Sea disposal of radioactive wastes: The London Convention 1972

The IAEA's technical advisory role under the international convention is changing in response to global developments

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For many years the oceans were used for the disposal of industrial wastes, including radioactive wastes. In the 1970s, the practice became subject to an international convention which had the aim of regularizing procedures and preventing activities which could lead to marine pollution. As time went on, pressure mounted, especially from smaller countries not engaged in ocean disposal, for waste disposal activities to be further restricted. In November 1993, it was finally decided that the disposal of industrial and radioactive wastes at sea should be prohibited.

This article traces the history of radioactive waste disposal at sea from the time when it first came within the view of international organizations up to the present.

Law of the Sea

In 1958, the United Nations Conference on the Law of the Sea concluded that "every State shall take measures to prevent pollution of the sea from dumping of radioactive wastes, taking into account any standards and regulations which may be formulated by competent international organizations".

Pursuant to its responsibilities, the IAEA set up successive scientific panels to provide guidance and recommendations to ensure that the disposal of radioactive wastes in the sea would not result in unacceptable hazards to man. The first of these meetings was held in 1957 and resulted in the publication of IAEA Safety Series No. 5, *Radioactive Waste Disposal into the Sea* (1961).

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London Convention 1972

Following the United Nations Conference on the Human Environment, held in Stockholm in 1972, the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention 1972, formerly referred to as the London Dumping Convention) was established and entered into force in 1975.* For the regulation of materials to be disposed of in the marine environment, "black" and "grey" lists were established. The disposal of substances on the "black" list (Annex I to the Convention) was prohibited except in trace quantities. Substances on the "grey" list (Annex II to the Convention) were subject to "special care" measures to ensure that their disposal — which had to be carried out under the provisions of a "special permit" — would not have adverse effects on the marine environment.

High-level radioactive wastes (HLW) were included in the "black" list. The IAEA — which was recognized by the Contracting Parties to the London Convention as the competent international body in matters relating to radioactive waste disposal and radiation protection — was entrusted with the responsibility for defining HLW unsuitable for dumping at sea.

Radioactive wastes and other matter not on the "black" list (low- and intermediate-level wastes) were included in the "grey" list. In issuing the special permits for the dumping of these types of radioactive wastes, countries were ad-

*For the purposes of the Convention, "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; and "wastes" or "other matter" means materials and substances of any kind, form, and description. In this article, the word wastes is used alone in reference to this definition.

vised to take the recommendations of the IAEA fully into account.

Developments in regulating the sea disposal of radioactive wastes

In fulfillment of its obligations to the London Convention, the IAEA formulated and periodically reviewed its definition of HLW and recommendations for the use of national authorities on the issuance of "special permits" for the dumping of radioactive wastes other than HLW. In 1974, the IAEA presented the first provisional definition and recommendations to the London Convention. The most recent revision, published as IAEA Safety Series No. 78, was issued in 1986.

IAEA recommendations include, among other things, the requirement that the secretariat of the London Convention — the International Maritime Organization (IMO) headquartered in London — be notified prior to dumping and that records be kept during the dumping operations. Selection criteria for dump sites and guidance for performing the environmental assessments are also included. The revisions of the definition and recommendations between 1974 and 1986 were prepared to take into account improvements in the understanding of the dispersion and behaviour of radionuclides in the marine environment and of developments in radiation protection criteria.

The dumping of radioactive wastes at sea took place solely under national authority until 1977. At that time, the Organization for Economic Co-operation and Development (OECD) established a "Multilateral Consultation and Surveillance Mechanism" to co-ordinate the ocean disposal of its member states. Later, the OECD also established a Co-ordinated Research and Environmental Surveillance Programme (CRESP) to provide additional information for assessing the suitability of the Northeast Atlantic dumpsite, which was used by OECD member states.

The former Soviet Union, although becoming a Contracting Party to the London Convention in 1976, continued, within the context of its national regulations, to dump high-, intermediate-, and low-level radioactive wastes in the Arctic Seas and in the Northwest Pacific without informing the Contracting Parties. The dumping operations were carried out in zones of the oceans other than those approved by the IAEA and at lesser depths than recommended. After the disintegration of the Soviet Union in 1991, the Russian Federation continued to dump low-level radioactive wastes.

Regional conventions

After the institution of the London Convention, several regional conventions for the protection of the sea were established, either under the umbrella of the United Nations Environment Programme (UNEP) or independently.

Many of these, while promoting the objectives of the London Convention, adopted more restrictive approaches to the regulation of dumping. Thus, the sea disposal of radioactive waste was totally prohibited in the Baltic Sea (1974), Mediterranean Sea (1976), Black Sea (1992), and in certain areas of the South Pacific (1985) and Southeast Pacific (1989).

Temporary moratorium and inter-governmental review

By the early 1980s, there was increasing disquiet among many of the Contracting Parties to the London Convention over the continuing practice of sea dumping of low-level radioactive wastes. This led to a proposal being made at the Convention's 1983 Consultative Meeting to prohibit all sea dumping of radioactive wastes. After a vote, the meeting adopted a voluntary moratorium on the sea dumping of all types of radioactive waste pending a review of the safety of the practice which was to be carried out by an independent panel of scientific experts.

An "expanded panel" of experts concluded in 1985 that "no scientific or technical grounds could be found to treat the option of sea dumping differently from other available options when applying internationally accepted principles of radiation protection to radioactive waste disposal". At the ninth Consultative Meeting in 1985, it was generally agreed that the scientific report had not shown the dumping of low-level radioactive wastes at sea to be environmentally dangerous but neither had it shown that dumping was harmless. At this point, the Contracting Parties decided to take a broader view of the issue, recognizing that there were political, legal, social, and economic issues involved besides the purely technical aspects. Thus, the next Consultative Meeting (1986) established an Intergovernmental Panel of Experts on Radioactive Waste Disposal (IGPRAD) to consider the wider political, legal, economic, and social aspects of low-level radioactive waste dumping at sea. The voluntary moratorium on sea dumping of radioactive wastes was extended accordingly, pending the panel's final report.

IGPRAD was divided into two working groups, one to examine the political, legal, economic, and social aspects and the other to

Sea disposal of radioactive waste by different countries (TBq)

	Time of disposal	Totals
Atlantic sites		
Belgium	1960-1982	2120.0
France	1967-1969	353 0
Germany	1967	0.2
Italy	1969	0.2
Netherlands	1967-1982	336.0
Sweden	1969	3.2
Switzerland	1969-1982	4 419.0
United Kingdom	1949-1982	35 078.0
United States	1949-1967	2 942.0
Subtotal		45 252 0
Pacific sites		
Japan	1955-1969	15.0
Korea, Republic of	1968-1972	Not known
New Zealand	1954-1976	1 0
Russian Federation	1992-1993	1 4
Soviet Union (former)	1966-1991	707.0
United States	1946-1976	554.0
Subtotal		1 278.0
Arctic sites		
Soviet Union (former)	1960-1991	90 152.0
Subtotal		90 152.0
All sites		
Total		136 682 0

Distribution of radioactive waste disposal between the oceans (TBq)

	Atlantic	Pacific	Arctic	Totals
Reactors with and without fuel	1 000	4.3	88 800	89 804
Solid low-level waste	44 252	818.0	588	45 658
Liquid low-level waste	<0.001	456.0	764	1 220
Total	45 252	1278.3	90 152	136 682

examine scientific and technical issues. The IAEA prepared several documents in support of IGPRAD and submitted them to the working group on scientific and technical issues. The most important of those documents are *Estimation of Radiation Risk at Low Dose* (TECDOC-557, 1990), *Low-level Radioactive Waste Disposal: An Evaluation of Reports Comparing Ocean and Land Based Disposal Options* (TECDOC-562, 1990), and *Risk Comparisons Relevant to Sea Disposal of Low-Level Radioactive Waste* (TECDOC-725, 1993).

Sea disposal operations

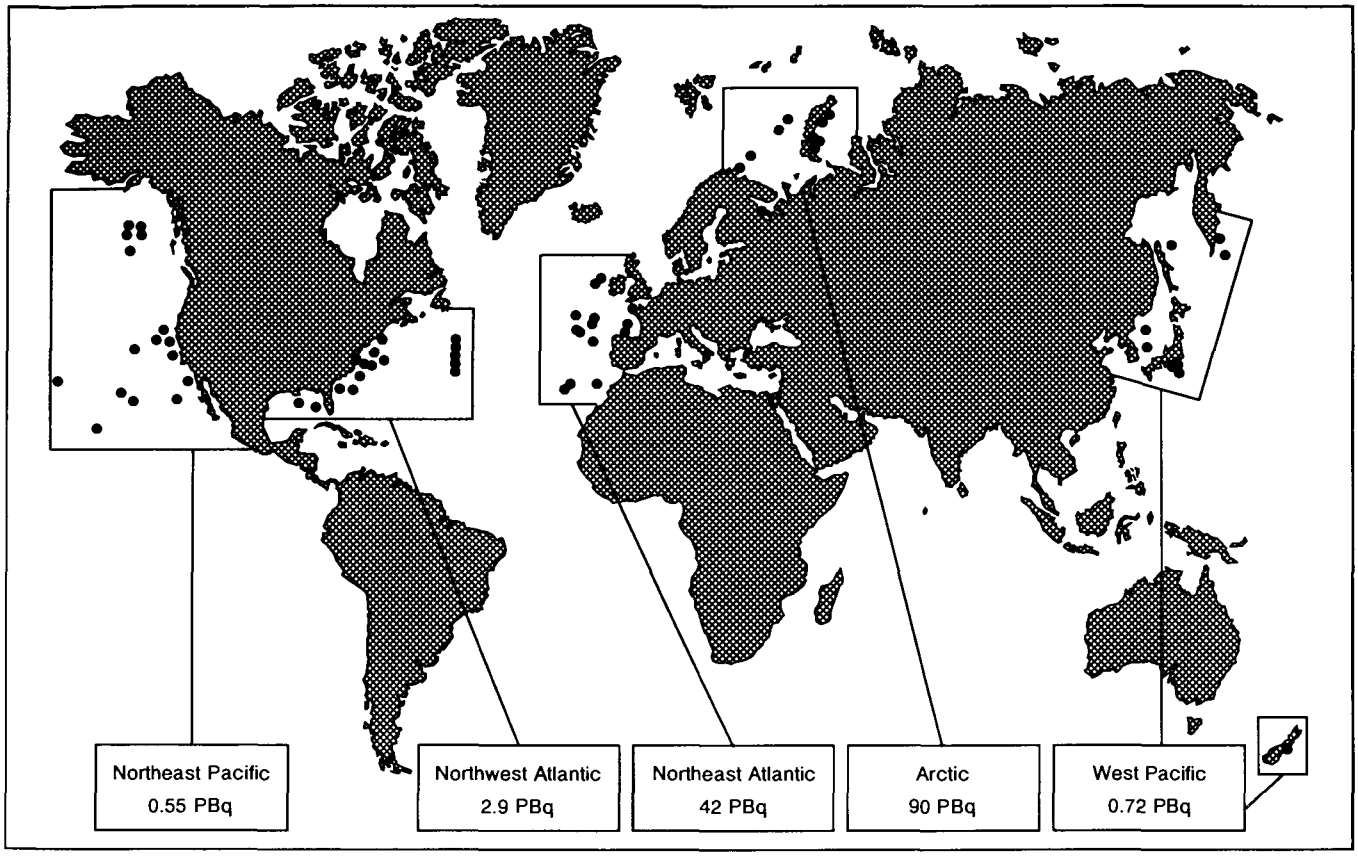
The first operations involving sea disposal of radioactive wastes took place in 1946 in the Northeast Pacific, about 80 km off the coast of California. During the 48-year history of sea disposal, 13 countries have disposed of approximately 140 PBq (140×10^{15} Bq) of radioactive wastes into the oceans. The wastes can be divided into three categories according to type: liquid low-level wastes; solid low-level wastes, either packaged in containers or large unpackaged objects; reactor vessels without nuclear fuel or containing damaged nuclear fuel.

The officially reported dumping operations of radioactive waste can be summarized broadly as follows: About two-thirds of the radioactivity of disposed waste is associated with six submarine reactors and the shielding assembly from a nuclear icebreaker reactor dumped together with damaged fuel by the former Soviet Union in the Kara Sea in the Arctic. The remaining one-third is associated with packaged solid low-level waste disposal at the Northeast Atlantic dumping sites, carried out by eight European States, predominantly the United Kingdom.

Of minor significance are, on the one hand, the dumping of liquid and solid low-level waste in the Arctic Ocean which makes up less than 1% of the total radioactivity dumped, and on the other hand, the entire dumping in the Pacific Ocean, also amounting to less than 1% of the worldwide total.

The dumping at the Northeast Atlantic site started on a very small scale in 1950, increased gradually, and reached a peak of 5 to 7 PBq per year in the early 1980s, before the voluntary moratorium of low-level radioactive waste disposal was adopted in 1983. The Arctic dumping sites were used from 1960 to 1992. High-level wastes were dumped predominantly before 1972, when the London Convention was introduced, but one submarine with two reactors containing nuclear fuel was dumped in 1981. The Pacific sites were used between 1946 and 1993.

Many of the States involved in the sea disposal operations only dumped small quantities on an occasional basis. For other countries, sea dumping was regularly used as an alternative to land-based waste disposal options.



Disposal at sea of radioactive wastes

Conclusions of expert panel

IGPRAD finalized its work in the summer of 1993. The conclusions on legal, political, social, and economic aspects referred to a growing awareness within the national and international communities that new and more effective measures were needed to protect the global marine environment, as evidenced by the results of the 1992 UN Conference on Environment and Development (UNCED) and spelled out in Agenda 21. (Chapter 22, para. 5b).

IGPRAD noted that there had been sustained development of international law in the previous 20 years. The trend was towards, firstly, restricting and controlling, and secondly, prohibiting sea disposal of radioactive wastes on a regional basis, and later challenging the legitimacy of States' use of the high seas and the ocean floors beyond their national jurisdiction for activities that might result in the pollution of the marine environment.

The work of the group on scientific and technical issues was fraught with difficulties throughout its meetings, largely because of the entrenched positions of many of the participants. The statement of its conclusions is ambiguous. In the discussion which followed the presentation of the IGPRAD report at the Consultative Meeting in November 1993, different Contracting Parties used the report to support opposing positions. In fact, none of the technical evidence presented to the IGPRAD working group in the seven years of its existence indicated that any significant radiological impact has resulted or would result from properly conducted sea disposal of solid low-level radioactive wastes in accordance with IAEA recommendations.

Prohibition of sea dumping of radioactive wastes

The Consultative Meeting of Contracting Parties in November 1993 was characterized by an extensive debate which was inflamed by reports of the illicit dumping of liquid radioactive waste by the Russian Federation in the Sea of Japan in October 1993. The meeting adopted, by a majority vote, the prohibition of dumping of all types of radioactive waste to come into effect on 20 February 1994. The meeting also adopted the prohibition of dumping of industrial wastes to come into effect by 1 January 1996.

The prohibitions were brought about by amending the Annexes to the Convention. As a result of the amendments, all types of radioactive wastes and radioactive matter are now included in the "black" list (Annex I).

The Russian Federation made a declaration not accepting the amendments associated with radioactive waste dumping, though stating that it will continue its endeavours to ensure that the sea is not polluted by the dumping of wastes and other matter. For it, the old Annexes of the Convention concerning this specific issue are still in force, and so too are the IAEA's definition and recommendations.

Coastal discharges

After the termination of solid industrial and radioactive waste disposal into the oceans, the only remaining route by which wastes can legally enter the marine environment is by effluent discharges to rivers and from coastal locations.

At the present time, the Montreal Guidelines for the Protection of the Marine Environment Against Pollution from Land-Based Sources (1985) is the main international document concerned with this subject, although it also comes within the scope of several regional conventions. Recognizing the potential sensitivity of coastal environments to pollutants, the Montreal Guidelines recommend that pollution, meaning the introduction by humans of substances to the marine environment which are likely to cause harm to living resources and marine ecosystems and hazards to human health, should be eliminated. Radioactive substances come within this categorization.

The guidelines do not attempt to eliminate discharges of small amounts of harmful substances but to eliminate the *pollution* caused by unrestricted releases of them. In addition, the guidelines do not have the status of an international convention, rather they are recommendations to countries. As a follow-up to the UNCED, an Intergovernmental Conference on Protection of the Marine Environment from Land-Based Activities will be organized in 1995.

Through various programmes, IAEA scientists are working to help protect the marine environment.

IAEA's current responsibilities to the London Convention 1972

As a result of the amendment of the Annexes, the mandate of the IAEA under the London Convention was also changed. While it continues to be identified by Contracting Parties as the competent international body in the field of radioactive waste management under the Convention, the IAEA's specific responsibilities, as stated in the revised Annexes to the Convention, are now limited to defining exempt or *de minimis* levels of radioactivity for the purposes of the Convention.The work related to this newly specified mandate is already under way. The principles for exemption are expressed in IAEA Safety Series No. 89, *Principles for the Exemption of Radiation Sources and Practices from Regulatory Control*, which was published in 1988.

In the case of marine disposal, the exemption principles are being applied to materials, such as sewage sludge and dredged material, the disposal of which is in principle not prohibited under the London Convention. These materials have not usually been subject to regulatory control. Nevertheless, they might contain radionuclides from anthropogenic sources on land or from coastal discharges. Now that the London Convention prohibits the sea disposal of all radioactive matter, it is seen as necessary to define quantitative exemption levels (expressed as becquerels per kilogram or becquerels per cubic meter), i.e. levels below which a material can be considered to be non-radioactive in the context of the Convention.

In addition, the IAEA continues to maintain other activities in support of the Convention. These include administering the International Arctic Seas Assessment Project (IASAP). Its objectives are to assess the potential risks to human health and to the environment associated with the radioactive wastes disposed of by the former Soviet Union in the Arctic Seas and to evaluate whether any remedial actions are necessary and justified. The IAEA is also developing and maintaining an inventory of radioactive material entering the marine environment from all anthropogenic sources. ❐