tanks, consumable stores, passengers and their effects.

(24) "Permeability" of a space means the ratio of the volume within that space which is assumed to be occupied by water to the total volume of that space.

(25) "Volumes" and "areas" in a ship shall be calculated in all cases to moulded lines.

Regulation 2

APPLICATION

(1) Unless expressly provided otherwise, the provisions of this Annex shall apply to all ships.

(2) In ships other than oil tankers fitted with cargo spaces which are constructed and utilized to carry oil in bulk of an aggregate capacity of 200 cubic metres or more, the requirements of Regulations 9, 10, 14, 15(1), (2) and (3), 18, 20 and 24(4) of this Annex for oil tankers shall also apply to the construction and operation of those spaces, except that where such aggregate capacity is less than 1,000 cubic metres the requirements of Regulation 15(4) of this Annex may apply in lieu of Regulation 15(1), (2) and (3).

(3) Where a cargo subject to the provisions of Annex II of the present Convention is carried in a cargo space of an oil tanker, the appropriate requirements of Annex II of the present Convention shall also apply.

(4) (a) Any hydrofoil, air-cushion vehicle and other new type of vessel (near surface craft, submarine craft, etc.) whose constructional features are such as to render the application of any of the provisions of Chapters II and III of this Annex relating to construction and equipment unreasonable or impracticable may be exempted by the Administration from such provisions, provided that the construction and equipment of that ship provides equivalent protection against pollution by oil, having regard to the service for which it is intended.

(b) Particulars of any such exemption granted by the Administration shall be indicated in the Certificate referred to in Regulation 5 of this Annex.

(c) The Administration which allows any such exemption shall, as soon as possible, but not more than ninety days thereafter, communicate to the Organization particulars of same and the reasons therefor, which the Organization shall circulate to the Parties to the Convention for their information and appropriate action, if any.

Regulation 3

EQUIVALENTS

(1) The Administration may allow any fitting, material, appliance or apparatus to be fitted in a ship as an alternative to that required by this Annex if such

fitting, material, appliance or apparatus is at least as effective as that required by this Annex. This authority of the Administration shall not extend to substitution of operational methods to effect the control of discharge of oil as equivalent to those design and construction features which are prescribed by Regulations in this Annex.

(2) The Administration which allows a fitting, material, appliance or apparatus, as an alternative to that required by this Annex shall communicate to the Organization for circulation to the Parties to the Convention particulars thereof, for their information and appropriate action, if any.

Regulation 4

SURVEYS

(1) Every oil tanker of 150 tons gross tonnage and above, and every other ship of 400 tons gross tonnage and above shall be subject to the surveys specified below:

(a) An initial survey before the ship is put in service or before the certificate required under Regulation 5 of this Annex is issued for the first time, which shall include a complete survey of its structure, equipment, fittings, arrangements and material insofar as the ship is covered by this Annex.

This survey shall be such as to ensure that the structure, equipment, fittings, arrangements and material fully comply with the applicable requirements of this Annex.

(b) Periodical surveys at intervals specified by the Administration, but not exceeding five years, which shall be such as to ensure that the structure, equipment, fittings, arrangements and material fully comply with the applicable requirements of this Annex. However, where the duration of the International Oil Pollution Prevention Certificate (1973) is extended as specified in Regulation 8(3) or (4) of this Annex, the interval of the periodical survey may be extended correspondingly.

(c) Intermediate surveys at intervals specified by the Administration but not exceeding thirty months, which shall be such as to ensure that the equipment and associated pump and piping systems, including oil discharge monitoring and control systems, oily-water separating equipment and oil filtering systems, fully comply with the applicable requirements of this Annex and are in good working order. Such intermediate surveys shall be endorsed on the International Oil Pollution Prevention Certificate (1973) issued under Regulation 5 of this Annex.

(2) The Administration shall establish appropriate measures for ships which are not subject to the provisions of paragraph (1) of this Regulation in order to ensure that the applicable provisions of this Annex are complied with.

(3) Surveys of the ship as regards enforcement of the provisions of this Annex shall be carried out by officers of the Administration. The Administration may, however, entrust the surveys either to surveyors nominated for the purpose or to organizations recognized by it. In every case the Administration concerned fully guarantees the completeness and efficiency of the surveys.

(4) After any survey of the ship under this Regulation has been completed, no significant change shall be made in the structure, equipment, fittings, arrangements or material covered by the survey without the sanction of the Administration, except the direct replacement of such equipment or fittings.

Regulation 5

ISSUE OF CERTIFICATE

(1) An International Oil Pollution Prevention Certificate (1973) shall be issued, after survey in accordance with the provisions of Regulation 4 of this Annex, to any oil tanker of 150 tons gross tonnage and above and any other ships of 400 tons gross tonnage and above which are engaged in voyages to ports or offshore terminals under the jurisdiction of other Parties to the Convention. In the case of existing ships this requirement shall apply twelve months after the date of entry into force of the present Convention.

(2) Such Certificate shall be issued either by the Administration or by any persons or organization duly authorized by it. In every case the Administration assumes full responsibility for the certificate.

Regulation 6

ISSUE OF A CERTIFICATE BY ANOTHER GOVERNMENT

(1) The Government of a Party to the Convention may, at the request of the Administration, cause a ship to be surveyed and, if satisfied that the provisions of this Annex are complied with, shall issue or authorize the issue of an International Oil Pollution Prevention Certificate (1973) to the ship in accordance with this Annex.

(2) A copy of the Certificate and a copy of the survey report shall be transmitted as soon as possible to the requesting Administration.

(3) A Certificate so issued shall contain a statement to the effect that it has been issued at the request of the Administration and it shall have the same force and receive the same recognition as the Certificate issued under Regulation 5 of this Annex.

(4) No International Oil Pollution Prevention Certificate (1973) shall be issued to a ship which is entitled to fly the flag of a State which is not a Party.

Regulation 7

FORM OF CERTIFICATE

The International Oil Pollution Prevention Certificate (1973) shall be drawn up in the official language or languages of the issuing country in the form corresponding to the model given in Appendix II to this Annex. If the language used is neither English nor French, the text shall include a translation into one of these languages.

Regulation 8

DURATION OF CERTIFICATE

(1) An International Oil Pollution Prevention Certificate (1973) shall be issued for a period specified by the Administration, which shall not exceed five years from the date of issue, except as provided in paragraphs (2), (3) and (4) of this Regulation.

(2) If a ship at the time when the Certificate expires is not in a port or offshore terminal under the jurisdiction of the Party to the Convention whose flag the ship is entitled to fly, the certificate may be extended by the Administration, but such extension shall be granted only for the purpose of allowing the ship to complete its voyage to the State whose flag the ship is entitled to fly or in which it is to be surveyed and then only in cases where it appears proper and reasonable to do so.

(3) No Certificate shall be thus extended for a period longer than five months and a ship to which such extension is granted shall not on its arrival in the State whose flag it is entitled to fly or the port in which it is to be surveyed, be entitled by virtue of such extension to leave that port or State without having obtained a new Certificate.

(4) A Certificate which has not been extended under the provisions of paragraph (2) of this Regulation may be extended by the Administration for a period of grace of up to one month from the date of expiry stated on it.

(5) A Certificate shall cease to be valid if significant alterations have taken place in the construction, equipment, fittings, arrangements, or material required without the sanction of the Administration, except the direct replacement of such equipment or fittings, or if intermediate surveys as specified by the Administration under Regulation 4(1)(c) of this Annex are not carried out.

(6) A Certificate issued to a ship shall cease to be valid upon transfer of such a ship to the flag of another State, except as provided in paragraph (7) of this Regulation.

(7) Upon transfer of a ship to the flag of another Party, the Certificate shall remain in force for a period not exceeding five months provided that it would not have expired before the end of that period, or until the Administration issues a replacement Certificate, whichever is earlier. As soon as possible after the transfer has taken place the Government of the Party whose flag the ship was formerly entitled to fly shall transmit to the Administration a copy of the Certificate carried by the ship before the transfer and, if available, a copy of the relevant survey report.

CHAPTER II—REQUIREMENTS FOR CONTROL OF OPERATIONAL POLLUTION

Regulation 9

CONTROL DISCHARGE OF OIL

(1) Subject to the provisions of Regulations 10 and 11 of this Annex and paragraph (2) of this Regulation, any discharge into the sea of oil or oily mixtures from ships to which this Annex applies shall be prohibited except when all the following conditions are satisfied:

(a) For an oil tanker, except as provided for in sub-paragraph (b) of this paragraph: (i) the tanker is not within a special area; (ii) the tanker is more than 50 nautical miles from the nearest land; (iii) the tanker is proceeding en route; (iv) the instantaneous rate of discharge of oil content does not exceed 60 litres per nautical mile; (v) the total quantity of oil discharged into the sea does not exceed for existing tankers 1/15,000 of the total quantity of the particular cargo of which the residue formed a part, and for new tankers 1/30,000 of the total quantity of the particular cargo of which the residue formed a part; and (vi) the tanker has in operation, except as provided for in Regulation 15(3) of this Annex, an oil discharge monitoring and control system and a slop tank arrangement as required by Regulation 15 of this Annex;

(b) From a ship of 400 tons gross tonnage and above other than an oil tanker and from machinery space bilges excluding cargo pump room bilges of an oil tanker unless mixed with oil cargo residue: (i) the ship is not within a special area; (ii) the ship is more than 12 nautical miles from the nearest land; (iii) the ship is proceeding en route; (iv) the oil content of the effluent is less than 100 parts per million; and (v) the ship has in operation an oil discharge monitoring and control system, oily water separating equipment, oil filtering system or other installation as required by Regulation 16 of this Annex.

(2) In the case of a ship of less than 400 tons gross tonnage other than an oil tanker whilst outside the special area, the Administration shall ensure that it is equipped as far as practicable and reasonable with installations to ensure the storage of oil residues on board and their discharge to reception facilities or into the sea in compliance with the requirements of paragraph (1) (b) of this Regulation.

(3) Whenever visible traces of oil are observed on or below the surface of the water in the immediate vicinity of a ship or its wake, Governments of Parties to the Convention should, to the extent they are reasonably able to do so, promptly investigate the facts bearing on the issue of whether there has been a violation of the provisions of this Regulation or Regulation 10 of this Annex. The investigation should include, in particular, the wind and sea conditions, the track and speed of the ship, other possible sources of the visible traces in the vicinity, and any relevant oil discharge records.

(4) The provisions of paragraph (1) of this Regulation shall not apply to the discharge of clean or segregated ballast. The provisions of sub-paragraph (1) (b) of this Regulation shall not apply to the discharge of oily mixture which without dilution has an oil content not exceeding 15 parts per million.

(5) No discharge into the sea shall contain chemicals or other substances in quantities or concentrations which are hazardous to the marine environment or chemicals or other substances introduced for the purpose of circumventing the conditions of discharge specified in this Regulation.

(6) The oil residues which cannot be discharged into the sea in compliance with paragraphs (1), (2) and (4) of this Regulation shall be retained on board or discharged to reception facilities.

Regulation 10

METHODS FOR THE PREVENTION OF OIL POLLUTION FROM SHIPS WHILE OPERATING IN SPECIAL AREAS

(1) For the purpose of this Annex the special areas are the Mediterranean Sea area, the Baltic Sea area, the Black Sea area, the Red Sea area and the "Gulf's area" which are defined as follows:

(a) The Mediterranean Sea area means the Mediterranean Sea proper including the gulfs and seas therein with the boundary between the Mediterranean

and the Black Sea constituted by the 41°N parallel and bounded to the west by the Straits of Gibraltar at the meridian of 5°36'W.

(b) The Baltic Sea area means the Baltic Sea proper with the Gulf of Bothnia, the Gulf of Finland and the entrance to the Baltic Sea bounded by the parallel of the Skaw in the Skagerrak at 57°44.8'N.

(c) The Black Sea area means the Black Sea proper with the boundary between the Mediterranean and the Black Sea constituted by the parallel 41°N.

(d) The Red Sea area means the Red Sea proper including the Gulfs of Suez and Aqaba bounded at the south by the rhumb line between Ras is Ane (12°8.5'N, 43°19.6'E) and Husn Murad (12°40.4'N, 43°30.2'E).

(e) The "Gulfs area" means the sea area located north west of the rhumb line between Ras al Hadd (22°30'N, 59°48'E) and Ras Al Fasteh (25°04'N, 61°25'E).

(2) (a) Subject to the provisions of Regulation 11 of this Annex, any discharge into the sea of oil or oily mixture from any oil tanker and any ship of 400 tons gross tonnage and above other than an oil tanker shall be prohibited, while in a special area.

(b) Such ships while in a special area shall retain on board all oil drainage and sludge, dirty ballast and tank washing waters and discharge them only to reception facilities.

(3) (a) Subject to the provisions of Regulation 11 of this Annex, any discharge into the sea of oil or oily mixture from a ship of less than 400 tons gross tonnage, other than an oil tanker, shall be prohibited while in a special area, except when the oil content of the effluent without dilution does not exceed 15 parts per million or alternatively when all of the following conditions are satisfied:

(i) the ship is proceeding en route; (ii) the oil content of the effluent is less than 100 parts per million; and (iii) the discharge is made as far as practicable from the land, but in no case less than 12 nautical miles from the nearest land.

(b) No discharge into the sea shall contain chemicals or other substances in quantities or concentrations which are hazardous to the marine environment or chemicals or other substances introduced for the purpose of circumventing the conditions of discharge specified in this Regulation.

(c) The oil residues which cannot be discharged into the sea in compliance with sub-paragraph (a) of this paragraph shall be retained on board or discharged to reception facilities.

(4) The provisions of this Regulation shall not apply to the discharge of clean or segregated ballast.

(5) Nothing in this Regulation shall prohibit a ship on a voyage only part of which is in a special area from discharging outside the special area in accordance with Regulation 9 of this Annex.

(6) Whenever visible traces of oil are observed on or below the surface of the water in the immediate vicinity of a ship or its wake, the Governments of Parties to the Convention should, to the extent they are reasonably able to do so, promptly investigate the facts bearing on the issue of whether there has been a violation of the provisions of this Regulation or Regulation 9 of this Annex. The investigation should include, in particular, the wind and sea conditions, the track and speed of the ship, other possible sources of the visible traces in the vicinity, and any relevant oil discharge records.

(7) Reception facilities within special areas:

(a) Mediterranean Sea, Black Sea and Baltic Sea areas.

(i) The Government of each Party to the Convention, the coastline of which borders on any given special area undertakes to ensure that not later than 1 January 1977 all oil loading terminals and repair ports within the special area are provided with facilities adequate for the reception and treatment of all the dirty ballast and tank washing water from oil tankers. In addition all ports within the special area shall be provided with adequate reception facilities for other residues and oily mixtures from all ships. Such facilities shall have adequate capacity to meet the needs of the ships using them without causing undue delay.

(ii) The Government of each Party having under its jurisdiction entrances to seawater courses with low depth contour which might require a reduction of draught by the discharge of ballast undertakes to ensure the provision of the facilities referred to in sub-paragraph (a)(i) of this paragraph but with the proviso that ships required to discharge slops or dirty ballast could be subject to some delay.

(iii) During the period between the entry into force of the present Convention (if earlier than 1 January 1977) and 1 January 1977 ships while navigating in the special areas shall comply with the requirements of Regulation 9 of this Annex. However the Governments of Parties the coastlines of which border any of the special areas under this sub-paragraph may establish a date earlier than 1 January 1977 but after the date of entry into force of the present Convention, from which the requirements of this Regulation in respect of the special areas in question shall take effect: (1) if all the reception facilities required have been provided by the date so established; and (2) provided that the Parties concerned notify the Organization of the date so established at least six months in advance, for circulation to other parties.

(iv) After 1 January 1977, or the date established in accordance with sub-paragraph (a) (iii) of this paragraph if earlier, each Party shall notify the Organization for transmission to the Contracting Governments concerned of all cases where the facilities are alleged to be inadequate.

(b) Red Sea area and "Gulf area."

(i) The Government of each Party the coastline of which borders on the special areas undertakes to ensure that as soon as possible all oil loading terminals and repair ports within these special areas are provided with facilities adequate for the reception and treatment of all the dirty ballast and tank washing water from tankers. In addition all ports within the special area shall be provided with adequate reception facilities for other residues and oily mixtures from all ships. Such facilities shall have adequate capacity to meet the needs of the ships using them without causing undue delay.

(ii) The Government of each Party having under its jurisdiction entrances to seawater courses with low depth contour which might require a reduction of draught by the discharge of ballast shall undertake to ensure the provision of the facilities referred to in subparagraph (b) (i) of this paragraph but with the proviso that ships required to discharge slops or dirty ballast could be subject to some delay.

(iii) Each Party concerned shall notify the Organization of the measures taken pursuant to provisions of sub-paragraph (b) (i) and (ii) of this paragraph. Upon receipt of sufficient notifications the Organization shall establish a date from which the requirements of this Regulation in respect of the area in question shall take effect. The Organization shall notify all Parties of the date so established no less than twelve months in advance of that date.

(iv) During the period between the entry into force of the present Convention and the date so established, ships while navigating in the special area shall comply with the requirements of Regulation 9 of this Annex.

(v) After such date oil tankers loading in ports in these special areas where such facilities are not yet available shall also fully comply with the requirements of this Regulation. However, oil tankers entering these special areas for the purpose of loading shall make every effort to enter the area with only clean ballast on board.

(vi) After the date on which the requirements for the special area in question take effect, each Party shall notify the Organization for transmission to the Parties concerned of all cases where the facilities are alleged to be inadequate.

(vii) At least the reception facilities as prescribed in Regulation 12 of this Annex shall be provided by 1 January 1977 or one year after the date of entry into force of the present Convention, whichever occurs later.

Regulation 11

EXCEPTION

Regulations 9 and 10 of this Annex shall not apply to:

(a) The discharge into the sea of oil or oily mixture necessary for the purpose of securing the safety of a ship or saving life at sea; or

(b) The discharge into the sea of oil or oily mixture resulting from damage to a ship or its equipment; (i) provided that all reasonable precautions have been taken after the occurrence of the damage or discovery of the discharge for the purpose of preventing or minimizing the discharge; and (ii) except if the owner or the Master acted either with intent to cause damage, or recklessly and with knowledge that damage would probably result; or

(c) The discharge into the sea of substances containing oil, approved by the Administration, when being used for the purpose of combating specific pollution

incidents in order to minimize the damage from pollution. Any such discharge shall be subject to the approval of any Government in whose jurisdiction it is contemplated the discharge will occur.

Regulation 12

RECEPTION FACILITIES

(1) Subject to the provisions of Regulation 10 of this Annex, the Government of each Party undertakes to ensure the provision at oil loading terminals, repair ports, and in other ports in which ships have oily residues to discharge, of facilities for the reception of such residues and oily mixtures as remain from oil tankers and other ships adequate to meet the needs of the ships using them without causing undue delay to ships.

(2) Reception facilities in accordance with paragraph (1) of this Regulation shall be provided in:

(a) All ports and terminals in which crude oil is loaded into oil tankers where such tankers have immediately prior to arrival completed a ballast voyage of not more than 72 hours or not more than 1,200 nautical miles;

(b) All ports and terminals in which oil other than crude oil in bulk is loaded at an average quantity of more than 1,000 metric tons per day;

(c) All ports having ship repair yards or tank cleaning facilities;

(d) All ports and terminals which handle ships provided with the sludge tank(s) required by Regulation 17 of this Annex;

(e) All ports in respect of oily bilge waters and other residues, which cannot be discharged in accordance with Regulation 9 of this Annex; and

(f) All loading ports for bulk cargoes in respect of oil residues from combination carriers which cannot be discharged in accordance with Regulation 9 of this Annex.

(3) The capacity for the reception facilities shall be as follows:

(a) Crude oil loading terminals shall have sufficient reception facilities to receive oil and oily mixtures which cannot be discharged in accordance with the provisions of Regulation 9(1) (a) of this Annex from all oil tankers on voyages as described in paragraph (2) (a) of this Regulation.

(b) Loading ports and terminals referred to in paragraph (2) (b) of this Regulation shall have sufficient reception facilities to receive oil and oily mixtures which cannot be discharged in accordance with the provisions of Regulation 9(1) (a) of this Annex from oil tankers which load oil other than crude oil in bulk.

(c) All ports having ship repair yards or tank cleaning facilities shall have sufficient reception facilities to receive all residues and oily mixtures which remain on board for disposal from ships prior to entering such yards or facilities.

(d) All facilities provided in ports and terminals under paragraph (2) (d) of this Regulation shall be sufficient to receive all residues retained according to Regulation 17 of this Annex from all ships that may reasonably be expected to call at such ports and terminals.

(e) All facilities provided in ports and terminals under this Regulation shall be sufficient to receive oily bilge waters and other residues which cannot be discharged in accordance with Regulation 9 of this Annex.

(f) The facilities provided in loading ports for bulk cargoes shall take into account the special problems of combination carriers as appropriate.

(4) The reception facilities prescribed in paragraphs (2) and (3) of this Regulation shall be made available no later than one year from the date of entry into force of the present Convention or by 1 January 1977, whichever occurs later.

(5) Each Party shall notify the Organization for transmission to the Parties concerned of all cases where the facilities provided under this Regulation are alleged to be inadequate.

Regulation 13

SEGREGATED BALLAST OIL TANKERS

(1) Every new oil tanker of 70,000 tons deadweight and above shall be provided with segregated ballast tanks and shall comply with the requirements of this Regulation.

(2) The capacity of the segregated ballast tanks shall be so determined that the ship may operate safely on ballast voyages without recourse to the use of

oil tanks for water ballast except as provided for in paragraph (3) of this Regulation. In all cases, however, the capacity of segregated ballast tanks shall be at least such that in any ballast condition at any part of the voyage, including the conditions consisting of lightweight plus segregated ballast only, the ship's draughts and trim can meet each of the following requirements:

(a) The moulded draught amidships (dm) in metres (without taking into account any ship's deformation) shall not be less than: $dm=2.0+0.02 L$.

(b) The draughts at the forward and after perpendiculars shall correspond to those determined by the draught amidships (dm), as specified in sub-paragraph (a) of this paragraph, in association with the trim by the stern of not greater than 0.015 L, and

(c) In any case the draught at the after perpendicular shall not be less than that which is necessary to obtain full immersion of the propeller(s).

(3) In no case shall ballast water be carried in oil tanks except in weather conditions so severe that, in the opinion of the Master, it is necessary to carry additional ballast water in oil tanks for the safety of the ship. Such additional ballast water shall be processed and discharged in compliance with Regulation 9 and in accordance with the requirements of Regulation 15 of this Annex, and entry shall be made in the Oil Record Book referred to in Regulation 20 of this Annex.

(4) Any oil tanker which is not required to be provided with segregated ballast tanks in accordance with paragraph (1) of this Regulation may, however, be qualified as a segregated ballast tanker, provided that in the case of an oil tanker of 150 metres in length and above it fully complies with the requirements of paragraphs (2) and (3) of this Regulation and in the case of an oil tanker of less than 150 metres in length the segregated ballast conditions shall be to the satisfaction of the Administration.

Regulation 14

SEGREGATION OF OIL AND WATER BALLAST

(1) Except as provided in paragraph (2) of this Regulation, in new ships of 4,000 tons gross tonnage and above other than oil tankers, and in new oil tankers of 150 tons gross tonnage and above, no ballast water shall be carried in any oil fuel tank.

(2) Where abnormal conditions or the need to carry large quantities of oil fuel render it necessary to carry ballast water which is not a clean ballast in any oil fuel tank, such ballast water shall be discharged to reception facilities or into the sea in compliance with Regulation 9 using the equipment specified in Regulation 16(2) of this Annex, and an entry shall be made in the Oil Record Book to this effect.

(3) All other ships shall comply with the requirements of paragraph (1) of this Regulation as far as reasonable and practicable.

Regulation 15

RETENTION OF OIL ON BOARD

(1) Subject to the provisions of paragraphs (5) and (6) of this Regulation, oil tankers of 150 tons gross tonnage and above shall be provided with arrangements in accordance with the requirements of paragraphs (2) and (3) of this Regulation, provided that in the case of existing tankers the requirements for oil discharge monitoring and control systems and slop tank arrangements shall apply three years after the date of entry into force of the present Convention.

(2) (a) Adequate means shall be provided for cleaning the cargo tanks and transferring the dirty ballast residue and tank washings from the cargo tanks into a slop tank approved by the Administration. In existing oil tankers, any cargo tank may be designated as a slop tank.

(b) In this system arrangements shall be provided to transfer the oily waste into a slop tank or combination of slop tanks in such a way that any effluent discharged into the sea will be such as to comply with the provisions of Regulation 9 of this Annex.

(c) The arrangements of the slop tank or combination of slop tanks shall have a capacity necessary to retain the slops generated by tank washing, oil residues and dirty ballast residues but the total shall be not less than 3 per cent of the oil carrying capacity of the ship, except that, where segregated ballast tanks

are provided in accordance with Regulation 13 of this Annex, or where arrangements such as eductors involving the use of water additional to the washing water are not fitted, the Administration may accept 2 per cent. New oil tankers over 70,000 tons deadweight shall be provided with at least two slop tanks.

(d) Slop tanks shall be so designed particularly in respect of the position of inlets, outlets, baffles or weirs where fitted, so as to avoid excessive turbulence and entrainment of oil or emulsion with the water.

(3) (a) An oil discharge monitoring and control system approved by the Administration shall be fitted. In considering the design of the oil content meter to be incorporated in the system, the Administration shall have regard to the specification recommended by the Organization.¹ The system shall be fitted with a recording device to provide a continuous record of the discharge in litres per nautical mile and total quantity discharged, or the oil content and rate of discharge. This record shall be identifiable as to time and date and shall be kept for at least three years. The oil discharge monitor and control system shall come into operation when there is any discharge of effluent into the sea and shall be such as will ensure that any discharge of oily mixture is automatically stopped when the instantaneous rate of discharge of oil exceeds that permitted by Regulation 9(1) (a) of this Annex. Any failure of this monitoring and control system shall stop the discharge and be noted in the Oil Record Book. A manually operated alternative method shall be provided and may be used in the event of such failure, but the defective unit shall be made operable before the oil tanker commences its next ballast voyage unless it is proceeding to a repair port. Existing oil tankers shall comply with all of the provisions specified above except that the stopping of the discharge may be performed manually and the rate of discharge may be estimated from the pump characteristic.

(b) Effective oil/water interface detectors approved by the Administration shall be provided for a rapid and accurate determination of the oil/water interface in slop tanks and shall be available for use in other tanks where the separation of oil and water is effected and from which it is intended to discharge effluent direct to the sea.

(c) Instructions as to the operation of the system shall be in accordance with an operational manual approved by the Administration. They shall cover manual as well as automatic operations and shall be intended to ensure that at no time shall oil be discharged except in compliance with the conditions specified in Regulation 9 of this Annex.²

(4) The requirements of paragraph (1), (2) and (3) of this Regulation shall not apply to oil tankers of less than 150 tons gross tonnage, for which the control of discharge of oil under Regulation 9 of this Annex shall be effected by the retention of oil on board with subsequent discharge of all contaminated washings to reception facilities. The total quantity of oil and water used for washing and returned to a storage tank shall be recorded in the Oil Record Book. This total quantity shall be discharged to reception facilities unless adequate arrangements are made to ensure that any effluent which is allowed to be discharged into the sea is effectively monitored to ensure that the provisions of Regulation 9 of this Annex are complied with.

(5) The Administration may waive the requirements of paragraphs (1), (2) and (3) of this Regulation for any oil tanker which engages exclusively on voyages both of 72 hours or less in duration and within 50 miles from the nearest land, provided that the oil tanker is not required to hold and does not hold an International Oil Pollution Prevention Certificate (1973). Any such waiver shall be subject to the requirement that the oil tanker shall retain on board all oily mixtures for subsequent discharge to reception facilities and to the determination by the Administration that facilities available to receive such oily mixtures are adequate.

(6) Where in the view of the Organization equipment required by Regulation 9(1) (a) (vi) of this Annex and specified in sub-paragraph (3) (a) of this Regulation is not obtainable for the monitoring of discharge of light refined products (white oils), the Administration may waive compliance with such requirement, provided that discharge shall be permitted only in compliance

¹ Reference is made to Recommendations on International Performance Specifications for Oil-Water Separating Equipment and Oil Content Meters adopted by the Organization by Resolution A.233(VII).

² Reference is made to "Clean Seas Guide for Oil Tankers," published by the International Chamber of Shipping and the Oil Companies International Marine Forum.

with procedures established by the Organization which shall satisfy the conditions of Regulation 9(1)(a) of this Annex except the obligation to have an oil discharge monitoring and control system in operation. The Organization shall review the availability of equipment at intervals not exceeding twelve months.

(7) The requirements of paragraphs (1), (2) and (3) of this Regulation shall not apply to oil tankers carrying asphalt, for which the control of discharge of asphalt under Regulation 9 of this Annex shall be effected by the retention of asphalt residues on board with discharge of all contaminated washings to reception facilities.

Regulation 16

OIL DISCHARGE MONITORING AND CONTROL SYSTEM AND OILY WATER SEPARATING EQUIPMENT

(1) Any ship of 400 tons gross tonnage and above shall be fitted with an oily water separating equipment or filtering system complying with the provisions of paragraph (6) of this Regulation. Any such ship which carries large quantities of oil fuel shall comply with paragraph (2) of this Regulation or paragraph (1) of Regulation 14.

(2) Any ship of 10,000 tons gross tonnage and above shall be fitted:

(a) In addition to the requirements of paragraph (1) of this Regulation with an oil discharge monitoring and control system complying with paragraph (5) of this Regulation; or

(b) As an alternative to the requirements of paragraph (1) and sub-paragraph (2)(a) of this Regulation, with an oily water separating equipment complying with paragraph (6) of this Regulation and an effective filtering system, complying with paragraph (7) of this Regulation.

(3) The Administration shall ensure that that ships of less than 400 tons gross tonnage are equipped, as far as practicable, to retain on board oil or oily mixtures or discharge them in accordance with the requirements of Regulation 9(1)(b) of this Annex.

(4) For existing ships the requirements of paragraphs (1), (2) and (3) of this Regulation shall apply three years after the date of entry into force of the present Convention.

(5) An oil discharge monitoring and control system shall be of a design approved by the Administration. In considering the design of the oil content meter to be incorporated into the system, the Administration shall have regard to the specification recommended by the Organization.¹ The system shall be fitted with a recording device to provide a continuous record of the oil content in parts per million. This record shall be identifiable as to time and date and shall be kept for at least three years. The monitoring and control system shall come into operation when there is any discharge of effluent into the sea and shall be such as will ensure that any discharge of oily mixture is automatically stopped when the oil content of effluent exceeds that permitted by Regulation 9(1)(b) of this Annex. Any failure of this monitoring and control system shall stop the discharge and be noted in the Oil Record Book. The defective unit shall be made operable before the ship commences its next voyage unless it is proceeding to a repair port. Existing ships shall comply with all of the provisions specified above except that the stopping of the discharge may be performed manually.

(6) Oily water separating equipment or an oil filtering system shall be of a design approved by the Administration and shall be such as will ensure that any oily mixture discharged into the sea after passing through the separator or filtering systems shall have an oil content of not more than 100 parts per million. In considering the design of such equipment, the Administration shall have regard to the specification recommended by the Organization.²

(7) The oil filtering system referred to in paragraph (2)(b) of this Regulation shall be of a design approved by the Administration and shall be such that it will accept the discharge from the separating system and produce an effluent the oil content of which does not exceed 15 parts per million. It shall be provided with alarm arrangements to indicate when this level cannot be maintained.

¹ Reference is made to the Recommendation on International Performance Specifications for Oily-Water Separating Equipment and Oil Content Meters adopted by the Organization by Resolution A.233(VII).

² Reference is made to the Recommendation on International Performance Specifications for Oily-Water Separating Equipment and Oil Content Meters adopted by the Organization by Resolution A.233(VII).

*Regulation 17***TANKS FOR OIL RESIDUES (SLUDGE)**

(1) Every ship of 400 tons gross tonnage and above shall be provided with a tank or tanks of adequate capacity, having regard to the type of machinery and length of voyage, to receive the oily residues (sludges) which cannot be dealt with otherwise in accordance with the requirements of this Annex, such as those resulting from the purification of fuel and lubricating oils and oil leakages in the machinery spaces.

(2) In new ships, such tanks shall be designed and constructed so as to facilitate their cleaning and the discharge of residues to reception facilities. Existing ships shall comply with this requirement as far as is reasonable and practicable.

*Regulation 18***PUMPING, PIPING AND DISCHARGE ARRANGEMENTS OF OIL TANKERS**

(1) In every oil tanker, a discharge manifold for connexion to reception facilities for the discharge of dirty ballast water or oil contaminated water shall be located on the open deck on both sides of the ship.

(2) In every oil tanker, pipelines for the discharge to the sea of effluent which may be permitted under Regulation 9 of this Annex shall be led to the open deck or to the ship's side above the waterline in the deepest ballast condition. Different piping arrangements to permit operation in the manner permitted in subparagraphs (4) (a) and (b) of this Regulation may be accepted.

(3) In new oil tankers means shall be provided for stopping the discharge of effluent into the sea from a position on upper deck or above located so that the manifold in use referred to in paragraph (1) of this Regulation and the effluent from the pipelines referred to in paragraph (2) of this Regulation may be visually observed. Means for stopping the discharge need not be provided at the observation position if a positive communication system such as telephone or radio system is provided between the observation position and the discharge control position.

(4) All discharges shall take place above the waterline except as follows:

(a) Segregated ballast and clean ballast may be discharged below the waterline in ports or at offshore terminals.

(b) Existing ships which, without modification, are not capable of discharging segregated ballast above the waterline may discharge segregated ballast below the waterline provided that an examination of the tank immediately before the discharge has established that no contamination with oil has taken place.

*Regulation 19***STANDARD DISCHARGE CONNECTION**

To enable pipes of reception facilities to be connected with the ship's discharge pipe line for residues from machinery bilges, both lines shall be fitted with a standard discharge connection in accordance with the following table:

STANDARD DIMENSIONS OF FLANGES FOR DISCHARGE CONNECTIONS

Description:	Dimension:
Outside diameter.....	215 mm.
Inner diameter.....	According to pipe outside diameter.
Bolt circle diameter.....	183 mm.
Slots in flange.....	6 holes 22 mm. in diameter equidistantly placed on a bolt circle of the above diameter, slotted to the flange periphery. The slot width to be 22 mm.
Flange thickness.....	20 mm.
Bolts and nuts: quantity, diameter.....	6, each of 20 mm. in diameter and of suitable length.

The flange is designed to accept pipes up to a maximum internal diameter of 125 mm. and shall be of steel or other equivalent material having a flat face.

This flange, together with a gasket of oilproof material, shall be suitable for a service pressure 6 kg/cm².

Regulation 20

OIL RECORD BOOK

(1) Every oil tanker of 150 tons gross tonnage and above and every ship of 400 tons gross tonnage and above other than an oil tanker shall be provided with an Oil Record Book, whether as part of the ship's official log book or otherwise, in the form specified in Appendix III to this Annex.

(2) The Oil Record Book shall be completed on each occasion, on a tank-to-tank basis, whenever any of the following operations take place in the ship:

- (a) *For oil tankers:*
 - (i) Loading of oil cargo;
 - (ii) Internal transfer of oil cargo during voyage;
 - (iii) Opening or closing before and after loading and unloading operations of valves or similar devices which inter-connect cargo tanks;
 - (iv) Opening or closing of means of communication between cargo piping and seawater ballast piping;
 - (v) Opening or closing of ships' side valves before, during and after loading and unloading operations;
 - (vi) Unloading of oil cargo;
 - (vii) Ballasting of cargo tanks;
 - (viii) Cleaning of cargo tanks;
 - (ix) Discharge of ballast except from segregated ballast tanks;
 - (x) Discharge of water from slop tanks;
 - (xi) Disposal of residues;
 - (xii) Discharge overboard of bilge water which has accumulated in machinery space whilst in port, and the routine discharge at sea of bilge water has accumulated in machinery spaces.

(b) *For ships other than oil tankers:*

- (i) Ballasting or cleaning of fuel oil tanks or oil cargo spaces;
- (ii) discharge of ballast or cleaning water from tanks referred to under (i) of this sub-paragraph;
- (iii) disposal of residues;
- (iv) discharge overboard of bilge water which has accumulated in machinery spaces whilst in port, and the routine discharge at sea of bilge water which has accumulated in machinery spaces.

(3) In the event of such discharge of oil or oily mixture as is referred to in Regulation 11 of this Annex or in the event of accidental or other exceptional discharge of oil not excepted by that Regulation, a statement shall be made in the Oil Record Book of the circumstances of, and the reasons for, the discharge.

(4) Each operation described in paragraph (2) of this Regulation shall be fully recorded without delay in the Oil Record Book so that all the entries in the book appropriate to that operation are completed. Each section of the book shall be signed by the officer or officers in charge of the operations concerned and shall be countersigned by the Master of the ship. The entries in the Oil Record Book shall be in an official language of the State whose flag the ship is entitled to fly, and, for ships holding an International Oil Pollution Prevention Certificate, (1973) in English or French. The entries in an official national language of the State whose flag the ship is entitled to fly shall prevail in case of a dispute or discrepancy.

(5) The Oil Record Book shall be kept in such a place as to be readily available for inspection at all reasonable times and, except in the case of unmanned ships under tow, shall be kept on board the ship. It shall be preserved for a period of three years after the last entry has been made.

(7) The competent authority of the Government of a Party to the Convention may inspect the Oil Record Book on board any ship to which this Annex applies while the ship is in its port or offshore terminals and may make a copy of any entry in that book and may require the Master of the ship to certify that the copy is a true copy of such entry. Any copy so made which has been certified by the Master of the ship as a true copy of an entry in the ship's Oil Record Book shall be made admissible in any judicial proceedings as evidence of the facts stated in the entry. The inspection of an Oil Record Book and the taking of a certified copy by the competent authority under this paragraph shall be performed as expeditiously as possible without causing the ship to be unduly delayed.

Regulation 21

SPECIAL REQUIREMENTS FOR DRILLING RIGS AND OTHER PLATFORMS

Fixed and floating drilling rigs when engaged in the exploration, exploitation and associated offshore processing of sea-bed mineral resources and other platforms shall comply with the requirements of this Annex applicable to ships of 400 tons gross tonnage and above other than oil tankers, except that:

(a) they shall be equipped as far as practicable with the installations required in Regulations 16 and 17 of this Annex;

(b) they shall keep a record of all operations involving oil or oily mixture discharges, in a form approved by the Administration; and

(c) in any special area and subject to the provisions of Regulation 11 of this Annex, the discharge into the sea of oil or oily mixture shall be prohibited except when the oil content of the discharge without dilution does not exceed 15 parts per million.

CHAPTER III

REQUIREMENTS FOR MINIMIZING OIL POLLUTION FROM OIL TANKERS DUE TO SIDE AND BOTTOM DAMAGES

Regulation 22

DAMAGE ASSUMPTIONS

For the purpose of calculating hypothetical oil outflow from oil tankers, three dimensions of the extent of damage of a parallelepiped on the side and bottom of the ship are assumed as follows. In the case of bottom damages two conditions are set forth to be applied individually to the stated portions of the oil tanker.

(a) *Side damage:*

(i) Longitudinal extent (l_c): $\frac{1}{3}L^{2/3}$ or 14.5 metres, whichever is less.

(ii) Transverse extent (t_c): $B/5$ or 11.5 metres, whichever is less.
(Inboard from the ship's side at right angles to the centreline at the level of the summer load line.)

(iii) Vertical extent (v_c): from the base line upward without limit.

(b) *Bottom damage:* For $0.3L$ from the forward perpendicular of ship. Any other part of ship.

(i) Longitudinal extent (l_b): $L/10$, $L/10$ or 5 metres, whichever is less.

(ii) Transverse extent (t_b): $B/6$ or 10 metres, whichever is less but not less than 5 metres, 5 metres.

(iii) Vertical extent from the base line (v_b): $B/15$ or 6 metres, whichever is less.

(2) Wherever the symbols given in this Regulation appear in this Chapter, they have the meaning as defined in this Regulation.

Regulation 23

HYPOTHETICAL OUTFLOW OF OIL

(1) The hypothetical outflow of oil in the case of side damage (O_s) and bottom damage (O_b) shall be calculated by the following formulae with respect to compartments breached by damage to all conceivable locations along the length of the ship to the extent as defined in Regulation 22 of this Annex.

(a) for side damages:

$$O_s = \Sigma W_i + \Sigma K_i C_i \quad (I)$$

(b) for bottom damages:

$$O_b = 1/3(\Sigma Z_i W_i + \Sigma Z_i C_i) \quad (II)$$

where:

W_i = volume of a wing tank in cubic metres assumed to be breached by the damage as specified in Regulation 22 of this Annex; W_i for a segregated ballast tank may be taken equal to zero,

C_i = volume of a centre tank in cubic metres assumed to be breached by the damage as specified in Regulation 22 of this Annex; C_i for a segregated ballast tank may be taken equal to zero,

$K_i = 1 - (b_i/t_c)$; when b_i is equal to or greater than t_c , K_i shall be taken equal to zero,

$Z_i = 1 - (h_i/v_b)$; when h_i is equal to or greater than v_b , Z_i shall be taken equal to zero,

b_1 = width of wing tank in metres under consideration measured inboard from the ship's side at right angles to the centreline at the level corresponding to the assigned summer freeboard.

h_1 = minimum depth of the double bottom in metres under consideration; where no double bottom is fitted h_1 shall be taken equal to zero,

Whenever symbols given in this paragraph appear in this chapter, they have the meaning as defined in this Regulation.

(2) If a void space or segregated ballast tank of a length less than l_c as defined in Regulation 22 of this Annex is located between wing oil tanks, O_c in formula (I) may be calculated on the basis of volume W_1 being the actual volume of one such tank (where they are of equal capacity) or the smaller of the two tanks (if they differ in capacity), adjacent to such space, multiplied by S_1 as defined below and taking for all other wing tanks involved in such a collision the value of the actual full volume.

$$S_1 = 1 - l_1/l_c$$

where: l_1 = length in metres of void space or segregated ballast tank under consideration.

(3) (a) Credit shall only be given in respect of double bottom tanks which are either empty or carrying clean water when cargo is carried in the tanks above.

(b) Where the double bottom does not extend for the full length and width of the tank involved, the double bottom is considered non-existent and the volume of the tanks above the area of the bottom damage shall be included in formula (II) even if the tank is not considered breached because of the installation of such a partial double bottom.

(c) Suction wells may be neglected in the determination of the value h_1 provided such wells are not excessive in area and extend below the tank for a minimum distance and in no case more than half the height of the double bottom. If the depth of such a well exceeds half the height of the double bottom, h_1 shall be taken equal to the double bottom height minus the well height.

Piping serving such wells if installed within the double bottom shall be fitted with valves or other closing arrangements located at the point of connection to the tank served to prevent oil outflow in the event of damage to the piping. Such piping shall be installed as high from the bottom shell as possible. These valves shall be kept closed at sea at any time when the tank contains oil cargo, except that they may be opened only for cargo transfer needed for the purpose of trimming of the ship.

(4) In the case where bottom damage simultaneously involves four centre tanks, the value of O_c may be calculated according to the formula

$$O_c = 1/4 (\Sigma Z_1 W_1 + \Sigma Z_1 C_1) \quad (III)$$

(5) An Administration may credit as reducing oil outflow in case of bottom damage, an installed cargo transfer system having an emergency high suction in each cargo oil tank, capable of transferring from a breached tank or tanks to segregated ballast tanks or to available cargo tankage if it can be assured that such tanks will have sufficient ullage. Credit for such a system would be governed by ability to transfer in two hours of operation, oil equal to one half of the largest of the breached tanks involved and by availability of equivalent receiving capacity in ballast or cargo tanks. The credit shall be confined to permitting calculation of O_c according to formula (III). The pipes for such suction shall be installed at least at a height not less than the vertical extent of the bottom damage r_s . The Administration shall supply the Organization with the information concerning the arrangements accepted by it, for circulation to other Parties to the Convention.

Regulation 24

LIMITATION OF SIZE AND ARRANGEMENT OF CARGO TANKS

(1) Every new oil tanker shall comply with the provisions of this Regulation. Every existing oil tanker shall be required, within two years after the date of entry into force of the present Convention, to comply with the provisions of this Regulation if such a tanker falls into either of the following categories:

- (a) a tanker, the delivery of which is after 1 January 1977; or
- (b) a tanker to which both the following conditions apply:
 - (i) delivery is not later than 1 January 1977 and

(ii) the building contract is placed after 1 January 1974, or in cases where no building contract has previously been placed, the keel is laid or the tanker is at a similar stage of construction after 30 June 1974.

(2) Cargo tanks of oil tankers shall be of such size and arrangements that the hypothetical outflow O_c and O_s calculated in accordance with the provisions of Regulation 23 of this Annex anywhere in the length of the ship does not exceed 30,000 cubic metres or $400^2\sqrt{DW}$, whichever is the greater, but subject to a maximum of 40,000 cubic metres.

(3) The volume of any one wing cargo oil tank of an oil tanker shall not exceed seventy-five per cent of the limits of the hypothetical oil outflow referred to in paragraph (2) of this Regulation. The volume of any one centre cargo oil tank shall not exceed 50,000 cubic metres. However in segregated ballast oil tankers as defined in Regulation 13 of this Annex, the permitted volume of a wing cargo oil tank situated between two segregated ballast tanks, each exceeding l_c in length, may be increased to the maximum limit of hypothetical oil outflow provided that the width of the wing tanks exceeds t_c .

(4) The length of each cargo tank shall not exceed 10 metres or one of the following values, whichever is the greater:

(a) where no longitudinal bulkhead is provided:

$$0.1L$$

(b) where a longitudinal bulkhead is provided at the centreline only:

$$0.15L$$

(c) where two or more longitudinal bulkheads are provided:

(i) for wing tanks:

$$0.2L$$

(ii) for centre tanks:

(1) if b_1/B is equal to or greater than $\frac{1}{6}$:

$$0.2L$$

(2) if b_1/B is less than $\frac{1}{6}$:

where no centreline longitudinal bulkhead is provided:

$$(0.5 \, b_1/B + 0.1)L$$

where a centreline longitudinal bulkhead is provided:

$$(0.25 \, b_1/B + 0.15)L$$

(5) In order not to exceed the volume limits established by paragraphs (2), (3) and (4) of this Regulation and irrespective of the accepted type of cargo transfer system installed, when such system interconnects two or more cargo tanks, valves or other similar closing devices shall be provided for separating the tanks from each other. These valves or devices shall be closed when the tanker is at sea.

(6) Lines of piping which run through cargo tanks in a position less than t_c from the ship's side or less than v_c from the ship's bottom shall be fitted with valves or similar closing devices at the point at which they open into any cargo tank. These valves shall be kept closed at sea at any time when the tanks contain cargo oil, except that they may be opened only for cargo transfer needed for the purpose of trimming of the ship.

Regulation 25

SUBDIVISION AND STABILITY

(1) Every new oil tanker shall comply with the subdivision and damage stability criteria as specified in paragraph (3) of this Regulation, after the assumed side or bottom damage as specified in paragraph (3) of this Regulation, for any operating draught reflecting actual partial or full load conditions consistent with trim and strength of the ship as well as specific gravities of the cargo. Such damage shall be applied to all conceivable locations along the length of the ship as follows:

(a) in tankers of more than 225 metres in length, anywhere in the ship's length;

(b) in tankers of more than 150 metres, but not exceeding 225 metres in length, anywhere in the ship's length except involving either after or forward bulkhead

bounding the machinery space located aft. The machinery space shall be treated as a single floodable compartment;

(o) in tankers not exceeding 150 metres in length, anywhere in the ship's length between adjacent transverse bulkheads with the exception of the machinery space. For tankers of 100 metres or less in length where all requirements of paragraph (3) of this Regulation cannot be fulfilled without materially impairing the operational qualities of the ship, Administrations may allow relaxations from these requirements.

Ballast conditions where the tanker is not carrying oil in cargo tanks excluding any oily residues, shall not be considered.

(2) The following provisions regarding the extent and the character of the assumed damage shall apply:

(a) the extent of side or bottom damage shall be as specified in Regulation 22 of this Annex, except that the longitudinal extent of bottom damage within $0.3L$ from the forward perpendicular shall be the same as for side damage, as specified in Regulation 22(1)(a)(i) of the Annex. If any damage of lesser extent results in a more severe condition such damage shall be assumed.

(b) where the damage involving transverse bulkheads is envisaged as specified in sub-paragraphs (1)(a) and (b) of this Regulation, transverse watertight bulkheads shall be spaced at least at a distance equal to the longitudinal extent of assumed damage specified in sub-paragraph (a) of this paragraph in order to be considered effective. Where transverse bulkheads are spaced at a lesser distance, one or more of these bulkheads within such extent of damage shall be assumed as non-existent for the purpose of determining flooded compartments.

(c) Where the damage between adjacent transverse watertight bulkheads is envisaged as specified in sub-paragraph (1)(c) of this Regulation, no main transverse bulkhead or a transverse bulkhead bounding side tanks or double bottom tanks shall be assumed damaged, unless:

(i) the spacing of the adjacent bulkheads is less than the longitudinal extent of assumed damage specified in sub-paragraph (a) of this paragraph; or

(ii) there is a step or a recess in a transverse bulkhead of more than 3.05 metres in length, located within the extent of penetration of assumed damage. The step formed by the after peak bulkhead and after peak tank top shall not be regarded as a step for the purpose of this Regulation.

(d) If pipes, ducts or tunnels are situated within the assumed extent of damage, arrangements shall be made so that progressive flooding cannot thereby extend to compartments other than those assumed to be floodable for each case of damage.

(3) Oil tankers shall be regarded as complying with the damage stability criteria if the following requirements are met:

(a) The final waterline, taking into account sinkage, heel and trim, shall be below the lower edge of any opening through which progressive flooding may take place. Such openings shall include air pipes and those which are closed by means of weathertight doors or hatch covers and may exclude those openings closed by means of watertight manhole covers and flush scuttles, small watertight cargo tank hatch covers which maintain the high integrity of the deck, remotely operated watertight sliding doors, and side scuttles of the non-opening type.

(b) In the final stage of flooding, the angle of heel due to unsymmetrical flooding shall not exceed 25 degrees, provided that this angle may be increased up to 30 degrees if no deck edge immersion occurs.

(c) The stability in the final stage of flooding shall be investigated and may be regarded as sufficient if the righting lever curve has at least a range of 20 degrees beyond the position of equilibrium in association with a maximum residual righting lever of at least 0.1 metre. The Administration shall give consideration to the potential hazard presented by protected or unprotected openings which may become temporarily immersed within the range of residual stability.

(d) The Administration shall be satisfied that the stability is sufficient during intermediate stages of flooding.

(4) The requirements of paragraph (1) of this Regulation shall be confirmed by calculations which take into consideration the design characteristics of the ship, the arrangements, configuration and contents of the damaged compartments; and the distribution, specific gravities and the free surface effect of liquids. The calculations shall be based on the following:

(a) Account shall be taken of any empty or partially filled tank, the specific gravity of cargoes carried, as well as any outflow of liquids from damaged compartments,

(b) The permeabilities are assumed as follows :

Spaces :	Permeability
Appropriated to stores.....	0.60.
Occupied by accommodation.....	0.95.
Occupied by machinery.....	0.85
Voids.....	0.95.
Intended for consumable liquids.....	¹ 0 or 0.95.
Intended for other liquids.....	² 0 to 0.95.

¹ Whichever results in the more severe requirements.

² The permeability of partially filled compartments shall be consistent with the amount of liquid carried.

(c) The buoyancy of any superstructure directly above the side damage shall be disregarded. The unflooded parts of superstructures beyond the extent of damage, however, may be taken into consideration provided that they are separated from the damaged space by watertight bulkheads and the requirements of subparagraph (3) (a) of this Regulation in respect of these intact spaces are complied with. Hinged watertight doors may be acceptable in watertight bulkheads in the superstructure.

(d) The free surface effect shall be calculated at an angle of heel of 5 degrees for each individual compartment. The Administration may require or allow the free surface corrections to be calculated at an angle of heel greater than 5 degrees for partially-filled tanks.

(e) In calculating the effect of free surfaces of consumable liquids it shall be assumed that, for each type of liquid at least one transverse pair or a single centre line tank has a free surface and the tank or combination of tanks to be taken into account shall be those where the effect of free surfaces is the greatest.

(5) The Master of every oil tanker and the person in charge of a non-self-propelled oil tanker to which this Annex applies shall be supplied in an approved form with :

(a) information relative to loading and distribution of cargo necessary to ensure compliance with the provisions of this Regulation ; and

(b) data on the ability of the ship to comply with damage stability criteria as determined by this Regulation, including the effect of relaxations that may have been allowed under subparagraph (1) (c) of this Regulation.

APPENDIX I—LIST OF OILS¹

Asphalt solutions :

Blending stocks
Roofers flux
Straight run residue

Oils :

Clarified
Crude oil
Mixtures containing crude oil
Diesel oil
Fuel oil No. 4
Fuel oil No. 5
Fuel oil No. 6
Residual fuel oil
Road oil
Transformer oil
Aromatic oil (excluding vegetable oil)
Lubricating oils and blending stocks
Mineral oil
Motor oil
Penetrating oil
Spindle oil
Turbine oil

Distillates :

Straight run
Flashed feed stocks

Gas oil : Cracked

Gasoline blending stocks :

Alkylates—fuel
Reformates
Polymer—fuel

Gasolines :

Casinghead (natural)
Automotive
Aviation
Straight run
Fuel oil No. 1 (Kerosene)
Fuel oil No. 1-D
Fuel oil No. 2
Fuel oil No. 2-D

Jet fuels :

JP-1 (Kerosene)
JP-3
JP-4
JP-5 (Kerosene, heavy)
Turbo fuel
Kerosene
Mineral spirit

Naphtha :

Solvent
Petroleum
Heartcut distillate oil

¹ The list of oils shall not necessarily be considered as comprehensive.

*Text of Annex II of the Convention Adopted by the Conference***REGULATIONS FOR THE CONTROL OF POLLUTION BY NOXIOUS LIQUID SUBSTANCES IN BULK***Regulation 1***DEFINITIONS**

For the purposes of this Annex :

(1) "Chemical tanker" means a ship constructed or adapted primarily to carry a cargo of noxious liquid substances in bulk and includes an "oil tanker" as defined in Annex I of the present Convention when carrying a cargo or part cargo of noxious liquid substances in bulk.

(2) "Clean ballast" means ballast carried in a tank which, since it was last used to carry a cargo containing a substance in Category A, B, C, or D has been thoroughly cleaned and the residues resulting therefrom have been discharged and the tank emptied in accordance with the appropriate requirements of this Annex.

(3) "Segregated ballast" means ballast water introduced into a tank permanently allocated to the carriage of ballast or to the carriage of ballast or cargoes other than oil or noxious liquid substances as variously defined in the Annexes of the present Convention, and which is completely separated from the cargo and oil fuel system.

(4) "Nearest land" is defined in Regulation 1(9) of Annex I of the present Convention.

(5) "Liquid substances" are those having a vapour pressure not exceeding 2.8 kp/cm² at a temperature of 37.8°C.

(6) "Noxious liquid substance" means any substance designated in Appendix II to this Annex or provisionally assessed under the provisions of Regulation 3(4) as falling into Category A, B, C or D.

(7) "Special area" means a sea area where for recognized technical reasons in relation to its oceanographic and ecological condition and to its peculiar transportation traffic the adoption of special mandatory methods for the prevention of sea pollution by noxious liquid substances is required.

Special areas shall be :

(a) The Baltic Sea Area, and

(b) The Black Sea Area.

(8) "Baltic Sea Area" is as defined in Regulation 10 of Annex I of the present Convention.

(9) "Black Sea Area" is as defined in Regulation 10 of Annex I of the present Convention.

*Regulation 2***APPLICATION**

(1) Unless expressly provided otherwise the provisions of this Annex shall apply to all ships carrying noxious liquid substances in bulk.

(2) Where a cargo subject to the provisions of Annex I of the present Convention is carried in a cargo space of a chemical tanker, the appropriate requirements of Annex I of the present Convention shall also apply.

(3) Regulation 13 of this Annex shall apply only to ships carrying substances which are categorized for discharge control purposes in Category A, B or C.

*Regulation 3***CATEGORIZATION AND LISTING OF NOXIOUS LIQUID SUBSTANCES**

(1) For the purpose of the Regulations of this Annex, except Regulation 13, noxious liquid substances shall be divided into four categories as follows :

(a) Category A—Noxious liquid substances which if discharged into the sea from tank cleaning or deballasting operations would present a major hazard

to either marine resources or human health or cause serious harm to amenities or other legitimate uses of the sea and therefore justify the application of stringent anti-pollution measures.

(b) Category B—Noxious liquid substances which if discharged into the sea from tank cleaning or deballasting operations would present a hazard to either marine resources or human health or cause harm to amenities or other legitimate uses of the sea and therefore justify the application of special anti-pollution measures.

(c) Category C—Noxious liquid substances which if discharged into the sea from tank cleaning or deballasting operations would present a minor hazard to either marine resources or human health or cause minor harm to amenities or other legitimate uses of the sea and therefore require special operational conditions.

(d) Category D—Noxious liquid substances which if discharged into the sea from tank cleaning or deballasting operations would present a recognizable hazard to either marine resources or human health or cause minimal harm to amenities or other legitimate uses of the sea and therefore require some attention in operational conditions.

(2) Guidelines for use in the categorization of noxious liquid substances are given in Appendix I to this Annex.

(3) The list of noxious liquid substances carried in bulk and presently categorized which are subject to the provisions of this Annex is set out in Appendix II to this Annex.

(4) Where it is proposed to carry a liquid substance in bulk which has not been categorized under paragraph (1) of this Regulation or evaluated as referred to in Regulation 4(1) of this Annex, the Governments of Parties to the Convention involved in the proposed operation shall establish and agree on a provisional assessment for the proposed operation on the basis of the guidelines referred to in paragraph (2) of this Regulation. Until full agreement between the governments involved has been reached, the substance shall be carried under the most severe conditions proposed. As soon as possible, but not later than ninety days after its first carriage, the Administration concerned shall notify the Organization and provide details of the substance and the provisional assessment for prompt circulation to all Parties for their information and consideration. The Government of each Party shall have a period of ninety days in which to forward its comments to the Organization, with a view to the assessment of the substance.

Regulation 4

OTHER LIQUID SUBSTANCES

(1) The substances listed in Appendix III to this Annex have been evaluated and found to fall outside the Categories A, B, C and D, as defined in Regulation 3(1) of this Annex because they are presently considered to present no harm to human health, marine resources, amenities or other legitimate uses of the sea, when discharged into the sea from tank cleaning or deballasting operations.

(2) The discharge of bilge or ballast water or other residues or mixtures containing only substances listed in Appendix III to this Annex shall not be subject to any requirement of this Annex.

(3) The discharge into the sea of clean ballast or segregated ballast shall not be subject to any requirement of this Annex.

Regulation 5

DISCHARGE OF NOXIOUS LIQUID SUBSTANCES—CATEGORIES A, B AND C SUBSTANCES OUTSIDE SPECIAL AREAS AND CATEGORY D SUBSTANCES IN ALL AREAS

Subject to the provisions of Regulation 6 of this Annex—

(1) The discharge into the sea of substances in Category A as defined in Regulation 3(1)(a) of this Annex or of those provisionally assessed as such or ballast water, tank washings, or other residues or mixtures containing such substances shall be prohibited. If tanks containing such substances or mixtures are to be washed, the resulting residues shall be discharged to a reception facility until the concentration of the substance in the effluent to such facility is at or below the residual concentration prescribed for that substance in column III of Appendix II to this Annex and until the tank is empty. Provided that the residue then remaining in the tank is subsequently diluted by the addition of a

volume of water of not less than 5 per cent of the total volume of the tank, it may be discharged into the sea when all the following conditions are also satisfied:

(a) the ship is proceeding en route at a speed of at least 7 knots in the case of self-propelled ships or at least 4 knots in the case of ships which are not self-propelled;

(b) the discharge is made below the waterline, taking into account the location of the seawater intakes; and

(c) the discharge is made at a distance of not less than 12 nautical miles from the nearest land and in a depth of water of not less than 25 metres.

(2) The discharge into the sea of substances in Category B as defined in Regulation 3(1)(b) of this Annex or of those provisionally assessed as such, or ballast water, tank washings, or other residues or mixtures containing such substances shall be prohibited except when all the following conditions are satisfied:

(a) the ship is proceeding en route at a speed of at least 7 knots in the case of self-propelled ships or at least 4 knots in the case of ships which are not self-propelled;

(b) the procedures and arrangements for discharge are approved by the Administration. Such procedures and arrangements shall be based upon standards developed by the Organization and shall ensure that the concentration and rate of discharge of the effluent is such that the concentration of the substance in the wake astern of the ship does not exceed 1 part per million;

(c) the maximum quantity of cargo discharged from each tank and its associated piping system does not exceed the maximum quantity approved in accordance with the procedures referred to in sub-paragraph (b) of this paragraph, which shall in no case exceed the greater of 1 cubic metre of 1/3,000 of the tank capacity in cubic metres;

(d) the discharge is made below the waterline, taking into account the location of the sea water intakes; and

(e) the discharge is made at a distance of not less than 12 nautical miles from the nearest land and in a depth of water of not less than 25 metres.

(3) The discharge into the sea of substances in Category C as defined in Regulation 3(1)(c) of this Annex or of those provisionally assessed as such, or ballast water, tank washings, or other residues or mixtures containing such substances shall be prohibited except when all the following conditions are satisfied:

(a) the ship is proceeding en route at a speed of at least 7 knots in the case of self-propelled ships or at least 4 knots in the case of ships which are not self-propelled;

(b) the procedures and arrangements for discharge are approved by the Administration. Such procedures and arrangements shall be based upon standards developed by the Organization and shall ensure that the concentration and rate of discharge of the effluent is such that the concentration of the substance in the wake astern of the ship does not exceed 10 parts per million;

(c) the maximum quantity of cargo discharged from each tank and its associated piping system does not exceed the maximum quantity approved in accordance with the procedures referred to in sub-paragraph (b) of this paragraph, which shall in no case exceed the greater of 3 cubic metres or 1/1000 of the tank capacity in cubic metres;

(d) the discharge is made below the waterline, taking into account the location of the sea water intakes; and

(e) the discharge is made at a distance of not less than 12 nautical miles from the nearest land and in a depth of water of not less than 25 metres.

(4) The discharge into the sea of substances in Category D as defined in Regulation 3(1)(d) of this Annex, or those provisionally assessed as such, or ballast water, tank washings, or other residues or mixtures containing such substances shall be prohibited except when all the following conditions are satisfied:

(a) the ship is proceeding en route at a speed of at least 7 knots in the case of self-propelled ships or at least 4 knots in the case of ships which are not self-propelled;

(b) such mixtures are of a concentration not greater than one part of the substance in ten parts of water; and

(c) the discharge is made at a distance of not less than 12 nautical miles from the nearest land.

(5) Ventilation procedures approved by the Administration may be used to remove cargo residues from a tank. Such procedures shall be based upon standards developed by the Organization. If subsequent washing of the tank is necessary, the discharge into the sea of the resulting tank washings shall be made in accordance with paragraph (1), (2), (3) or (4) of this Regulation, whichever is applicable.

(6) The discharge into the sea of substances which have not been categorized, provisionally assessed, or evaluated as referred to in Regulation 4(1) of this Annex, or of ballast water, tank washings, or other residues or mixtures containing such substances shall be prohibited.

CATEGORIES A, B AND C SUBSTANCES WITHIN SPECIAL AREAS

Subject to the provisions of Regulation 6 of this Annex—

(7) The discharge into the sea of substances in Category A as defined in Regulation 3(1) (a) of this Annex, or of those provisionally assessed as such, or ballast water, tank washings, or other residues or mixtures containing such substances shall be prohibited. If tanks containing such substances or mixtures are to be washed the resulting residues shall be discharged to a reception facility which the States bordering the special area shall provide in accordance with Regulation 7 of this Annex, until the concentration of the substance in the effluent to such facility is at or below the residual concentration prescribed for that substance in column IV of Appendix II to this Annex and until the tank is empty. Provided that the residue then remaining in the tank is subsequently diluted by the addition of a volume of water of not less than 5 per cent of the total volume of the tank, it may be discharged into the sea when all the following conditions are also satisfied:

(a) the ship is proceeding en route at a speed of at least 7 knots in the case of self-propelled ships or at least 4 knots in the case of ships which are not self-propelled;

(b) the discharge is made below the waterline, taking into account the location of the seawater intakes; and

(c) the discharge is made at a distance of not less than 12 nautical miles from the nearest land and in a depth of water of not less than 25 metres.

(8) The discharge into the sea of substances in Category B as defined in Regulation 3(1) (b) of this Annex or of those provisionally assessed as such, or ballast water, tank washings, or other residues or mixtures containing such substances shall be prohibited except when all the following conditions are satisfied:

(a) the tank has been washed after unloading with a volume of water of not less than 0.5 per cent of the total volume of the tank, and the resulting residues have been discharged to a reception facility until the tank is empty;

(b) the ship is proceeding on route at a speed of at least 7 knots in the case of self-propelled ships or at least 4 knots in the case of ships which are not self-propelled;

(c) the procedures and arrangements for discharge and washings are approved by the Administration. Such procedures and arrangements shall be based upon standards developed by the Organization and shall ensure that the concentration and rate of discharge of the effluent is such that the concentration of the substance in the wake astern of the ship does not exceed 1 part per million;

(d) the discharge is made below the waterline, taking into account the location of the seawater intakes; and

(e) the discharge is made at a distance of not less than 12 nautical miles from the nearest land and in a depth of water of not less than 25 metres.

(9) The discharge into the sea of substances in Category C as defined in Regulation 3(1) (c) of this Annex or of those provisionally assessed as such, or ballast water, tank washings, or other residues or mixtures containing such substances shall be prohibited except when all the following conditions are satisfied:

(a) the ship is proceeding en route at a speed of at least 7 knots in the case of self-propelled ships or at least 4 knots in the case of ships which are not self-propelled;

(b) the procedures and arrangements for discharge are approved by the Administration. Such procedures and arrangements shall be based upon standards developed by the Organization and shall ensure that the concentra-

tion and rate of discharge of the effluent is such that the concentration of the substance in the wake astern of the ship does not exceed 1 part per million ;

(c) the maximum quantity of cargo discharged from each tank and its associated piping system does not exceed the maximum quantity approved in accordance with the procedures referred to in subparagraph (b) of this paragraph which shall in no case exceed the greater of 1 cubic metre or 1/3,000 of the tank capacity in cubic metres.

(d) the discharge is made below the waterline, taking into account the location of the seawater intakes ; and

(e) the discharge is made at a distance of not less than 12 nautical miles from the nearest land and in a depth of water of not less than 25 metres.

(10) Ventilation procedures approved by the Administration may be used to remove cargo residues from a tank. Such procedures shall be based upon standards developed by the Organization. If subsequent washing of the tank is necessary, the discharge into the sea of the resulting tank washings shall be made in accordance with paragraphs (7), (8), or (9) of this Regulation, whichever is applicable.

(11) The discharge into the sea of substances which have not been categorized, provisionally assessed or evaluated as referred to in Regulation 4(1) of this Annex, or of ballast water, tank washings, or other residues or mixtures containing such substances shall be prohibited.

(12) Nothing in this Regulation shall prohibit a ship from retaining on board the residues from a category B or C cargo and discharging such residues into the sea outside a special area in accordance with paragraph (2) or (3) of this Regulation, respectively.

(13) (a) The Governments of Parties to the Convention, the coastlines of which border on any given special area, shall collectively agree and establish a date by which time the requirement of Regulation 7(1) of this Annex will be fulfilled and from which the requirements of paragraphs (7), (8), (9) and (10) of this Regulation in respect of that area shall take effect and notify the Organization of the date so established at least six months in advance of that date. The Organization shall then promptly notify all Parties of that date.

(b) If the date of entry into force of the present Convention is earlier than the date established in accordance with sub-paragraph (a) of this paragraph, the requirements of paragraphs (1), (2) and (3) of this Regulation shall apply during the interim period.

Regulation 6

EXCEPTION

Regulation 5 of this Annex shall not apply to :

(a) the discharge into the sea of noxious liquid substances or mixtures containing such substances necessary for the purpose of securing the safety of a ship or saving life at sea ; or

(b) the discharge into the sea of noxious liquid substances or mixtures containing such substances resulting from damage to a ship or its equipment :

(i) Provided that all reasonable precautions have been taken after the occurrence of the damage or discovery of the discharge for the purpose of preventing or minimizing the discharge ; and

(ii) except if the owner or the Master acted either with intent to cause damage, or recklessly and with knowledge that damage would probably result ; or

(c) the discharge into the sea of noxious liquid substances or mixtures containing such substances, approved by the Administration, when being used for the purpose of combating specific pollution incidents in order to minimize the damage from pollution. Any such discharge shall be subject to the approval of any Government in whose jurisdiction it is contemplated the discharge will occur.

Regulation 7

RECEPTION FACILITIES

(1) The Government of each Party to the Convention undertakes to ensure the provision of reception facilities according to the needs of ships using its ports, terminals or repair ports as follows :

(a) cargo loading and unloading ports and terminals shall have facilities adequate for reception without undue delay to ships of such residues and

mixtures containing noxious liquid substances as would remain for disposal from ships carrying them as a consequence of the application of this Annex : and

(b) ship repair ports undertaking repairs to chemical tankers shall have facilities adequate for the reception of residues and mixtures containing noxious liquid substances.

(2) The Government of each Party shall determine the types of facilities provided for the purpose of paragraph (1) of this Regulation at each cargo loading and unloading port, terminal and ship repair port in its territories and notify the Organization thereof.

(3) Each Party shall notify to the Organization, for transmission to the Parties concerned, of any case where facilities required under paragraph (1) of this Regulation are alleged to be inadequate.

Regulation 8

MEASURES OF CONTROL

(1) The Government of each Party to the Convention shall appoint or authorize surveyors for the purpose of implementing this Regulation.

Category A Substance in All Areas

(2) (a) If a tank is partially unloaded or unloaded but not cleaned, an appropriate entry shall be made in the Cargo Record Book.

(b) Until that tank is cleaned every subsequent pumping or transfer operation carried out in connection with that tank shall also be entered in the Cargo Record Book.

(3) If the tank is to be washed :

(a) The effluent from the tank washing operation shall be discharged from the ship to a reception facility at least until the concentration of the substance in the discharge, as indicated by analyses of samples of the effluent taken by the surveyor, has fallen to the residual concentration specified for that substance in Appendix II to this Annex. When the required residual concentration has been achieved, remaining tank washings shall continue to be discharged to the reception facility until the tank is empty. Appropriate entries of these operations shall be made in the Cargo Record Book and certified by the surveyor ;

(b) After diluting the residue then remaining in the tank with at least 5 per cent of the tank capacity of water, this mixture may be discharged into the sea in accordance with the provisions of sub-paragraphs (1)(a), (b) and (c) or 7(a), (b) and (c), whichever is applicable, of Regulation 5 of this Annex. Appropriate entries of these operations shall be made in the Cargo Record Book.

(4) Where the Government of the receiving Party is satisfied that it is impracticable to measure the concentration of the substance in the effluent without causing undue delay to the ship, that Party may accept an alternative procedure as being equivalent to sub-paragraph (3)(a) provided that :

(a) a precleaning procedure for that tank and that substance, based on standards developed by the Organization, is approved by the Administration and that Party is satisfied that such procedure will fulfil the requirements of paragraph (1) or (7), whichever is applicable, of Regulation 5 of this Annex with respect to the attainment of the prescribed residual concentrations ;

(b) a surveyor duly authorized by that Party shall certify in the Cargo Record Book that :

(i) the tank, its pump and piping system have been emptied, and that the quantity of cargo remaining in the tank is at or below the quantity on which the approved precleaning procedure referred to in sub-paragraph (ii) of this paragraph has been based ;

(ii) precleaning has been carried out in accordance with the precleaning procedure approved by the Administration for that tank and that substance ; and

(iii) the tank washings resulting from such precleaning have been discharged to a reception facility and the tank is empty ;

(c) the discharge into the sea of any remaining residues shall be in accordance with the provisions of paragraph (3)(b) of this Regulation and an appropriate entry is made in the Cargo Record Book.

Category B substances outside special areas and category C substances in all areas

(5) Subject to such surveillance and approval by the authorized or appointed surveyor as may be deemed necessary by the Government of the Party, the Master of a ship shall, with respect to a Category B substance outside special areas or a Category C substance in all areas, ensure compliance with the following:

(a) If a tank is partially unloaded or unloaded but not cleaned, an appropriate entry shall be made in the Cargo Record Book.

(b) If the tank is to be cleaned at sea:

(i) the cargo piping system serving that tank shall be drained and an appropriate entry made in the Cargo Record Book;

(ii) the quantity of substance remaining in the tank shall not exceed the maximum quantity which may be discharged into the sea for that substance under Regulation 5(2)(c) of this Annex outside special areas in the case of Category B substances, or under Regulations 5(3)(c) and 5(9)(c) outside and within special areas respectively in the case of Category C substances. An appropriate entry shall be made in the Cargo Record Book;

(iii) where it is intended to discharge the quantity of substance remaining into the sea the approved procedures shall be complied with, and the necessary dilution of the substance satisfactory for such a discharge shall be achieved. An appropriate entry shall be made in the Cargo Record Book; or

(iv) where the tank washings are not discharged into the sea, if any internal transfer of tank washings takes place from that tank an appropriate entry shall be made in the Cargo Record Book; and

(v) any subsequent discharge into the sea of such tank washings shall be made in accordance with the requirements of Regulation 5 of this Annex for the appropriate area and Category of substance involved.

(c) If the tank is to be cleaned in port:

(i) the tank washings shall be discharged to a reception facility and an appropriate entry shall be made in the Cargo Record Book; or

(ii) the tank washings shall be retained on board the ship and an appropriate entry shall be made in the Cargo Record Book indicating the location and disposition of the tank washings.

(d) If after unloading a Category C substance within a special area, any residues or tank washings are to be retained on board until the ship is outside the special area, the Master shall so indicate by an appropriate entry in the Cargo Record Book and in this case the procedures set out in Regulation 5(3) of this Annex shall be applicable.

Category B substances within special areas

(6) Subject to such surveillance and approval by the authorized or appointed surveyor as may be deemed necessary by the Government of the Party, the Master of a ship shall, with respect to a Category B substance within a special area, ensure compliance with the following:

(a) If a tank is partially unloaded or unloaded but not cleaned, an appropriate entry shall be made in the Cargo Record Book.

(b) Until that tank is cleaned every subsequent pumping or transfer operation carried out in connection with that tank shall also be entered in the Cargo Record Book.

(c) If the tank is to be washed, the effluent from the tank washing operation, which shall contain a volume of water not less than 0.5 per cent of the total volume of the tank, shall be discharged from the ship to a reception facility until the tank, its pump and piping system are empty. An appropriate entry shall be made in the Cargo Record Book.

(d) If the tank is to be further cleaned and emptied at sea, the Master shall:

(i) ensure that the approved procedures referred to in Regulation 5(8)(c) of this Annex are complied with and that the appropriate entries are made in the Cargo Record Book; and

(ii) ensure that any discharge into the sea is made in accordance with the requirements of Regulation 5(8) of this Annex and an appropriate entry is made in the Cargo Record Book.

(e) If after unloading a Category B substance within a special area, any residues or tank washings are to be retained on board until the ship is outside the special area, the Master shall so indicate by an appropriate entry in the Cargo Record Book and in this case the procedures set out in Regulation 5(2) of this Annex shall be applicable.

Category D substances in all areas

(7) The Master of a ship shall, with respect to a Category D substance, ensure compliance with the following:

(a) If a tank is partially unloaded or unloaded but not cleaned, an appropriate entry shall be made in the Cargo Record Book.

(b) If the tank is to be cleaned at sea:

(i) the cargo piping system serving that tank shall be drained and an appropriate entry made in the Cargo Record Book;

(ii) where it is intended to discharge the quantity of substance remaining into the sea, the necessary dilution of the substance satisfactory for such a discharge shall be achieved. An appropriate entry shall be made in the Cargo Record Book;

(iii) where the tank washings are not discharged into the sea, if any internal transfer of tank washings takes place from that tank an appropriate entry shall be made in the Cargo Record Book; and

(iv) any subsequent discharge into the sea of such tank washings shall be made in accordance with the requirements of Regulation 5(4) of this Annex.

(c) If the tank is to be cleaned in port:

(i) the tank washings shall be discharged to a reception facility and an appropriate entry shall be made in the Cargo Record Book; or

(ii) the tank washings shall be retained on board the ship and an appropriate entry shall be made in the Cargo Record Book indicating the location and disposition of the tank washings.

Discharge from a slop tank

(8) Any residues retained on board in a slop tank, including those from pump room bilges, which contain a Category A substance, or within a special area either a Category A or a Category B substance, shall be discharged to a reception facility in accordance with the provisions of Regulation 5(1), (7) or (8) of this Annex, whichever is applicable. An appropriate entry shall be made in the Cargo Record Book.

(9) Any residues retained on board in a slop tank, including those from pump room bilges, which contain a quantity of a Category B substances outside a special area or a Category C substance in all areas in excess of the aggregate of the maximum quantities specified in Regulation 5(2)(c), (3)(c) or (9)(c) of this Annex, whichever is applicable, shall be discharged to a reception facility. An appropriate entry shall be made in the Cargo Record Book.

Regulation 9

CARGO RECORD BOOK

(1) Every ship to which this Annex applies shall be provided with a Cargo Record Book, whether as part of the ship's official log book or otherwise, in the form specified in Appendix IV to this Annex.

(2) The Cargo Record Book shall be completed, on a tank-to-tank basis, whenever any of the following operations with respect to a noxious liquid substance take place in the ship:

(i) loading of cargo;

(ii) unloading of cargo;

(iii) transfer of cargo;

(iv) transfer of cargo, cargo residues or mixtures containing cargo to a slop tank;

(v) cleaning of cargo tanks;

(vi) transfer from slop tanks;

(vii) ballasting of cargo tanks;

(viii) transfer of dirty ballast water;

(ix) discharge into the sea in accordance with Regulation 5 of this Annex.

(3) In the event of any discharge of the kind referred to in Article 7 of the

present Convention and Regulation 6 of this Annex of any noxious liquid substance or mixture containing such substance, whether international or accidental, an entry shall be made in the Cargo Record Book stating the circumstances of, and the reason for, the discharge.

(4) When a surveyor appointed or authorized by the Government of the Party to the Convention to supervise any operations under this Annex has inspected a ship, then that surveyor shall make an appropriate entry in the Cargo Record Book.

(5) Each operation referred to in paragraphs (2) and (3) of this Regulation shall be fully recorded without delay in the Cargo Record Book so that all the entries in the Book appropriate to that operation are completed. Each entry shall be signed by the officer or officers in charge of the operation concerned and, when the ship is manned, each page shall be signed by the Master of the ship. The entries in the Cargo Record Book shall be in an official language of the State whose flag the ship is entitled to fly, and, for ships holding an International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances in Bulk (1973) in English or French. The entries in an official national language of the State whose flag the ship is entitled to fly shall prevail in case of a dispute or discrepancy.

(6) The Cargo Record Book shall be kept in such a place as to be readily available for inspection and, except in the case of unmanned ships under tow, shall be kept on board the ship. It shall be retained for a period of two years after the last entry has been made.

(7) The competent authority of the Government of a Party may inspect the Cargo Record Book on board any ship to which this Annex applies while the ship is in its port, and may make a copy of any entry in that book and may require the Master of the ship to certify that the copy is a true copy of such entry. Any copy so made which has been certified by the Master of the ship as a true copy of an entry in the ship's Cargo Record Book shall be made admissible in any judicial proceedings as evidence of the facts stated in the entry. The inspection of a Cargo Record Book and the taking of a certified copy by the competent authority under this paragraph shall be performed as expeditiously as possible without causing the ship to be unduly delayed.

Regulation 10

SURVEYS

(1) Ships which are subject to the provisions of this Annex and which carry noxious liquid substances in bulk shall be surveyed as follows:

(a) An initial survey before a ship is put into service or before the certificate required by Regulation 11 of this Annex is issued for the first time, which shall include a complete inspection of its structure, equipment, fittings, arrangements and material insofar as the ship is covered by this Annex.

The survey shall be such as to ensure full compliance with the applicable requirements of this Annex.

(b) Periodical surveys at intervals specified by the Administration which shall not exceed five years and which shall be such as to ensure that the structure, equipment, fittings, arrangements and material fully comply with the applicable requirements of this Annex. However, where the duration of the International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances in Bulk (1973) is extended as specified in Regulation 12 (2) or (4) of this Annex, the interval of the periodical survey may be extended correspondingly.

(c) Intermediate surveys at intervals specified by the Administration which shall not exceed thirty months and which shall be such as to ensure that the equipment and associated pumps and piping systems, fully comply with the applicable requirements of this Annex and are in good working order. The survey shall be endorsed on the International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances in Bulk (1973) issued under Regulation 11 of this Annex.

(2) Surveys of a ship with respect to the enforcement of the provisions of this Annex shall be carried out by officers of the Administration. The Administration may, however, entrust the surveys either to surveyors nominated for the purpose or to organizations recognized by it. In every case the Administration concerned shall fully guarantee the completeness and efficiency of the survey.

(3) After any survey of a ship under this Regulation has been completed, no significant change shall be made in the structure, equipment, fittings, arrangements or material, covered by the survey without the sanction of the Administration, except the direct replacement of such equipment and fittings for the purpose of repair or maintenance.

Regulation 11

ISSUE OF CERTIFICATE

(1) An International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances in Bulk (1973) shall be issued to any ship carrying noxious liquid substances which is engaged in voyages to ports or offshore terminals under the jurisdiction of other Parties to the Convention after survey of such ship in accordance with the provisions of Regulation 10 of this Annex.

(2) Such Certificate shall be issued either by the Administration or by a person or organization duly authorized by it. In every case the Administration shall assume full responsibility for the certificate.

(3) (a) The Government of a Party may, at the request of the Administration, cause a ship to be surveyed and if satisfied that the provisions of this Annex are complied with shall issue or authorize the issue of a Certificate to the ship in accordance with this Annex.

(b) A copy of the Certificate and a copy of the survey report shall be transmitted as soon as possible to the requesting Administration.

(c) A Certificate so issued shall contain a statement to the effect that it has been issued at the request of the Administration and shall have the same force and receive the same recognition as a certificate issued under paragraph (1) of this Regulation.

(d) No International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances in Bulk (1973) shall be issued to any ship which is entitled to fly the flag of a State which is not a Party.

(4) The Certificate shall be drawn up in an official language of the issuing country in a form corresponding to the model given in Appendix V to this Annex. If the language used is neither English nor French, the text shall include a translation into one of those languages.

Regulation 12

DURATION OF CERTIFICATE

(7) On International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances in Bulk (1973) shall be issued for a period specified by the Administration, which shall not exceed five years from the date of issue, except as provided in paragraphs (2) and (4) of this Regulation.

(2) If a ship at the time when the Certificate expires is not in a port or offshore terminal under the jurisdiction of the Party to the Convention whose flag the ship is entitled to fly, the Certificate may be extended by the Administration, but such extension shall be granted only for the purpose of allowing the ship to complete its voyage to the State whose flag the ship is entitled to fly or in which it is to be surveyed and then only in cases where it appears proper and reasonable to do so.

(3) No Certificate shall be thus extended for a period longer than five months and a ship to which such extension is granted shall not on its arrival in the State whose flag it is entitled to fly or the port in which it is to be surveyed, be entitled by virtue of such extension to leave that port or State without having obtained a new Certificate.

(4) A Certificate which has not been extended under the provisions of paragraph (2) of this Regulation may be extended by the Administration for a period of grace of up to one month from the date of expiry stated on it.

(5) A Certificate shall cease to be valid if significant alterations have taken place in the structure, equipment, fittings, arrangements and material required by this Annex without the sanction of the Administration, except the direct replacement of such equipment or fitting for the purpose of repair or maintenance or if intermediate surveys as specified by the Administration under Regulation 10(1) (c) of this Annex are not carried out.

(6) A Certificate issued to a ship shall cease to be valid upon transfer of such a ship to the flag of another State, except as provided in paragraph (7) of this Regulation.

(7) Upon transfer of a ship to the flag of another Party, the Certificate shall remain in force for a period not exceeding five months provided that it would not have expired before the end of that period, or until the Administration issues a replacement certificate, whichever is earlier. As soon as possible after the transfer has taken place the Government of the Party whose flag the ship was formerly entitled to fly shall transmit to the Administration a copy of the Certificate carried by the ship before the transfer and, if available, a copy of the relevant survey report.

Regulation 13

REQUIREMENTS FOR MINIMIZING ACCIDENTAL POLLUTION

(1) The design, construction, equipment and operation of ships carrying noxious liquid substances in bulk which are subject to the provisions of this Annex shall be such as to minimize the uncontrolled discharge into the sea of such substances.

(2) Pursuant to the provisions of paragraph (1) of this Regulation, the Government of each Party shall issue, or cause to be issued, detailed requirements on the design, construction, equipment and operation of such ships.

(3) In respect of chemical tankers, the requirements referred to in paragraph (2) of this Regulation shall contain at least all the provisions given in the Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk adopted by the Assembly of the Organization in Resolution A.212(VII) and as may be amended by the Organization, provided that the amendments to that Code are adopted and brought into force in accordance with the provisions of Article 17 of the present Convention for amendment procedures to an Appendix to an Annex.

Appendix I

GUIDELINES FOR THE CATEGORIZATION OF NOXIOUS LIQUID SUBSTANCES

Category A.—Substances which are bioaccumulated and liable to produce a hazard to aquatic life or human health; or which are highly toxic to aquatic life (as expressed by a Hazard Rating 4, defined by a TLM less than 1 ppm); and additionally certain substances which are moderately toxic to aquatic life (as expressed by a Hazard Rating 3, defined by a TLM of 1 or more, but less than 10 ppm) when particular weight is given to additional factors in the hazard profile or to special characteristics of the substance.

Category B.—Substances which are bioaccumulated with a short retention of the order of one week or less; or which are liable to produce tainting of the sea food; or which are moderately toxic to aquatic life (as expressed by a Hazard Rating 3, defined by a TLM of 1 ppm or more, but less than 10 ppm); and additionally certain substances which are slightly toxic to aquatic life (as expressed by a Hazard Rating 2, defined by a TLM of 10 ppm or more, but less than 100 ppm) when particular weight is given to additional factors in the hazard profile or to special characteristics of the substance.

Category C.—Substances which are slightly toxic to aquatic life (as expressed by a Hazard Rating 2, defined by a TLM of 10 or more, but less than 100 ppm); and additionally certain substances which are practically non-toxic to aquatic life (as expressed by a Hazard Rating 1, defined by a TLM of 100 ppm or more, but less than 1,000 ppm) when particular weight is given to additional factors in the hazard profile or to special characteristics of the substance.

Category D.—Substances which are practically non-toxic to aquatic life (as expressed by a hazard rating 1, defined by a TLM of 100 ppm or more, but less than 1,000 ppm); or causing deposits blanketing the seafloor with a high biochemical oxygen demand (BOD); or highly hazardous to human health, with an LD₅₀ of less than 5 mg/kg; or produce moderate reduction of amenities because of persistency, smell or poisonous or irritant characteristics, possibly interfering with use of beaches; or moderately hazardous to human health, with an LD₅₀ of 5 mg/kg or more, but less than 50 mg/kg and produce slight reduction of amenities.

Other Liquid Substances (for the purposes of Regulation 4 of this Annex).—Substances other than those categorized in Categories A, B, C and D above.

APPENDIX II.—LIST OF NOXIOUS LIQUID SUBSTANCES CARRIED IN BULK

Substance	U.N. number	Pollution category for operational discharge (regulation 3 of annex II)	Residual concentration (percent by weight)	
			(Regulation 5(1) of annex II) outside special areas	(Regulation 5(7) of annex II) within special areas
	(I)	(II)	(III)	(IV)
Acetaldehyde	1089	C		
Acetic acid	1842	C		
Acetic anhydride	1715	C		
Acetone	1090	D		
Acetone cyanohydrin	1541	A	0.1	0.05
Acetyl chloride	1717	C		
Acrolein	1092	A	.1	.05
Acrylic acid ¹		C		
Acrylonitrile	1093	B		
Adiponitrile		D		
Alkylbenzene sulfonate:				
(Straight chain)		C		
(Branched chain)		B		
Allyl alcohol	1098	B		
Allyl chloride	1100	C		
Alum (15 percent solution)		D		
Aminoethylethanolamine (hydroxyethyl-ethylene-diamine) ¹		D		
Ammonia (28 percent aqueous)	1005	B		
iso-Amyl acetate	1104	C		
n-Amyl acetate	1104	C		
n-Amyl alcohol		D		
Aniline	1547	C		
Benzene	1114	C		
Benzyl alcohol		D		
Benzyl chloride	1738	B		
n-Butyl acetate	1123	D		
sec-Butyl acetate	1124	D		
n-Butyl acrylate		D		
Butyl butyrate ¹		B		
Butylene glycol(s)		D		
Butyl methacrylate		D		
n-Butyraldehyde	1129	B		
Butyric acid		B		
Calcium hydroxide (solution)		D		
Camphor oil	1130	B		
Carbon disulphide	1131	A	.01	.005
Carbon tetrachloride	1846	B		
Caustic potash (potassium hydroxide)	1814	C		
Chloroacetic acid	1750	C		
Chloroform	1888	B		
Chlorohydrins (crude) ¹		D		
Chloroprene ¹	1991	C		
Chlorosulphonic acid	1754	C		
para-Chlorotoluene		B		
Citric acid (10 to 25 percent)		D		
Cresosote	1334	A	.1	.05
Cresols	2076	A	.1	.05
Cresylic acid	2022	A	.1	.05
Crotonaldehyde	1143	B		
Cumene	1918	C		
Cyclohexane	1145	C		
Cyclohexanol		D		
Cyclohexanene	1915	D		
Cyclohexylamine ¹		D		
Para-Cymene (isopropyltoluene) ¹	2046	D		
Decahydronaphthalene	1147	D		
Decane ¹		D		
Diacetone alcohol ¹	1148	D		
Dibenzyl ether ¹		C		
Dichlorobenzenes	1591	A	.1	.05
Dichloroethyl ether	1916	B		
Dichloropropene-Dichloropropane mixture (D.D. soil fumigant)	2047	B		
Diethylamine	1154	C		
Diethylbenzene (mixed isomers)	2049	C		
Diethyl ether	1155	D		
Diethylene triamine ¹	2079	C		
Diethylene glycol monoethyl ether		C		
Diethylketone (3-pentanene)	1156	D		
Diisobutylene ¹	2050	D		

See footnote at end of table.

APPENDIX II.—LIST OF NOXIOUS LIQUID SUBSTANCES CARRIED IN BULK—Continued

Substance	U.N. number	Pollution category for operational discharge (regulation 3 of annex II)	Residual concentration (percent by weight)	
			(Regulation 5(1) of annex II) outside special areas	(Regulation 5(7) of annex II) within special areas
	(I)	(II)	(III)	(IV)
Diisobutyl ketone.....	1157	D		
Diisopropanolamine.....	1158	C		
Diisopropylamine.....	1158	C		
Diisopropyl ether ¹	1159	D		
Dimethylamine (40 percent aqueous).....	1160	C		
Dimethylformamide (form-dimethylamide).....		D		
Dimethylethanolamine (2-dimethylaminoethanol) ¹	2051	C		
1,4-dioxane ¹	1165	C		
Diphenyl/diphenyloxide mixtures ¹		D		
Dodecylbenzene.....		C		
Epichlorohydrine.....	2023	B		
2-ethoxyethyl acetate ¹	1172	D		
Ethyl acetate.....	1173	D		
Ethyl acrylate.....	1917	D		
Ethyl amyl ketone ¹		C		
Ethylbenzene.....	1175	C		
Ethyl cyclohexane.....		D		
Ethylene chlorohydrin (2-chloro-ethanol).....	1135	D		
Ethylene cyanohydrin ¹		D		
Ethylenediamine.....	1604	C		
Ethylene dibromide.....	1605	D		
Ethylene dichloride.....	1184	B		
Ethylene glycol monethyl ether (methyl cellosolve).....	1171	D		
2-ethylhexyl acrylate ¹		C		
2-ethylhexyl alcohol.....		D		
Ethyl lactate ¹	1192	D		
2-ethyl 3-propylacrolein ¹		B		
Formaldehyde (37 to 50 percent solution).....	1198	C		
Formic acid.....	1779	D		
Furfuryl alcohol.....		C		
Heptanoic acid ¹		D		
Hexamethylenediamine ¹	1783	C		
Hydrochloric acid.....	1789	D		
Hydrofluoric acid (40 percent aqueous).....	1790	B		
Hydrogen peroxide (greater than 60 percent).....	2015	C		
Isobutyl acrylate.....		D		
Isobutyl alcohol.....	1212	D		
Isobutyl methacrylate.....		D		
Isobutyraldehyde.....	2045	C		
Isooctane ¹		D		
Isopentane.....		D		
Isophorone.....		D		
Isopropylamine.....	1221	C		
Isopropyl cyclohexane.....		D		
Isoprene.....	1218	D		
Lactic acid.....		D		
Mesityl oxide ¹	1229	C		
Methyl acetate.....	1231	D		
Methyl acrylate.....	1919	C		
Methylamyl alcohol.....		B		
Methylene chloride.....	1593	B		
2-Methyl-5-ethyl-pyridine ¹		B		
Methyl methacrylate.....	1247	D		
2-Methylpentene ¹		D		
alpha-Methylstyrene ¹		D		
Monochlorobenzene.....	1134	B		
Monoethanolamine.....		D		
Monoisopropanolamine.....		C		
Monomethyl othanolamine.....		C		
Mononitrobenzene.....		C		
Monoisopropylamine.....		C		
Morpholine ¹	2054	C		
Naphthalene (mollen).....	1334	A	.1	.05
Naphthenic acids ¹		A	.1	.05
Nitric acid (90 percent).....	2031/2032	C		
2-Nitropropane.....		D		
ortho-Nitrotoluene.....	1664	C		
Nonyl alcohol ¹		C		
Nonylphenol.....		C		
n-Octanol.....		C		
Oleum.....	1831	C		
Oxalic acid (10 to 25 percent).....		D		
Pentachloroethane.....	1669	B		
n-Pentane.....	1265	C		
Perchloroethylene (tetrachloroethylene).....	1897	B		

See footnote at end of table.

APPENDIX II.—LIST OF NOXIOUS LIQUID SUBSTANCES CARRIED IN BULK—Continued

Substance	U.N. number	Pollution category for operational discharge (regulation 3 of annex II)	Residual concentration (percent by weight)	
			(Regulation 5(1) of annex II) outside special areas	(Regulation 5(7) of annex II) within special areas
	(I)	(II)	(III)	(IV)
Phenol.....	1671	B	-----	-----
Phosphoric acid.....	1805	D	-----	-----
Phosphorus (elemental).....	1338	A	.01	.005
Phthalic anhydride (molten).....		C	-----	-----
beta-Propiolactone ¹		B	-----	-----
Propionaldehyde.....	1275	D	-----	-----
Propionic acid.....	1848	D	-----	-----
Propionic anhydride.....		D	-----	-----
n-Propyl acetate ¹	1276	C	-----	-----
n-Propyl alcohol.....	1274	D	-----	-----
n-Propylamine.....	1277	C	-----	-----
Pyridine.....	1282	B	-----	-----
Silicon tetrachloride.....	1818	D	-----	-----
Sodium bichromate (solution).....		C	-----	-----
Sodium hydroxide.....	1824	C	-----	-----
Sodium pentachlorophenate (solution).....		A	.1	.05
Styrene monomer.....	2055	C	-----	-----
Sulphuric acid.....	1830/1831/1832	C	-----	-----
Tallow.....		D	-----	-----
Tetraethyllead.....	1649	A	.1	.05
Tetrahydrofuran.....		D	-----	-----
Tetrahydronaphthalene.....	1540	C	-----	-----
Tetramethylbenzene.....		D	-----	-----
Tetramethyllead.....	1649	A	.1	.05
Titanium tetrachloride.....		D	-----	-----
Toluene.....	1294	C	-----	-----
Toluene diisocyanate ¹	2078	B	-----	-----
Trichloroethane.....		C	-----	-----
Trichloroethylene.....	1710	B	-----	-----
Triethanolamine.....		D	-----	-----
Triethylamine.....	1296	C	-----	-----
Trimethylbenzene ¹		C	-----	-----
Tritolyl phosphate (tricresyl phosphate) ¹		B	-----	-----
Turpentine (wood).....	1299	B	-----	-----
Vinyl acetate.....	1301	C	-----	-----
Vinylidene chloride ¹	1303	B	-----	-----
Xylenes (mixed isomers).....	1307	C	-----	-----

¹ Substance has been provisionally included in this list and that further data are necessary in order to complete the evaluation of its environmental hazards, particularly in relation to living resources.

Appendix III

LIST OF OTHER LIQUID SUBSTANCES CARRIED IN BULK

Acetonitrile (Methyl cyanide)	n-Hexane
tert-Amyl alcohol	Ligroin
n-Butyl alcohol	Methyl alcohol
Butyrolactone	Methylamyl acetate
Calcium chloride (solution)	Methyl ethyl ketone (2-butanone)
Castor oil	Milk
Citric juices	Molasses
Coconut oil	Olive Oil
Cod liver oil	Polypropylene glycol
iso-Decyl alcohol	iso-Propyl acetate
n-Decyl alcohol	iso-Propyl alcohol
Decyl octyl alcohol	Propylene glycol
Dibutyl ether	Propylene oxide
Diethanolamine	Propylene tetramer
Diethylene glycol	Propylene trimer
Dipentene	Sorbitol
Dipropylene glycol	Sulphur (liquid)
Ethyl alcohol	Tridecanol
Ethylene glycol	Triethylene glycol
Fatty alcohols (C ₁₇ -C ₂₀)	Triethylenetetramine
Glycerine	Tripolyene glycol
n-Heptane	Water
Heptene (mixed isomers)	Wine

*Appendix IV***CARGO RECORD BOOK FOR SHIPS CARRYING NOXIOUS LIQUID SUBSTANCES
IN BULK**

Name of ship-----

Cargo carrying capacity of each tank in cubic metres-----

Voyage from----- to -----

(a) Loading of cargo:

1. Date and place of loading.
2. Name and category of cargo(es) loaded.
3. Identity of tank(s) loaded.

(b) Transfer of cargo:

4. Date of transfer.
5. Identity of tank(s) (i) From
(ii) To
6. Was(were) tank(s) in 5(i) emptied?
7. If not, quantity remaining.

(c) Unloading of cargo:

8. Date and place of unloading.
9. Identity of tank(s) unloaded.
10. Was(were) tank(s) emptied?
11. If not, quantity remaining in tank(s).
12. Is(are) tank(s) to be cleaned?
13. Amount transferred to slop tank.
14. Identity of slop tank.

(d) Ballasting of cargo tanks:

15. Identity of tank(s) ballasted.
16. Date and position of ship at start of ballasting.

*(c) Cleaning of cargo tanks:**Category A substances:*

17. Identity of tank(s) cleaned.
18. Date and location of cleaning.
19. Method(s) of cleaning.
20. Location of reception facility used.
21. Concentration of effluent when discharge to reception facility stopped.
22. Quantity remaining in tank.
23. Procedure and amount of water introduced into tank in final cleaning.
24. Location, date of discharge into sea.
25. Procedure and equipment used in discharge into the sea.

Category B, C and D substances:

26. Washing procedure used.
27. Quantity of water used.
28. Date, location of discharge into sea.
29. Procedure and equipment used in discharge into the sea.

(f) Transfer of dirty ballast water:

30. Identity of tank(s).
31. Date and position of ship at start of discharge into sea.
32. Date and position of ship at finish of discharge into sea.
33. Ship's speed(s) during discharge.
34. Quantity discharged into sea.
35. Quantity of polluted water transferred to slop tank(s) (identify slop tank(s)).
36. Date and port of discharge to shore reception facilities (if applicable).

(g) Transfer from slop tank/disposal of residue:

37. Identity of slop tank(s).
38. Quantity disposed from each tank.
39. Method of disposal of residue:
 - (a) Reception facilities.
 - (b) Mixed with cargo.

(c) Transferred to another (other) tank (s) (identify tank (s)).

(d) Other method.

40. Date and port of disposal of residue.

(h) *Accidental or other exceptional discharge:*

41. Date and time of occurrence.

42. Place or position of ship at time of occurrence.

43. Approximate quantity, name and category of substance.

44. Circumstances of discharge or escape and general remarks.

Signature of Master

Text of Annex III of the Convention Adopted by the Conference

ANNEX III. REGULATIONS FOR THE PREVENTION OF POLLUTION BY HARMFUL SUBSTANCES CARRIED BY SEA IN PACKAGED FORMS, OR IN FREIGHT CONTAINERS, PORTABLE TANKS OR ROAD AND RAIL TANK WAGONS

Regulation 1

APPLICATION

(1) Unless expressly provided otherwise, the Regulations of this Annex apply to all ships carrying harmful substances in packaged forms, or in freight containers, portable tanks or road and rail tank wagons.

(2) Such carriage of harmful substances is prohibited except in accordance with the provisions of this Annex.

(3) To supplement the provisions of this Annex the Government of each Party to the Convention shall issue, or cause to be issued, detailed requirements on packaging, marking and labelling, documentation, stowage, quantity limitations, exceptions and notification, for preventing or minimizing pollution of the marine environment by harmful substances.

(4) For the purpose of this Annex, empty receptacles, freight containers, portable tanks and road and rail tank wagons which have been used previously for the carriage of harmful substances shall themselves be treated as harmful substances unless adequate precautions have been taken to ensure that they contain no residue that is hazardous to the marine environment.

Regulation 2

PACKAGING

Packagings, freight containers, portable tanks and road and rail tank wagons shall be adequate to minimize the hazard to the marine environment having regard to their specific contents.

Regulation 3

MARKING AND LABELLING

Packages, whether shipped individually or in units or in freight containers, portable tanks or road and rail tank wagons containing a harmful substance, shall be durably marked with the correct technical name (trade names shall not be used as the correct technical name), and further marked with a distinctive label or stencil of label, indicating that the contents are harmful. Such identification shall be supplemented where possible by any other means, for example by the use of the United Nations number.

Regulation 4

DOCUMENTATION

(1) In all documents relating to the carriage of harmful substances by sea where such substances are named, the correct technical name of the substances shall be used (trade names shall not be used).

(2) The shipping documents supplied by the shipper shall include a certificate or declaration that the shipment offered for carriage is properly packed, marked and labelled and in proper condition for carriage to minimize the hazard to the marine environment.

(3) Each ship carrying harmful substances shall have a special list or manifest setting forth the harmful substances on board and the location thereof. A detailed stowage plan which sets out the location of all harmful substances on board may be used in place of such special list or manifest. Copies of such documents shall also be retained on shore by the owner of the ship or his representative until the harmful substances are unloaded.

(4) In a case where the ship carries a special list or manifest or a detailed stowage plan, required for the carriage of dangerous goods by the International Convention for the Safety of Life at Sea in force, the documents required for the purpose of this Annex may be combined with those for dangerous goods. Where documents are combined, a clear distinction shall be made between dangerous goods and other harmful substances.

Regulation 5

STOWAGE

Harmful substances shall be both properly stowed and secured so as to minimize the hazards to the marine environment without impairing the safety of ship and persons on board.

Regulation 6

QUANTITY LIMITATIONS

Certain harmful substances which are very hazardous to the marine environment may, for sound scientific and technical reasons, need to be prohibited for carriage or be limited as to the quantity which may be carried aboard any one ship. In limiting the quantity due consideration shall be given to size, construction and equipment of the ship as well as the packaging and the inherent nature of the substance.

Regulation 7

EXCEPTIONS

(1) Discharge by jettisoning of harmful substances carried in packaged forms, freight containers, portable tanks or road and rail tank wagons shall be prohibited except where necessary for the purpose of securing the safety of the ship or saving life at sea.

(2) Subject to the provisions of the present Convention, appropriate measures based on the physical, chemical and biological properties of harmful substances shall be taken to regulate the washing of leakages overboard provided that compliance with such measures would not impair the safety of the ship and persons on board.

Regulation 8

NOTIFICATION

With respect to certain harmful substances, as may be designated by the Government of a party to the Convention, the master or owner of the ship or his representative shall notify the appropriate port authority of the intent to load or unload such substances at least 24 hours prior to such action.

Text of Annex IV of the Convention Adopted by the Conference

ANNEX IV. REGULATIONS FOR THE PREVENTION OF POLLUTION BY SEWAGE FROM SHIPS

Regulation 1

DEFINITIONS

For the purposes of the present Annex:

(1) "New ship" means a ship:

(a) for which the building contract is placed, or in the absence of a building contract, the keel of which is laid, or which is at a similar stage of con-

struction on or after the date of entry into force of this Annex; or

(b) the delivery of which is three years or more after the date of entry into force of this Annex.

(2) "Existing ship" means a ship which is not a new ship.

(3) "Sewage" means:

(a) drainage and other wastes from any form of toilets, urinals, and WC scuppers;

(b) drainage from medical premises (dispensary, sick bay, etc.) via wash basins, wash tubs and scuppers located in such premises;

(c) drainage from spaces containing living animals; or

(d) other waste waters when mixed with the drainages defined above.

(4) "Holding tank" means a tank used for the collection and storage of sewage.

(5) "Nearest land". The term "from the nearest land" means from the baseline from which the territorial sea of the territory in question is established in accordance with international law except that, for the purposes of the present Convention "from the nearest land" off the north eastern coast of Australia shall mean from a line drawn from a point on the coast of Australia in:

Latitude 11° South, longitude 142°08' East to a point in latitude 10°35' South, longitude 141°55' East—thence to a point latitude 10°00' South, longitude 142°00' East, thence to a point latitude 9°10' South, longitude 143°52' East, thence to a point latitude 9°00' South, longitude 144°30' East, thence to a point latitude 13°00' South, longitude 144°00' East, thence to a point latitude 15°00' South, longitude 146°00' East, thence to a point latitude 18°00' South, longitude 147°00' East, thence to a point latitude 21°00' South, longitude 153°00' East, thence to a point on the coast of Australia in latitude 24°42' South, longitude 153°15' East.

Regulation 2

APPLICATION

The provisions of this Annex shall apply to:

(a) (i) new ships of more than 200 tons gross tonnage;

(ii) new ships of not more than 200 tons gross tonnage which are certified to carry more than 10 person;

(iii) new ships which do not have a measured gross tonnage and are certified to carry more than 10 persons; and

(b) (i) existing ships of more than 200 tons gross tonnage, 10 years after the date of entry into force of this Annex;

(ii) existing ships of not more than 200 tons gross tonnage which are certified to carry more than 10 persons, 10 years after the date of entry into force of this Annex; and

(iii) existing ships which do not have a measured gross tonnage and are certified to carry more than 10 persons, 10 years after the date of entry into force of this Annex.

Regulation 3

SURVEYS

(1) Every ship which is required to comply with the provisions of this Annex and which is engaged in voyages to ports or offshore terminals under the jurisdiction of other Parties to the Convention shall be subject to the surveys specified below:

(a) an initial survey before the ship is put in service or before the certificate required under Regulation 4 of this Annex is issued for the first time, which shall include a survey of the ship which shall be such as to ensure:

(i) when the ship is equipped with a sewage treatment plant the plant shall meet operational requirements based on standards and the test methods developed by the Organization;

(ii) when the ship is fitted with a system to comminute and disinfect the sewage, such a system shall be of a type approved by the Administration;

(iii) when the ship is equipped with a holding tank the capacity of such tank shall be to the satisfaction of the Administration for the retention of all sewage having regard to the operation of the ship, the number of persons on board and other relevant factors. The holding tank shall have a means to indicate visually the amount of its contents; and

(iv) that the ship is equipped with a pipeline leading to the exterior convenient for the discharge of sewage to a reception facility and that such a pipeline is fitted with a standard shore connection in compliance with Regulation 11 of this Annex.

This survey shall be such as to ensure that the equipment, fittings, arrangements and material fully comply with the applicable requirements of this Annex.

(b) Periodical surveys at intervals specified by the Administration but not exceeding five years which shall be such as to ensure that the equipment, fittings, arrangements and material fully comply with the applicable requirements of this Annex. However, where the duration of the International Sewage Pollution Prevention Certificate (1973) is extended as specified in Regulation 7(2) or (4) of this Annex, the interval of the periodical survey may be extended correspondingly.

(2) The Administration shall establish appropriate measures for ships which are not subject to the provisions of paragraph (1) of this Regulation in order to ensure that the provisions of this Annex are complied with.

(3) Surveys of the ship as regards enforcement of the provisions of this Annex shall be carried out by officers of the Administration. The Administration may, however, entrust the surveys either to surveyors nominated for the purpose or to organizations recognized by it. In every case the Administration concerned fully guarantees the completeness and efficiency of the surveys.

(4) After any survey of the ship under this Regulation has been completed, no significant change shall be made in the equipment, fittings, arrangements, or material covered by the survey without the approval of the Administration, except the direct replacement of such equipment or fittings.

Regulation 4

ISSUE OF CERTIFICATE

(1) An International Sewage Pollution Prevention Certificate (1973) shall be issued, after survey in accordance with the provisions of Regulation 3 of this Annex, to any ship which is engaged in voyages to ports or offshore terminals under the jurisdiction of other Parties to the Convention.

(2) Such Certificate shall be issued either by the Administration or by any persons or organization duly authorized by it. In every case the Administration assumes full responsibility for the Certificate.

Regulation 5

ISSUE OF A CERTIFICATE BY ANOTHER GOVERNMENT

(1) The Government of a Party to the Convention may, at the request of the Administration, cause a ship to be surveyed and, if satisfied that the provisions of this Annex are complied with, shall issue or authorize the issue of an International Sewage Pollution Prevention Certificate (1973) to the ship in accordance with this Annex.

(2) A copy of the Certificate and a copy of the survey report shall be transmitted as early as possible to the Administration requesting the survey.

(3) A Certificate so issued shall contain a statement to the effect that it has been issued at the request of the Administration and it shall have the same force and receive the same recognition as the certificate issued under Regulation 4 of this Annex.

(4) No International Sewage Pollution Prevention Certificate (1973) shall be issued to a ship which is entitled to fly the flag of a State, which is not a Party.

Regulation 6

FORM OF CERTIFICATE

The International Sewage Pollution Prevention Certificate (1973) shall be drawn up in an official language of the issuing country in the form corresponding to the model given in Appendix to this Annex. If the language used is neither English nor French, the text shall include a translation into one of these languages.

Regulation 7

DURATION OF CERTIFICATE

(1) An International Sewage Pollution Prevention Certificate (1973) shall be issued for a period specified by the Administration, which shall not exceed five years from the date of issue, except as provided in paragraphs (2), (3) and (4) of this Regulation.

(2) If a ship at the time when the Certificate expires is not in a port or off-shore terminal under the jurisdiction of the Party to the Convention whose flag the ship is entitled to fly, the Certificate may be extended by the Administration, but such extension shall be granted only for the purpose of allowing the ship to complete its voyage to the State whose flag the ship is entitled to fly or in which it is to be surveyed and then only in cases where it appears proper and reasonable to do so.

(3) No Certificate shall be thus extended for a period longer than five months and a ship to which such extension is granted shall not on its arrival in the State whose flag it is entitled to fly or the port in which it is to be surveyed, be entitled by virtue of such extension to leave that port or State without having obtained a new Certificate.

(4) A certificate which has not been extended under the provisions of paragraph (2) of this Regulation may be extended by the Administration for a period of grace of up to one month from the date of expiry stated on it.

(5) A Certificate shall cease to be valid if significant alterations have taken place in the equipment, fittings, arrangement or material required without the approval of the Administration, except the direct replacement of such equipment or fittings.

(6) A Certificate issued to a ship shall cease to be valid upon transfer of such a ship to the flag of another State, except as provided in paragraph (7) of this Regulation.

(7) Upon transfer of a ship to the flag of another Party, the Certificate shall remain in force for a period not exceeding five months provided that it would not have expired before the end of that period, or until the Administration issues a replacement Certificate, whichever is earlier. As soon as possible after the transfer has taken place the Government of the Party whose flag the ship was formerly entitled to fly shall transmit to the Administration a copy of the Certificate carried by the ship before the transfer and, if available, a copy of the relevant survey report.

Regulation 8

DISCHARGE OF SEWAGE

(1) Subject to the provisions of Regulation 9 of this Annex, the discharge of sewage into the sea is prohibited, except when:

(a) the ship is discharging comminuted and disinfected sewage using a system approved by the Administration in accordance with Regulation 3(1)

(a) at a distance of more than four nautical miles from the nearest land, or sewage which is not comminuted or disinfected at a distance of more than 12 nautical miles from the nearest land, provided that in any case, the sewage that has been stored in holding tanks shall not be discharged instantaneously but at a moderate rate when the ship is en route and proceeding at not less than 4 knots; the rate of discharge shall be approved by the Administration based upon standards developed by the Organization; or

(b) the ship has in operation an approved sewage treatment plant which has been certified by the Administration to meet the operational requirements referred to in Regulation 3(1) (a) (i) of this Annex, and

(i) the test results of the plant are laid down in the ship's International Sewage Pollution Prevention Certificate (1973);

(ii) additionally, the effluent shall not produce visible floating solids in, nor cause discolouration of, the surrounding water; or

(c) the ship is situated in the waters under the jurisdiction of a State and is discharging sewage in accordance with such less severe requirements as may be imposed by such State.

(2) When the sewage is mixed with wastes or waste water having different discharge requirements, the more severe requirements shall apply.

Regulation 9

EXCEPTIONS

Regulation 8 of this Annex shall not apply to:

(a) the discharge of sewage from a ship necessary for the purpose of securing the safety of a ship and those on board or saving life at sea;

(b) the discharge of sewage resulting from damage to a ship or its equipment if all reasonable precautions have been taken before and after the occurrence of the damage, for the purpose of preventing or minimizing the discharge.

Regulation 10

RECEPTION FACILITIES

(1) The Government of each Party to the Convention undertakes to ensure the provision of facilities at ports and terminals for the reception of sewage, without causing undue delay to ships, adequate to meet the needs of the ships using them.

(2) The Government of each Party shall notify the Organization for transmission to the Contracting Governments concerned all cases where the facilities provided under this Regulation are alleged to be inadequate.

Regulation 11

STANDARD DISCHARGE CONNECTION

To enable pipes of reception facilities to be connected with the ship's discharge pipeline, both lines shall be fitted with standard discharge connection in accordance with the following table:

*Text of Annex V adopted by the Conference***ANNEX V. REGULATIONS FOR THE PREVENTION OF POLLUTION BY GARBAGE FROM SHIPS****Regulation 1****DEFINITIONS**

For the purposes of this Annex: (1) "Garbage" means all kinds of victual, domestic and operational waste excluding fresh fish and parts thereof, generated during the normal operation of the ship and liable to be disposed of continuously or periodically except those substances which are defined or listed in other Annexes to the present Convention.

(2) "Nearest land". The term "from the nearest land" means from the baseline from which the territorial sea of the territory in question is established in accordance with international law except that, for the purposes of the present Convention "from the nearest land" off the north eastern coast of Australia shall mean from a line drawn from a point on the coast of Australia in latitude 11° South, longitude 142°08' East to a point in latitude 10°35' South, longitude 141°55' East, thence to a point latitude 10°00' South, longitude 142°00' East, thence to a point latitude 9°10' South, longitude 143°52' East, thence to a point latitude 9°00' South, longitude 144°30' East, thence to a point latitude 13°00' South, longitude 144°00' East, thence to a point latitude 15°00' South, longitude 146°00' East, thence to a point latitude 18°00' South, longitude 147°00' East, thence to a point latitude 21°00' South, longitude 153°00' East, thence to a point on the coast of Australia in latitude 24°42' South, longitude 153°15' East.

(3) "Special area" means a sea area where for recognized technical reasons in relation to its oceanographical and ecological condition and to the particular character of its traffic the adoption the special mandatory methods for the prevention of sea pollution by garbage is required. Special areas shall include those listed in Regulation 5 of this Annex.

Regulation 2**APPLICATION**

The provisions of this Annex shall apply to all ships.

Regulation 3**DISPOSAL OF GARBAGE OUTSIDE SPECIAL AREAS**

(1) Subject to the provisions of Regulations 4, 5 and 6 of this Annex:

(a) the disposal into the sea of all plastics, including but not limited to synthetic ropes, synthetic fishing nets and plastic garbage bags is prohibited;

(b) the disposal into the sea of the following garbage shall be made as far as practicable from the nearest land but in any case is prohibited if the distance from the nearest land is less than:

(i) 25 nautical miles for dunnage, lining and packing materials which will float;

(ii) 12 nautical miles for food wastes and all other garbage including paper products, rags, glass, metal, bottles, crockery and similar refuse;

(c) disposal into the sea of garbage specified in sub-paragraph (b) (ii) of this Regulation may be permitted when it is passed through a comminuter or grinder and made as far as practicable from the nearest land but in any case is prohibited if the distance from the nearest land is less than 3 nau-

tical miles. Such comminuted or ground garbage shall be capable of passing through a screen with openings no greater than 25 millimetres.

(2) When the garbage is mixed with other discharges having different disposal or discharge requirements the more severe requirements shall apply.

Regulation 4

DISPOSALS FROM DRILLING RIGS

(1) Fixed or floating platforms engaged in the exploration, exploitation and associated offshore processing of sea-bed mineral resources, and all other ships when alongside such platforms or within 500 metres of such platforms, are forbidden to dispose of any materials regulated by this Annex, except as permitted by paragraph (2) of this Regulation.

(2) The disposal into the sea of food wastes when passed through a comminuter or grinder from such fixed or floating drilling rigs located more than 12 nautical miles from land and all other ships when positioned as above. Such comminuted or ground food wastes shall be capable of passing through a screen with openings no greater than 25 millimetres.

Regulation 5

DISPOSAL OF GARBAGE WITHIN SPECIAL AREAS

(1) For the purpose of this Annex the special areas are the Mediterranean Sea area, the Baltic Sea area, the Black Sea area, the Red Sea area and the "Gulfs area" which are defined as follows:

(a) The Mediterranean Sea area means the Mediterranean Sea proper including the gulfs and seas therein with the boundary between the Mediterranean and the Black Sea constituted by the 41°N parallel and bounded to the west by the Straits of Gibraltar at the meridian of 5°36'W.

(b) The Baltic Sea area means the Baltic Sea proper with the Gulf of Bothnia and the Gulf of Finland and the entrance to the Baltic Sea bounded by the parallel of the Skaw in the Skagerrak at 57°44.8'N.

(c) The Black Sea area means the Black Sea proper with the boundary between the Mediterranean and the Black Sea constituted by the parallel 41°N.

(d) The Red Sea area means the Red Sea proper including the Gulfs of Suez and Aqaba bounded at the south by the rhumb line between Ras si Ane (12°8.5'N, 43°19.6'E) and Husn Murad (12°40.4'N, 43°30.2'E).

(e) The "Gulfs area" means the sea area located north west of the rhumb line between Ras al Hadd (22°30'N, 59°48'E) and Ras al Fasteh (25°04'N, 61°25'E).

(2) Subject to the provisions of Regulation 6 of this Annex:

(a) disposal into the sea of the following is prohibited:

(i) all plastics, including but not limited to synthetic ropes, synthetic fishing nets and plastic garbage bags;

(ii) all other garbage, including paper products, rags, glass, metal, bottles, crockery, dunnage, lining and packing materials;

(b) disposal into the sea of food wastes shall be made as far as practicable from land, but in any case not less than 12 nautical miles from the nearest land.

(3) When the garbage is mixed with other discharges having different disposal or discharge requirements the more severe requirements shall apply.

(4) Reception facilities within special areas.

(a) The Government of each party to the Convention, the coast line of which borders a special area undertakes to ensure that as soon as possible in all ports within a special area, adequate reception facilities are provided in accordance with Regulation 7 of this Annex, taking into account the special needs of ships operating in these areas.

(b) The Government of each party concerned shall notify the Organization of the measures taken pursuant to sub-paragraph (a) of this Regulation. Upon receipt of sufficient notifications the Organization shall establish a date from which the requirements of this Regulation in respect of the area in question shall take effect. The Organization shall notify all parties of the date so established no less than twelve months in advance of that date.

(c) After date so established, ships calling also at ports in these special areas where such facilities are not yet available, shall fully comply with the requirements of this Regulation.

Regulation 6

EXCEPTION

Regulations 3, 4 and 5 of this Annex shall not apply to (a) the disposal of garbage from a ship necessary for the purpose of security the safety of a ship, the health of its personnel, or saving life at sea; (b) the escape of garbage resulting from damage to a ship or its equipment provided all reasonable precautions have been taken before and after the occurrence of the damage, for the purpose of preventing or minimizing the escape; (c) the accidental loss of synthetic fishing nets or synthetic material incidental to the repair of such nets, provided that all reasonable precautions have been taken to prevent such loss.

Regulation 7

RECEPTION FACILITIES

(1) The Government of each party to the Convention undertakes to ensure the provisions of facilities at ports and terminals for the reception of garbage, without causing undue delay to ships, and according to the needs of the ships using them.

(2) The Government of each party shall notify the Organization for transmission to the parties concerned of all cases where the facilities provided under this Regulation are alleged to be inadequate.



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