

**THE IAEA INVENTORY DATABASES RELATED TO RADIOACTIVE MATERIAL
ENTERING THE MARINE ENVIRONMENT**

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Contracting Parties to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter (LC 1972) have requested the IAEA to develop an inventory of radioactive material entering the marine environment from all sources. The rationale for developing and maintaining the inventory is related to its use as an information base with which the impact of radionuclides entering the marine environment from different sources can be assessed and compared.

Five anthropogenic sources of radionuclides entering the marine environment can be identified. These sources are: radioactive waste disposal at sea; accidents and losses at sea involving radioactive material; discharge of low level liquid effluents from land-based nuclear facilities; the fallout from nuclear weapons testing; and accidental releases from land-based nuclear facilities. The first two of these sources are most closely related to the objective of the LC 1972 and its request to the IAEA. This paper deals with the Agency's work on developing a database on radioactive material entering the marine environment from these two sources. The database has the acronym RAMEM (RAdioactive Material Entering the Marine Environment). It includes two modules: inventory of radioactive waste disposal at sea and inventory of accidents and losses at sea involving radioactive material.

The database module on sea disposal of packaged radioactive waste includes relevant disposal data such as total volume and activity of disposed waste, the State responsible for disposal, waste type (solid objects, solidified or liquid waste, reactor vessel with or without fuel), matrix type (concrete, bitumen, polymer etc.), containers (type, weight, number etc.) and geographical coordinates and depth of the disposal site. The first output of the inventory, IAEA - TECDOC - 588 [1] published in 1991, included disposal operations reported by 12 countries. This inventory has recently been updated to include information provided by the Russian Federation on disposal operations carried out by the former Soviet Union and subsequently the Russian Federation and some additional disposal information provided by Sweden and the UK. These information on sea disposal operations has been confirmed by the States involved. Dumping operations have been carried out in the Atlantic, Pacific and Arctic Oceans. The dumping sites and respective total activities are presented in Fig. 1. The distribution of disposed activities among the countries involved are summarized as follows:

Total activity disposed by 14 countries (1946-1993)		85 PBq (2.3 MCi)
Atlantic Ocean	-	45.26 PBq (53.2% - nine countries)
Arctic Ocean	-	38.37 PBq (45.1% - former Soviet Union)
Pacific Ocean	-	1.44 PBq (1.7% - four countries)

The radioactive waste types and activity in the disposed wastes are summarized as follows:

Low level solid waste	-	45.45 PBq [53.42%]
Low level liquid waste	-	1.22 PBq [1.44%]
Reactors with spent nuclear fuel	-	36.88 PBq [43.34%]
Reactors without spent nuclear fuel	-	1.53 PBq [1.80%]

The module of the database on accidents and losses contains the information on date of the accident or loss, material involved such as vessels, aeroplanes, satellites, sealed sources etc., geographical location and depth of loss, a brief description of the source involved, whether recovered, whether monitoring was carried out, and whether any activity was released to the

environment. All accidents and losses included in the database are either officially notified or confirmed by the States involved or based on authoritative information. The data is categorized into: (a) accidents involving nuclear powered submarine, 9 out of which 7 was confirmed (5 accidents resulted in loss of submarine containing about 25 PBq of activity at the time of loss, nuclear weapons were carried in 3 submarines); (b) accidents involving nuclear weapons, 17 accidents out of which 9 have been confirmed (14 accidents resulted in loss, two recovered and one partially recovered); (c) accidents involving energy sources used in spacecraft, satellites, and deep sea acoustic signal transmitters, 5 accidents resulting in the loss of 4 satellites and 1 spacecraft (total estimated activity was 4.7 PBq); (d) one accident involving RTG powered light house during transportation by helicopter with total activity of 13 PBq - recovery was not successful; (e) accidents during marine transport of radioactive material, 3 accidents involving about 334 TBq activity without any reported release of activity; and (f) accidents involving sealed radioactive sources primarily been used in the offshore oil and gas drilling industry, 156 incidents reported by 9 countries with the loss of sources predominantly in the drill holes with activity in the range of 50 to 3700 GBq per source, sources were recovered in 10 other incidents.

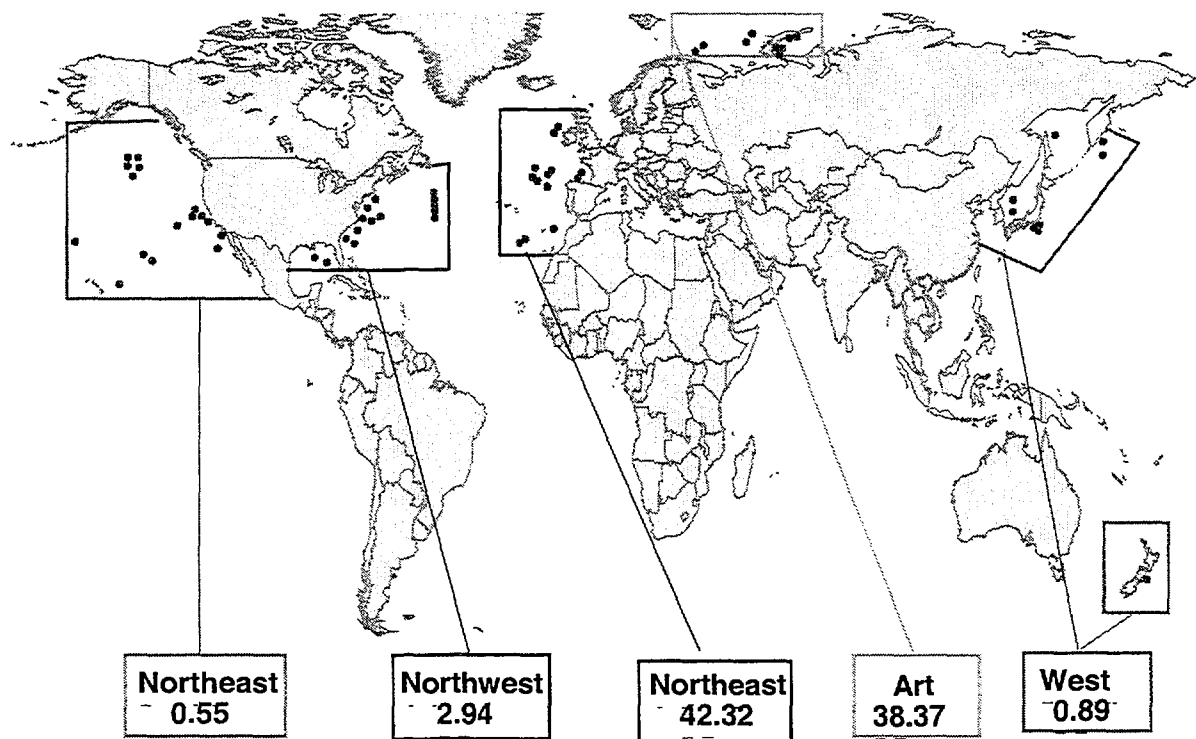


FIG. 1. Disposal at sea of radioactive waste - world wide.

References

- [1] IAEA, Inventory of Radioactive Material Entering the Marine Environment: Sea Disposal of Radioactive Waste, IAEA-TECDOC-588 (1991).