Beyond Dumping? The Effectiveness of the London Convention

Olav Schram Stokke

Introduction

Echoing several regional arrangements, the Contracting Parties to the London Convention decided in 1993 to prohibit dumping of all types of radioactive waste and sea-based incineration of sewage sludge and industrial waste; moreover, dumping of the latter would be phased out within three years.[1] They also resolved to take an active part in the implementation of Agenda 21 of the United Nations Conference on Environment and Development (UNCED) regarding waste management world-wide. Hence a programme of technical assistance would be elaborated in tandem with sustained efforts to increase participation in the Convention.[2]

Those two themes, bringing global-level commitments on par with the most advanced regional agreements and strengthening programmatic activities with a view to improving waste management in developing countries, form the core of a long-term strategy hammered out by the Contracting Parties and incorporated into a 1996 Protocol which thoroughly rewrites the Convention.[3] By that time, sharper domestic regulations and keen attention from environmental groups had induced most industrial countries to avoid sea disposal of hazardous and industrial waste, seeking instead to reduce waste production and resort to land-based treatment processes. The significance of the global dumping regime for this development is worth assessing also because the need to develop waste disposal options is becoming increasingly salient for a number of newly industrialized and developing countries, many of which are not parties to the London Convention.[4] Unless regulative achievements are matched by strong measures to support implementation, many relevant states will enforce regulations leniently or simply remain outside of the arrangement. In this situation, the test of effectiveness for the global dumping regime is shifting from the regulative sphere to that of capacity enhancement.[5] The purpose of this article is to review the London Convention in these regards, supported by an implementation study featuring the most conspicuous violation of commitments under the Convention thus far, namely Soviet disposal of radioactive waste in Arctic seas.

Waste Disposal at Sea

The global waste stream is the evil twin of population growth, urbanization and the ever more intensive use of natural resources; and the stream broadens by the day. In the United States alone, as much as 1.3 billion tonnes are disposed of each year; if loaded onto trucks, the convoy would encircle the globe more than 20 times.[6] Partly for cost reasons, and partly because land-based disposal too may pose severe environmental problems, not least to groundwater reserves, a significant share of this waste has been either dumped or incinerated at sea.

Political attention turned first to *radioactive* waste. The 1958 Convention on the High Seas had already obliged states to take measures to prevent pollution from dumping of radioactive waste;[7] and the London Convention 1972 instituted a global prohibition on disposal of high-level waste applicable to all major nuclear powers. Dumping of low- and medium-level waste was still allowed under this Convention, however, and a number of states continued this practice throughout the 1970s and early 1980s; as we shall see, one nation continued even longer. On balance, dumping of nuclear waste has been a very modest contributor to radioactivity in the world oceans; atmospheric nuclear testing between 1954 and 1962 contributed amounts three thousand times larger, and even that had added no more than 1 per cent to the radioactivity naturally occurring in the ocean.[8] An expert panel set up under the London Convention concluded that '. . . the present and future risk to individuals from past oceanic dumping of radioactive waste is extremely small.'[9] Nevertheless, nuclear dumping provided a politically potent starting point for environmental organizations seeking to draw popular attention also to dumping of other types of waste.

For its part, *industrial* waste dumped into the ocean is generated from a wide range of economic activities, including chemical and pharmaceutical industries, production of pulp and paper, and smelter works. Pollution problems associated with it also vary greatly. As recorded under the London Convention, the amounts of industrial waste dumped into the world oceans have fluctuated considerably, with a peak in 1982 of 17 million tonnes;[10] since then, investments in reduction and recycling facili-

ties have enabled many industrial states to do without this kind of dumping.[11]

Sewage sludge is another main category of waste which has regularly been disposed of at sea, especially by some countries such as the United Kingdom, which in the late 1980s disposed of around 30 per cent of its sewage sludge in this way.[12] In this period, some 15 million tonnes was dumped at sea annually, some two thirds of it in the North and Irish seas.[13] Whereas other types of waste cause worries because of their toxicity, sewage sludge is problematic largely because of its nutrient contents, including nitrates and phosphates, which in some cases may yield algae blooms, even to the extent of so-called red tides, which tend to exclude zooplankton and other animals and result in oxygen depletion.[14] Unless the sludge is contaminated by heavy metals or other toxic material, a major alternative to dumping is agricultural use as fertilizer; among the North Sea states as much as a third of the sewage sludge is used in this way, whereas the rest is either used as landfill or disposed of by tipping or incineration.[15]

But the overwhelming share of the materials dumped into the ocean is *dredged spoils*, resulting largely from efforts to keep harbours, rivers, and other waterways open.[16] Of this, only a small fraction, usually taken from busy shipping harbours or heavily industrialized areas, poses pollution problems; sound management here is defined by the relative ability of land-based and aquatic locations to immobilize contaminants.[17] Some 90 per cent can be put to productive use as landfill, artificial reefs, and enhancement of wetlands, or dumped without raising concerns beyond physical impacts on habitats.[18]

Especially for organic, liquid materials, *incineration* is seen as the least harmful mode of disposal; and the attraction of at-sea incineration is remoteness from populated areas and, as far as is known, negligible effects on the marine environment.[19] Critics of incineration at sea note, however, that observance of sound practices is easier to control at land-based facilities. The main problems associated with incineration are re-formation of toxic materials in the flue gases, harmful impacts of emissions to the sea-surface microlayer, and the fear that the availability of this option may keep industry from investing in technologies to reduce waste.[20] Incineration, which has largely been conducted by a small number of vessels at a designated location in the North Sea, became the subject of a Greenpeace International campaign in the mid-1980s.

The Global Dumping Regime

The basic principle of the regime based on the London Convention 1972 is that disposal at sea of hazardous waste, defined in terms of toxicity, persistence, and tendency to bioaccumulate in marine organisms, must be forbidden save in cases where all other options are deemed more harmful.[21] Putting this into practice involves at least three types of activity: generating the knowledge necessary to make informed choices; adopting regulative measures which give life to the principles and take heed of existing knowledge; and sustaining a collective system to further compliance, including reporting and verification of whether international commitments are matched by behavioural adaptation.

The main decision-making body is the Consultative Meeting of the Parties, usually held every year. A black and grey list system is applied, in which black items may not be dumped whereas grey ones require special permits from a designated national authority to be reported to the secretariat of the Convention,[22] located with the International Maritime Organization (IMO). When the 1996 Protocol enters into force, a reverse listing will be introduced implying that all dumping is prohibited unless explicitly permitted; the impact of this is further enhanced by a strong statement of the Precautionary Principle.[23] Unlike many other international arrangements, the London Convention permits regulative decisions to be taken without unanimity: amendments to the lists may be passed by a two-thirds majority, balanced, however, by an opting-out clause allowing states to avoid being legally bound by provisions to which they do not wish to adhere.[24] A tacit consent procedure, implying that amendments become binding on the parties after a hundred days unless they file a reservation, adds speed to the implementation process;[25] in addition, the Meeting may adopt by simple majority non-binding resolutions. As to enforcement, the London Convention sets out a broad range of provisions for prevention, discovery, and punishment of violations, obliging members to enforce rules in their capacities as, respectively, flag states, port states, and coastal states; the last-named can apply the Convention not only to their territorial waters but to the exclusive economic zone and continental shelf as well.[26]

While the London Convention forms the core of the international dumping regime, other global and regional processes are complementing it. The obligation to control dumping is confirmed by the 1982 Law of the Sea Convention, which in Article 210 refers implicitly to the London Convention and its annexes when requiring that national regulation shall be no less effective than the rules and standards set globally.[27] And the London Convention itself is to a large extent modelled on the regional and

somewhat older Oslo Convention governing dumping activities in the Northeast Atlantic.[28]

Scientific Knowledge

Since the adoption of the London Convention, a system of scientific advice has been elaborated, with three strands. The broadest advisory mechanism is the Scientific Group on Dumping, comprising experts nominated by the Contracting Parties, which evaluates and reviews existing provisions and annexes in light of new scientific information.[29] Second, a range of *ad hoc* groups, such as the Group of Legal Experts on Dumping, the Group of Experts on the Annexes, and the Panels on Sea Disposal of Radioactive Waste, has been set up to compile information and advise the Consultative Meetings on especially vital or controversial matters.[30] Third, considerable amounts of work are conducted by external organizations at the request of the Consultative Meetings; the significance of investigations conducted by others becomes clear when we note that, in 1990, the budget of the London Convention was a mere $US0.76 million and the number of IMO staff allocated to it was five.[31] For instance, in the radioactive waste area, the International Atomic Energy Agency (IAEA), with a budget of roughly $US200 million and a staff of some 2000,[32] was vital to the work of an Intergovernmental Panel of Experts on Radioactive Waste Disposal set up in 1987 to assess the wider political, legal, economic, and social aspects of this activity.[33]

Regulation

In terms of regulative provisions under the London Convention, the Parties have tended to take an expansive view whenever the functional or geographic scope has been debated. While Article VII states that military vessels and aircraft are exempted from the Convention, no Contracting Party objected when a working group in 1989 interpreted another part of that article to the effect that disposal of decommissioned naval submarines was covered by the prohibition on dumping of high-level waste.[34] Similarly, the Parties have decided that disposal of radioactive waste into a seabed repository accessed from the sea, and also disposal of derelict offshore platforms, would constitute dumping.[35] And whereas Article III excludes internal waters from the spatial scope of the Convention, the Consultative Meetings have discussed since 1992 the possibility of extending provisions to those waters as well.[36] The trend of an ever-widening scope was halted when the Parties rejected proposals during the negotiation of the 1996 Protocol to include also disposal directly resulting from offshore oil and gas activities.[37]

As to the *substantive contents* of the commitments taken on under the London Convention, the following points are particularly relevant.

- Members are obliged to monitor and keep a record of the nature and quantities of matter permitted to be dumped as well as when, where, and how it occurred and the condition of the seas where it occurred.[38]
- High-level radioactive waste was placed on the original black list in 1972, and State Parties are obliged to abstain from any dumping of such material;[39] in 1983, while a proposed ban failed to gain sufficient support, a resolution was adopted on a voluntary moratorium on all dumping of radioactive materials until an expert meeting had presented their final report to the Contracting Parties;[40] and in 1993 a binding prohibition on dumping of low- and medium-level waste was established by a unanimous decision.[41]
- Industrial waste is a very heterogeneous category; the Scientific Group on Dumping advises the Consultative Meetings on what compounds may be suitable for dumping and which should be prohibited, based on the likely impacts on the marine environment. With a number of exemptions, dumping of industrial waste has been banned under the London Convention since 1996.[42]
- Informed by a Working Group on Dredged Materials, the Contracting Parties to the London Convention have established a set of guidelines for the issuance of permits to dump dredged spoils.[43] Like sewage sludge, dredged material is one of the exemptions to the ban on dumping of industrial waste.
- Incineration at sea has been subject to ever more detailed and stringent procedural and substantive regulation since 1977,[44] culminating, as noted, with the 1993 amendment prohibiting this practice.
- A Working Group of the Annexes was assigned in 1988 with the task of updating the black- and grey-list system and produced what came to be known as the Waste Assessment Framework, implying more detailed guidance of the domestic decision-making process before issuing permits, especially regarding environmental impact assessment and consideration of alternative waste management options;[45] the framework is comprised in Annex 2 to the 1996 Protocol.
- Seeking to close a loophole, a 1986 resolution recommends that Contracting Parties refrain from exporting wastes for sea disposal to states not committed by the London Convention or regional dumping arrangements unless there are both compelling reasons and clear evidence that disposal would be conducted in accordance with the requirements of the

Convention.[46] The 1996 Protocol prohibits export of waste for purposes of dumping or incineration at sea.[47]

Compliance Control

For their parts, monitoring and assessment of compliance with the regulations of the London Convention are based largely on self-reporting. Since the IMO staff earmarked for work on this Convention are so few, their ability to assist the Contracting Parties in critically assessing the implementation of international commitments is negligible. To make things even more difficult, the rate of submission of national reports on dumping and management activities is fairly low; on average half of the Contracting Parties have failed to lodge reports with the secretariat over the period 1976–94.[48] In an effort to strengthen the regime in this respect, the Contracting Parties after considerable debate passed a resolution in 1989 that redefined 'monitoring', as required by the Convention, from 'assessments of changes in the marine environment caused by dumping operations' to 'measurements . . . to demonstrate the compliance of their permitted at-sea dumping and incineration practices with the overall intent of the Convention and the requirements of the Annexes.'[49]

Thus, whereas knowledge has accumulated and regulations have been adopted at a healthy rate, albeit with some time-lag compared with regional arrangements, the compliance system of the London Convention is the weak part of its implementation profile.[50] It should be noted here that relatively undeveloped compliance systems are quite common for environmental and resource management regimes.[51]

Contribution to Problem Solving

Compared with land-based sources, dumping and incineration of hazardous and industrial waste were never very large contributors to pollution of world oceans;[52] and today sea disposal is becoming steadily less relevant for most industrialized countries. The United Kingdom, for instance, ceased dumping of liquid and solid industrial waste in 1992 and will phase out dumping of sewage sludge by 1998.[53] Japan, which in 1980 disposed of as much as 15 per cent of its industrial waste at sea, had this figure reduced a decade later to 1 per cent.[54] Similarly, the United States had practically eliminated dumping of industrial waste by 1983, and ceased dumping of sewage sludge in 1991.[55] With the dumping regime increasingly stringent and comprehensive, the most pressing challenge now is to expand real participation in the London Convention among developing countries and find ways to support the enhancement, whenever needed, of legal-administrative structures and storage and treatment facilities. Three aspects of the global dumping regime are particularly relevant here: rapid globalization of regional achievements, a measure of transparency, and growing attention to capacity-enhancement measures.

Removing the Ladder?

We have seen that, quite often, procedures and regulations have found their way into the London Convention years after being adopted in regional forums. For instance, an environmental agreement targeting the Baltic Sea introduced the reverse listing procedure 22 years before the 1996 Protocol to the London Convention,[56] thus banning, *inter alia*, dumping of radioactive waste of every kind. A year before the 1993 amendment rendered global the radioactive waste ban, a Northeast Atlantic agreement had already elicited commitments to this effect from two of the most outspoken recalcitrants in the London process, the United Kingdom and France;[57] while neither had dumped radioactive materials since 1983, they had been unwilling to relinquish the option. Moreover, the commitments to phase out dumping of industrial waste and incineration at sea had already been accepted by a number of the major dumping nations in the late 1980s within the framework of the Oslo Commission.[58] Indeed, the Contracting Parties to the London Convention prohibited at-sea incineration of industrial waste and sewage sludge only two years after the last incineration vessel had been decommissioned.[59] In certain areas, therefore, what regulative measures under the London Convention have amounted to is flogging horses killed elsewhere.

This is only part of the story, however. Industrialized countries taking the lead in the quest for stricter provisions on dumping and incineration in effect institute a *ratchet* preventing resumption of old practices and ensuring *globalization* of regional commitments. From another perspective, they are denying less developed countries a ladder, in the form of relatively inexpensive ways to dispose of rapidly accumulating piles and pools of wastes, which they themselves have used eagerly in the past and have only recently moved beyond. Realizing that this might severely impede widening of membership and participation in the London Convention, the 1996 Protocol provides for a grace period of up to five years before regulative commitments become binding on new members.[60] This moderate level of differentiation may lower the barrier to entry while at the same time ensuring that broader membership is not realized at the cost of weaker global standards.[61]

Shaming Laggards?

Within the limits set by a poor national reporting practice, the regime established by the London Convention ensures a considerable degree of transparency. It allows not only relevant international organizations, such as specialized agencies of the United Nations or the International Atomic Energy Agency, but also a range of non-governmental organizations to attend as observers and make statements, submit documents, and participate freely in plenary and working discussions.[62] Consultative Meetings are closely followed by environmental media, and the secretariat publishes fairly detailed reports.

In combination with the high political loading of some agenda items such as radioactive waste, these features have made Meetings of the Parties attractive arenas for environmental organizations desiring to influence decisions and direct public attention to states they perceive as blocking the development of tighter rules or failing to implement existing ones. And the arena is used: for instance, the intervention by a representative of Greenpeace International in the debate over the 1983 moratorium on radioactive waste, especially his characterization of the United Kingdom's position, was candid enough to draw reproachful statements from several Contracting Parties.[63] At the 1991 Meeting the same organization circulated a report exposing Soviet dumping of high-level radioactive waste in the Arctic, thus adding a sense of urgency to a situation which subsequently triggered a wide array of regulative and programmatic responses by the Contracting Parties.[64] Shaming of laggards is also a domestic-level phenomenon, although the Soviet case study below reveals that it is not equally relevant in all countries at all times. When the Australian cabinet, subsequent to the London amendment to phase out sea disposal of industrial waste by 1 January 1996, granted a permit to continue dumping of jarosite until end-1997, the opposition acidly noted that this decision placed Australia in a shamefully exclusive group of states openly contravening measures under the global dumping accord.[65]

The risk of being snubbed internationally or ridiculed at home for failing to adhere to international commitments is presumably seen as a drawback by governments considering whether to accede to the London Convention. As to exposure to criticism stemming from the presence of non-governmental organizations, however, a 1988 resolution obliges the latter to refrain from using their access to Meetings for purposes of '. . . demonstrations or the distribution of material which is detrimental to the Meeting, as determined by the Chairmen . . .'.[66]

More importantly, acceding to the Convention is also likely to imply influence over subsequent decisions, including interpretation of existing provisions. While the radioactive waste moratorium and subsequent ban were instituted despite open resistance from certain Contracting Parties, the general approach to controversy at Consultative Meetings is careful accommodation of interest or postponement of decisions until opposition has faded. For instance, the phase-out of dumping of industrial waste has a number of exemptions directly related to special concerns voiced by Contracting Parties:[67] 1) dredged material, which accounts for 80 to 90 per cent of the amounts of waste dumped world-wide;[68] 2) sewage sludge, dumping of which is still important to some countries, such as Japan and South Korea;[69] 3) fish waste and other organic materials resulting from fish processing, relevant to a number of coastal states; 4) vessels and offshore installations, particularly addressing requests from Norway and the United Kingdom that such disposal should not be ruled out at the outset but rather result from case-by-case assessments;[70] the costs of removing existing platforms is believed to be especially high in the North Sea;[71] 5) uncontaminated inert geological materials unlikely to release chemical constituents into the environment, including colliery wastes, which in 1988 accounted for two thirds of the industrial waste dumped by the United Kingdom;[72] and 6) uncontaminated organic materials of natural origin.

Similarly, when seabed disposal of radioactive waste was raised at the 1983 Consultative Meeting, a group of legal experts open to all Contracting Parties and a number of observers was convened to clarify whether such activities would fall under the definition of 'dumping';[73] in the absence of agreement on this point, decision was deferred by one Consultative Meeting after another until a resolution was finally put up to vote in 1990 and passed with merely four votes against.[74] And, as noted, even the ban on sea disposal of radioactive waste was passed only after ten years of scientific impact studies, gradually including also social and political dimensions, and not until regional bans had practically committed most of the states critical of it. In this context of regulative cautiousness, it is perhaps not surprising that so little attention has been directed at Consultative Meetings to the fact that a dispute settlement arrangement, providing for arbitration or submission to the International Court of Justice and actually adopted already in 1978, is yet to enter into force.[75]

Hence, while the transparency of the global dumping regime implies greater exposure to criticism abroad and at home, its consensus-oriented nature also ensures that accession and participation generates a measure of influence over the future direction of the London Convention.

Enhancing Capacity?

The above cannot alter the fact that regulations already adopted under the London Convention place severe constraints on the waste-disposal practices of new member states. This highlights another potential advantage to developing countries from acceding to the London Convention, namely its provisions for technical assistance and training. Under Article IX of the London Convention, some activities had been generated under the sponsorship of the IMO and other organizations since the 1970s, including a dormant trainee programme, courses on waste management at the World Maritime University, and a series of International Ocean Disposal Symposia.[76] Responding to a challenge from UNCED, the Contracting Parties realized that this side of the regime was in urgent need of strengthening, and decided in 1992 to submit a comprehensive capacity-enhancement programme to the Commission on Sustainable Development and seek funding from the Global Environmental Facility.[77] That programme would also draw on preliminary findings of the Global Waste Survey, a broad-brush assessment intiated by the Contracting Parties in 1991 on the state of waste management world-wide.[78] The final report of that survey identified a number of barriers to implementation of the London Convention in many developing countries, such as diffusion of authority among government agencies, limited availability of land-based facilities, lack of experience with elaboration of environmentally sound waste-disposal programmes, and not least financial sustainability of programmes and facilities.[79] This awareness is reflected in Article 13 of the 1996 Protocol, which strengthens the obligation to respond to requests for technical or financial support and instructs the IMO to serve as an information clearing-house and provide, if resources permit, assistance to developing countries and those in transition to market economies. The ability to secure the financial basis for an effective programme remains unclear, however,[80] although some concrete regional technical co-operation projects have already been developed and funded by voluntary contributions from Contracting Parties.[81]

The Regime Challenged: The London Convention and Soviet Disposal of Radioactive Waste

Those regime processes—globalizing regional commitments, shaming laggards, and enhancing capacity—were all activated when, in 1990, news seeped out about Soviet dumping of high-level radioactive waste in the Arctic.[82] As documented in the Yablokov Report, a Russian governmental White Paper published in 1993, as many as 16 nuclear reactors have been dumped in the Kara Sea since 1965; seven of those are especially dangerous because of failure to remove spent fuel prior to disposal.[83] In addition, large amounts of low- and medium-level solid waste have been dumped by the Northern Fleet in flimsy metal containers that are highly liable to corrosion. And dumping of liquid low-level waste, such as water used in cooling, incineration, or disactivation of radioactive installations, continued well into the 1990s. This case demonstrates the potential significance of the London Convention in lowering domestic access barriers to hazardous-waste management decisions even in a sector marked by general secrecy, but it also brings out the limits of the compliance verification system of the global dumping regime.

Closing a two-decade-long period of military self-regulation, the Soviet Union implemented legislation of the London Convention in 1979 and thereby elevated the nuclear-waste issue to cabinet level; it also designated a civilian agency, *Goskomgidromet*, as responsible not only for monitoring the environmental situation but also for granting dumping permits.[84] This change implied somewhat enhanced *assessment* of the radiological situation, but not much—as measurements were still not taken near the dumping sites of solid waste;[85] nor was the dumping reported to the IMO.[86] Gradually, the entry of civilian agencies in the radioactive waste area prepared the ground for domestic *regulative* controversy, as *Goskomgidromet* was increasingly critical of naval practices and in 1987 withdrew its permit to continue dumping of low- and medium-level waste on grounds that this activity violated guidelines on geographic criteria for dumping sites developed by IAEA and endorsed under the London Convention.[87] It is important to recall here that in 1985, Gorbachev had ascended to power in the Soviet Union, and rapidly embarked on his project of gradually slackening restrictions on access to bureaucratic decision making; and the Chernobyl accident the following year had channelled much of the public disapproval into the environmental area, in particular activities involving nuclear risks.

Access to information on nuclear safety in the military sector, as well as participation in the associated policy-making processes, reached a high point with the publication of the 1993 Yablokov Report. While the report itself is largely a result of internal Russian processes,[88] it also responded to increasingly sharp demands articulated by Consultative Meetings under the London Convention.[89] Indeed, the Yablokov Report itself reveals a strong belief, at least among the authors, in the domestic political clout of the global dumping regime, because Soviet commitments under the London Convention are systematically exaggerated. The report makes no mention of the distinction between resolutions and amendments in the London Convention or of the opting-out clause pertain-

ing to the latter. Thus, it does not convey that the Soviet abstention from the votes on the voluntary moratorium in 1983 makes it very hard to argue that the country was legally or even politically bound by them in this period.[90] Likewise, while the commission boldly states that the permission to conduct dumping of low- and medium-level waste in the Barents and Kara seas was illegal,[91] in reality the IAEA guidelines have no more than quasi-legal status.[92]

Since then, access to military information, including nuclear-waste practices, has been tightened at a time when public attention to environmental problems is ebbing; also, the limits of the funds, personnel, and experience of the environmental bureaucracy is becoming apparent as the nuclear-industrial complex is currently regaining much of its previous political strength and prestige.[93] Another indication of this trend towards less openness on nuclear matters is that *Gosatomnadzor*, the Federal Nuclear and Radiation Safety Authority of Russia, which in 1991 had been assigned the task of regulating and inspecting safety practices both at civilian and military facilities, lost the military part of its portfolio by a presidential decree of July 1995 after a very critical inspection report.[94]

Regarding measures to enhance *compliance* with the provisions under the London Convention, the entry of foreign participants into the politics of radioactive waste in the region around 1990 is still affecting waste management practices. We noted that monitoring obligations were not taken seriously in the Russian Northwest until the dumping scandal reverberated world-wide by the turn of the decade. Under a bilateral Russo-Norwegian Environmental Commission, three joint cruises were conducted from 1991 onwards and included measurements also in the fjords of Novaya Zemlya, where reactors with remaining spent fuel had been dumped.[95] Similarly, and encouraged by the Consultative Meeting of the London Convention, the International Atomic Energy Agency established an International Arctic Seas Assessment Programme.[96] Regarding discrete dumping decisions, harsh criticism from a number of Parties to the London Convention, especially Japan, following a 1993 dumping operation of low-level liquid radioactive waste in the Sea of Japan, induced Russia to reverse a plan to conduct a second operation, and the government pledged to cease such operations completely within a few years.[97]

Still, the role of the London Convention in stimulating compliance is not so much in the negative mode of verification and shaming as in the supportive form of helping to *enhance* the ability of the Northern Fleet to avoid dumping. Responding to criticism of the 1993 dumping incident, the Russian environmental minister put it down to irresponsibility on the part of the navy and the nuclear industry, but added that Western technology and financial resources would speed up the process of acquiring ability to do without such dumping in the future.[98] In response, an international Technical Advisory Assistance Team was set up to develop projects on treatment and storage facilities.[99] The following year this team was able to report to the Consultative Meeting that Japan and Russia had signed an agreement to build a treatment facility in the Far East for low-level liquid waste; and also that there was progress regarding a project to enhance the liquid-processing capacity at Atomflot, the base of the Murmansk Shipping Company;[100] furthermore, Norway and Russia had reached agreement on a two-year assessment programme on the nuclear waste challenges in a reprocessing plant near Chelyabinsk in the Urals.[101]

Thus, while the level of domestic participation is declining, international contacts are still thriving. Actors traditionally skeptical to openness on nuclear matters, including the navy and the Ministry of Atomic Power, have consolidated their control over domestic decision making, but find themselves increasingly involved in co-operative programmes generated under the London Convention as well as other forums. With the international focus shifting from assessment and regulation of radioactive contamination to development of practical measures to avoid it, the resisters of yesterday are turning up as today's supporters of international co-ordination in the nuclear-waste area.

In summary, a combination of international political pressure, primarily by means of Consultative Meetings under the London Convention, and a series of joint investigations has been decisive for the generation of adequate knowledge about the hazards associated with dumping of radioactive waste in the Arctic. Such foreign contribution will also be decisive for the realization of Russian capacity adequately to treat and store radioactive waste, because the domestic political fuel available for this issue appears to have been largely spent and the navy and Russian authorities are tending once more to shroud radioactive waste management in secrecy. The role of the London Convention has been partly to co-ordinate and partly to encourage and legitimize programmatic activities initiated or financed within other such processes.

Conclusions

Industrialized countries today tend to avoid disposal at sea of hazardous and industrial waste, focusing instead on waste reduction, by recycling and clean production technologies and land-based treatment. The London Convention has promoted this development, primarily

by rendering global regulations established under regional conventions; by providing an arena where political compromises may evolve under the pressure of wide public attention; and, to some extent, by co-ordinating technology transfer and financial support when political will exists among Contracting Parties, as in the case of upgrading Russian treatment facilities for low-level radioactive waste.

The main deficiencies of the regime are inability to recruit sufficiently wide participation, especially among developing coastal states, and a clearly inadequate compliance system. Obligations to lodge national reports on dumping and management activities are widely ignored, hence reducing actual transparency, and, as demonstrated also in the protracted implementation failure of the Soviet Union regarding disposal of radioactive waste, there is scant opportunity for the secretariat or other Parties to assess critically the validity of reports. Thus, the future effectiveness of the Convention will be determined less by further regulative advances than by stimulation of wider participation and implementation of existing provisions. This would require a stronger emphasis on funding and organization of programmatic activities which can support the enhancement of administrative and physical waste management capacities where they are inadequate.

Notes and References

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1. See, respectively, Res. LC 51(16), Res. LC 50(16), and Res. LC 49(16), reproduced in International Maritime Organization (1993), *Report of the Sixteenth Consultative Meeting* (IMO Doc. LC 16/14), Annexes 5, 4, and 3. Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, London, 1972, reproduced in *International Legal Materials*, 11, (1972), 1291ff. The official short name of the Convention was changed from the London Dumping Convention (LDC) to the London Convention (LC) in 1992; on the background, see Erik Jaap Molenaar (1997), 'The 1996 Protocol to the 1972 London Convention', *International Journal of Marine and Coastal Law*, 12: 3, 396–403. Most of the conventions cited in this article are presented in the Agreement Section of this volume.
2. IMO Doc. LC 16/14, 8.
3. 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972, and Resolutions Adopted by Special Meetings, reproduced in *International Legal Materials*, 36: 1 (1997), 7–30. The Protocol is not yet in force, but much of its contents is already binding on Contracting Parties, as it incorporates a large number of amendments to the Convention made since the first Consultative Meeting; for an analysis of the Protocol, see René Coenen (1997), 'Dumping of Wastes at Sea: Adoption of the 1996 Protocol to the London Convention 1972', *Review of European Community and International Law*, 6: 1, 54–61; also Molenaar (1997), 'The 1996 Protocol'.
4. See 'Industrial Waste Dumping "Catastrophic" Says Report', *IMO News*, No. 4 (1995), 18–19. By 1996, 74 states had acceded to the convention, non-participation being especially pronounced among developing countries in Asia and Africa.
5. On the notion of regime effectiveness and its relation to problem solving, see in particular Arild Underdal (1992), 'The Concept of Regime "Effectiveness"', *Cooperation and Conflict*, 27: 3, 227–40, Olav Schram Stokke and Davor Vidas (1996), 'The Effectiveness of International Regimes', in O. S. Stokke and D. Vidas (eds.), *Governing the Antarctic: The Effectiveness and Legitimacy of the Antarctic Treaty System* (Cambridge: Cambridge University Press), and Oran R.Young and Marc A. Levy (with Gail Osherenko) (1998), 'The Effectiveness of International Regimes', in M. A. Levy and O. R. Young (eds.), *The Effectiveness of International Regimes* (Cambridge, MA: MIT Press).
6. Derek W. Spencer, (1990), 'The Ocean and Waste Management', *Oceanus*, 33: 2, 4–12, at 6.
7. Convention on the High Seas (Geneva, 29 Apr. 1958), United Nations Treaty Series, 450, 285ff, Art. 25, para. 1; see the discussion in Alexandre Kiss and Dinah Shelton (1991), *International Environmental Law* (Ardsley-on-Hudson: Transnational Publishers), 185–6.
8. GESAMP (Joint Group of Experts on the Sicentific Aspects of Marine Pollution) (1990), 'The State of the Marine Environment', in *Regional Seas Reports and Studies* (Nairobi: United Nations Environment Programme), 115, 40; the amounts cited are, respectively, 60 PBq, 200,000 PBq, and 20 million PBq. Estimated in 1990, the dumping figure is somewhat lower than it should be, as Russia has subsequently admitted to dumping an additional 90 PBq at various locations in the Barents and Kara seas; see below.
9. Cited in GESAMP (1990), 'The State of the Marine Environment', 40.
10. Ibid. 13; the period referred to is 1970–85.
11. Oslo Commission (1990), 'Dumping at Sea: Report on Achievements and Developments under the Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircrafts' (London: Oslo Commission), 2–3.
12. Oslo Commission (1989), 'Review of Sewage Sludge Disposal at Sea' (London: Oslo Commission), 6–7; that country decided in 1991, as the last of the North Sea states, to phase out this practice by 1998; see Danish Environmental Protection Agency (1995), *Progress Report: 4th International Conference on the Protection of the North Sea. Esbjerg, Denmark, 8–9 June 1995* (Copenhagen: Ministry of the Environment and Energy), 152–6.
13. GESAMP (1990), 'The State of the Marine Environment', 14, and Oslo Commission (1989), 'Review of Sewage Sludge Disposal', 8–9.
14. R. B. Clark, (1986), *Marine Pollution* (Oxford: Clarendon Press), 20; also GESAMP (1990), 'The State of the Marine Environment', 13–14.
15. Oslo Commission (1989), 'Review of Sewage Sludge Disposal', 65; also Clark (1986), *Marine Pollution*, 19.
16. According to the secretariat of the London Convention, an average of 215 million tonnes of dredged material was dumped annually in the period from 1980 to 1985, and this accounted for around a fifth of all dredged materials; see GESAMP (1990), 'The State of the Marine Environment', 12.
17. This depends, *inter alia*, on sediment characteristics such as particle size and organic or metal contents, and environmental conditions such as acidity and water currents causing mixing and resuspension; site management techniques include covering with clean sediment or locating sites in abiotic areas; see Robert M.

Engler (1990), 'Managing Dredged Materials', *Oceanus*, 33: 2, 63–71, esp. 66–9.

18. Ibid. 63; also GESAMP (1990), 'The State of the Marine Environment', 12.
19. Ibid. 14.
20. Ibid.; between 1980 and 1988, an average of 100,000 tonnes of liquid organohalogen was incinerated at sea, mainly in the North Sea.
21. See IMO Doc. LDC 4/12, Annex 2; also the discussion in Patricia Birnie and Alan E. Boyle (1992), *International Law and the Environment* (Oxford: Clarendon Press), 321; those main criteria also guide regulative decisions under regional conventions such as the 1992 OSPAR and 1974 Helsinki Conventions; see, respectively, Convention on the Protection of the Marine Environment of the Baltic Sea Area (Helsinki, 22 March 1974), *International Legal Materials*, 13 (1974), 546–84, and Convention for the Protection of the Marine Environment of the North-East Atlantic (Paris, 22 September 1992), *International Legal Materials*, 32 (1993), 1069ff.
22. Art. IV, paras. 1–2, and Art. VI respectively.
23. Compare 1996 Protocol, Arts. 4 and 3 with the London Convention 1972, Art. IV.
24. Art. XV, paras. 1 and 2.
25. Art. XV, para. 2; see also Kiss and Shelton (1991), '*International Environmental Law*', 102; a more general discussion of procedural mechanisms designed to get around the 'slowest-boat' problem in international regimes is provided by Peter H. Sand, (1991), 'Lessons Learned in Global Environmental Governance', in *Environmental Affairs Law Review*, 18, 213–77, esp. 236–47.
26. See IMO Doc. LDC 11/14, 32; the Parties were clarifying implications of the 1982 Law of the Sea Convention.
27. Birnie and Boyle (1992), *International Law*, 320; UN Convention on the Law of the Sea (Montego Bay, 10 December 1982) UN Doc. A/Conf.62/122, reproduced in *International Legal Materials*, 21 (1982), 1261ff. For a condensed analysis of this relationship between the London Convention and the Law of the Sea Convention, see Jeffrey L. Canfield (1994), 'Soviet and Russian Nuclear Waste Dumping in the Arctic Marine Environment: Legal, Historical, and Political Implications', *Georgetown International Environmental Law Review*, 6: 2, 353–444, esp. 358–60.
28. Kiss and Shelton (1991), *International Environmental Law*, 183; Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft (Oslo, 15 February 1972), in *International Legal Materials*, 11 (1972), 262ff. For an analysis of the effectiveness of this Convention, see Jon Birger Skjærseth (1992), 'Towards the End of Dumping in the North Sea: An Example of Effective International Problem-Solving?', *Marine Policy*, 16: 2, 130–40; when the OSPAR Convention 1992 enters into force, it will supersede the Oslo Convention.
29. International Maritime Organization (1991), *The London Dumping Convention: The First Decade and Beyond* (London: IMO), 117; this group achieved permanent status in 1984.
30. Other *ad hoc* groups set up under the Convention are the Working Group on Dredged Materials Disposal, the Working Group on Incineration at Sea, and the Task Team on Liability. The radioactive waste panels were formed in 1983 and 1985; see, respectively, IMO Doc. LDC 8/10, 19–20, and IMO Doc. LDC 9/12, 19–29.
31. Peter H. Sand (ed.) (1992), *The Effectiveness of International Environmental Agreements: A Survey of Existing Legal Instruments* (Cambridge: Grotius), 16.
32. Helge Ole Bergesen and Georg Parmann (eds.) (1997), *Green Globe Yearbook of International Co-operation on Environment and Development 1997* (Oxford: Oxford University Press), 214; of those, more than 800 are professional scientists.
33. See IMO Doc. LDC 10/15, Annex 11, and IMO Doc. LDC 13/15, 32.
34. IMO Doc. LDC 12/16, 40. Art. VII, para. 4, obliges Parties to adopt measures to ensure that even such vessels and aircraft '. . . act in a manner consistent with the object and purpose of this Convention . . .' While the 1996 Protocol retains the exemption of aircraft and vessels entitled to sovereign immunity, an opting-in clause is added permitting Parties to declare that it will apply the Protocol also to those; see Art. 10, paras. 4 and 5.
35. See IMO Doc. LDC 13/15, 39–41.
36. IMO Doc. LC 15/16, 14–16; while the 1996 Protocol is not applicable to internal waters, it includes a similar opting-in formulation as in the case of vessels entitled to sovereign immunity; see Art. 7.
37. Art. I, para. 4.3; on the negotiation of this point, see Coenen (1997), 'Dumping of Wastes at Sea', 55.
38. Art. VI, para. 1.
39. The London Convention, Annex 1.
40. IMO Doc. LDC 7/12, 19–30; the moratorium was established by Res. LDC 14(7), reproduced in Annex 3.
41. Five states abstained from the vote: the United Kingdom, Belgium, France, Russia, and China; of these, only Russia filed a formal reservation to the amendment, and this is the only state not formally bound by this prohibition; see IMO Doc. LC 17/14, 6.
42. Res. LC 49(16), reproduced in IMO Doc. LC 16/14, Annex 3; on the exemptions, see below.
43. See IMO Doc. LDC 4/12, Annex 5; a joint meeting of experts under the London Convention and the Oslo Convention prepared draft guidelines largely adopted in Res. LDC 23(10), reproduced in IMO Doc. LDC 10/15, Annex 2. These guidelines have been reviewed in 1994–5, resulting in the so-called 'Dredged Material Assessment Framework'; see IMO Doc. LC 2/Circ. 368, issued February 1996.
44. See in particular IMO Doc. LDC 2/11, Annex 2, which mirrors guidelines developed under the regional Oslo Convention; and IMO Doc. LDC 3, Annex 3; incineration at sea has been a regular item on the agenda of Consultative Meetings.
45. See, respectively, IMO Doc. LDC 11/14, 13, and IMO Doc. LC 15/16, Annex 4; also 18–20.
46. Res. LDC 29(10), reproduced in IMO Doc. LDC 10/15, Annex 13; also Res. LDC 35(11), reproduced in IMO Doc. LDC 11/14, Annex 7, addressing export of noxious wastes intended for incineration. Res. LDC 42(13), reproduced in IMO Doc. LDC 13/15, Annex 8, recommends elaboration of standards compatible to those imposed by the Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel, 22 March 1989), *International Legal Materials*, 28 (1989), 657ff.
47. Art. 6; on the compatibility with the Basel Convention, see Coenen (1997), 'Dumping of Wastes at Sea', 57.
48. See IMO Doc. LC 19/2/2.
49. See, respectively, IMO Doc. LDC 5/12, 8–9 and IMO Doc. LDC 12/16–89, 13.
50. See also Manfred Nauke and Geoffrey L. Holland (1992), 'The Role and Development of Global Marine Conventions: Two Case Histories', *Marine Pollution Bulletin* (special issue on Progress and Trends in Marine Environmental Protection), 25, 75–9.
51. For an overview of a range of environmental agreements in this respect, see Steinar Andresen (1992), 'International Verification in Practice: A Brief Account of Experiences from Relevant International Cooperative Measures', in E. Lykke (ed.), *Achieving Environmental Goals: The Concept and Practice of Environmental Performance Review* (London: Belhaven Press), 101–21.
52. It is estimated that some 10 per cent of the potential pollutants entering the marine environment derive from dumping activities; in comparison, run-off and land-based discharges account for 44

per cent and atmospheric contamination for 33 per cent; see GESAMP (1990), 'The State of the Marine Environment', 88.
53. See Organization for Economic Co-operation and Development (1994), *OECD Environmental Performance Review: United Kingdom* (Paris: OECD), 72; also Danish Environmental Protection Agency (1995), *Progress Report*, 152. The phase-out of industrial waste does not include colliery waste; see below.
54. Organization for Economic Co-operation and Development (1994), *OECD Environmental Performance Review: Japan* (Paris: OECD), 58.
55. Organization for Economic Co-operation and Development (1996), *OECD Environmental Performance Review: United States*. (Paris: OECD), 100.
56. Helsinki Convention 1974, Art. 9.
57. OSPAR Convention 1992, Annex 2, Art. 3, para. 3; the OSPAR prohibition would expire after 15 years; France and the United Kingdom unsuccessfully opted for this solution also under the London Convention; see IMO Doc. LC 16/14, 16. The International North Sea Conference had already agreed in 1990 that the North Sea was unsuitable for dumping of radioactive waste; see Birnie and Boyle (1992), *International Law*, 324.
58. OSCOM Decisions 88/1 (24 June 1988) and 89/1 (14 June 1989); reproduced in Oslo Commission (1990), Annexes 1 and 3.
59. See Coenen (1997), 'Dumping of Wastes at Sea', 57.
60. 1996 Protocol, Art. 26; this provision does not apply to incineration at sea and dumping of radioactive waste.
61. See also Coenen (1997), 'Dumping of Wastes at Sea'.
62. See, respectively, Art. XVIII and rules 3 and 4 of the Rules of Procedure (IMO Doc. LC 1/16, Annex 2); whether or not to invite given international or non-governmental organizations is left for each Meeting to decide (rule 3). Comparing the London Convention with several other international agreements, Gerard Peet concludes that the former is comparatively generous regarding the opportunities for non-governmental organizations to be active; see Gerard Peet (1994), 'The Role of (Environmental) Non-Governmental Organizations at the Marine Environmental Protection Committee (MEPC) of the International Maritime Organization (IMO), and at the London Dumping Convention (LDC)', *Ocean and Coastal Management*, 22: 1, 3–18.
63. IMO Doc. LDC 7/12, 27, 36. According to Peet (1994), 'The Role of Non-Governmental Organizations', 7, the perception among Contracting Parties of the contributions of the environmental groups to the deliberations at Consultative Meetings changed for the better in later years.
64. IMO Doc. LDC 14/16, 36–7; see the case study below.
65. Senator Robert Bell of the Democratic Party, referred to in *International Environmental Reporter*, (9 February 1994), 131; Australia had filed a reservation to the industrial waste dumping ban as regards jarosite, and was thus not legally bound by it before the end of 1997; see IMO Doc. LC 17/14, 6.
66. Res. LDC 30(11), reproduced in IMO Doc. LDC 11/14, Annex 2.
67. See Res. LC 49(16), reproduced in IMO Doc. LC 16/14, Annex 3.
68. GESAMP (1990), 'The State of the Marine Environment', 12.
69. Yoshimi Deai of Japan's Environmental Agency, cited in 'Japan to Still Dump Wastes into Ocean Despite International Curb, Official Says', *International Environmental Reporter* (20 April 1994), 357.
70. This exemption extends the position already taken at the 1988 Meeting that existing IMO guidelines in this area are sufficient; see IMO Doc. LDC 11/14, 48–50; on national positions in this matter, see IMO Doc. LC 18/11, 5–6.
71. GESAMP (1990), 'The State of the Marine Environment', 24.
72. Oslo Commission (1990), 'Dumping at Sea', 4.
73. Res. LDC 15(7), reproduced in IMO Doc. LDC 7/12, Annex 4; also IMO Doc. LDC 8/11, 22–31.
74. Res. LDC 41(13), reproduced in IMO Doc. LDC 13/15, Annex 7; see also IMO Doc. LDC 13/15, 39–40.
75. IMO Doc. LDC 3/12, 10–12; also Annexes 4 and 5. In the 1996 Protocol, the dispute settlement system is comprised in Art. 16 and Annex 3.
76. IMO (1991), *The London Dumping Convention*, 97–9.
77. See IMO Doc. LC 15/16, 9.
78. See Res. LDC 43(13), reproduced in IMO Doc. LDC 13/15, Annex 9, and IMO Doc. LDC 14/16, 24–5.
79. See IMO Doc. 18/11, 17–19.
80. See Ellen Hey (1995), 'Ocean Dumping', in G. Handl (ed.), *Yearbook of International Environmental Law* (Oxford: Clarendon Press), 190–94; also IMO Doc. 18/11, 19–20.
81. See Res. LC 55(SM), reproduced in IMO Doc. LC/SM 1/6, including an Annex comprising a Framework for a Technical Co-operation and Assistance Programme under the London Convention 1972.
82. This section draws on Olav Schram Stokke (1997), 'Nuclear Dumping in Arctic Seas: Russian Implementation of the London Convention', in D. G. Victor, Kal Raustiala, and Eugene B. Skolnikoff (eds.), *The Implementation and Effectiveness of International Environmental Commitments: Theory and Practice* (Cambridge, MA: MIT Press).
83. A.V. Yablokov, V. K. Karasev, V. M. Ruyantsev, M. Y. Kokeyev, O. I. Petrov, V. N. Lystsov, A. F. Yemelyanenkov, and M. Rubtsov (1993), *Fakta og problemer forbundet med deponering av radioaktivt avfall i havet som omgir den russiske føderasjons territorium. Materiale fra rapporten til regjeringskommisjonen for spørsmål forbundet med deponeringen av radioaktivt avfall i havet* (Norwegian trans.) (Moscow: Office of the President of the Russian Federation). *Facts and Problems Related to Radioactive Waste Disposal in Seas Adjacent to the Territory of the Russian Federation* (English trans.) (Albaquerque, NM: Small World Publishers, 1993).
84. Resolution 222 on Measures to Ensure Performance of the Soviet Side's Obligations Following from the 1972 [London] Convention, cited in Canfield (1994), 'Soviet and Russian Nuclear Waste Dumping'.
85. Yablokov *et al.* (1993), *Fakta og problemer*, 54.
86. Parts, but not all, of the dumping activity were conducted by naval vessels, to which the provisions of the London Convention do not apply; however, see the discussion above regarding vessels and aircraft entitled to sovereign immunity.
87. Yablokov *et al.* (1993), *Fakta og problemer*, 25; the guidelines are reproduced in IAEA Infcirc/205/Add. 1/Rev. 1. (Vienna: International Atomic Energy Agency, 1978).
88. See Stokke (1997), 'Nuclear Dumping in Arctic Seas', and Canfield (1994), 'Soviet and Russian Nuclear Waste Dumping'.
89. See in particular IMO Doc. LDC 14/16, 36–7, IMO Doc. LC 15/16, 38–40, IMO Doc. LC 16/14, 19, 23–4.
90. See IMO Doc. LDC 7/12, 29; the Soviet Union also abstained when the moratorium was prolonged in 1985; see IMO Doc. LDC 9/12, 41. As noted above, when the 1993 prohibition was adopted, Russia abstained from the vote and was the only state which subsequently filed a reservation.
91. Yablokov *et al.* (1993), *Fakta og problemer*, 26.
92. Birnie and Boyle (1992), *International Law*, 324.
93. See in general Vladimir Baranovski (1995), 'Russia and its Neighbourhood: Conflict Developments and Settlement Efforts', in Stockholm International Peace Research Institute (1995), *SIPRI Yearbook 1995: Armaments, Disarmaments and International Security* (Stockholm: SIPRI), 231–64, and Office of Technology Assessment (1995), *Nuclear Wastes in the Arctic: An Analysis of Arctic and Other Regional Impacts from Soviet Nuclear Contamination* (Washington, DC: Congress of the United States), 107.

94. Raphael Vartanov, Alexei Roginko, and Vladimir Kolossov (1997), 'Russian Security Policy, 1945–96: The Role of the Arctic, the Environment and the NSR', in W. Østreng (ed.), *National Security and International Environmental Security: The Case of the Northern Sea Route* (Lysaker: Fridtjof Nansen Institute), INSROP Working Paper No. 83, 57–112. *Gosatomnadzor* had withdrawn permits from three enterprises engaged in the processing of radioactive waste, including Mayak, due to a '. . . very complicated situation in radwaste management . . .'; see Y. I. Zubkov and A. I. Kislov (1995), 'Federal Nuclear and Radiation Safety Authority of the Russian Federation (Gosatomnadzor)', in *International Cooperation on Nuclear Waste Management in the Russian Federation* (Vienna: International Atomic Energy Agency), 27–36; the conference where this article was presented was held one month before the decision to reduce the area of competence of *Gosatomnadzor* itself.
95. See Secretariat of the Joint Russian-Norwegian Expert Group for Investigation of Radioactive Contamination in the Northern Areas (1996), *Radioactive Contamination in the Kara Sea: Results from 3 Years of Investigations (1992–1994) in the Kara Sea*, (Østerås: Joint Russian-Norwegian Expert Group for Investigation of Radioactive Contamination in the Northern Areas), 42–9; a fourth cruise was conducted by the Norwegian Akvaplan–NIVA and the Murmansk Marine Biological Institute in 1992; see Kirsti-Liisa Sjoeblom and Gordon S. Linsley (1995) 'The International Arctic Seas Assessment Project: Progress Report', *IAEA Bulletin*, 37: 2, 25–30.
96. See LC 15/16, 38–40; the IAEA programme is described in Sjoeblom and Linsley (1995), 'The International Arctic Seas Assessment Project'.
97. See IMO Doc. LC 16/14, 22–5.
98. IMO Doc. LC 16/14, Annex 6.
99. IMO Doc. LC 16/14, 25.
100. IMO Doc. LC 17/14, Annex 5. A facility to concentrate and solidify low-level liquid waste had been built in 1991–2; see Rune Castberg and Olav Schram Stokke (1992), *Barentsregionen: Miljøproblemer i Murmansk og Arkhangelsk fylker* (Lysaker: Fridtjof Nansen Institute), RSN Report No. 4, 35.
101. IMO Doc. LC 17/14, 30.