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Nuclear Arms Control: The Environmental Dimension

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[T]he United States pledges before you—and therefore to the World—its determination to help solve the fearful atomic dilemma—to devote its entire heart and mind to find the way by which the miraculous inventiveness of man shall not be dedicated to his death but consecrated to his life.[1]

Dwight D. Eisenhower

I. INTRODUCTION

International arms control efforts have reduced the nuclear balance of terror and even offered a glimpse of the much-vaunted but elusive peace dividend.[2] These efforts are among the few remaining bipartisan foreign policy issues embraced by conservatives and liberals alike.[3] This

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1. The remarks of President Dwight D. Eisenhower in an address before the United Nations General Assembly on December 12, 1953.

2. *See* ARMS CONTROL: TOWARDS THE 21ST CENTURY (Jeffrey A. Larsen & Gregory J. Rattray eds., 1996); KERRY M. KARTCHNER, NEGOTIATING START: STRATEGIC ARMS REDUCTION TALKS AND THE QUEST FOR STRATEGIC STABILITY (1992).

3. *See, e.g.*, Antonio F. Perez, *To Judge Between the Nations: Post Cold War Transformations in National Security and Separation of Powers—Beating Nuclear Swords into Plowshares in an Imperfectly Competitive World*, 20 HASTINGS INT'L & COMP. L. REV. 331, 337 n.15 (1997); Marian Nash (Leich), *Arms Control and Disarmament: Nuclear Materials Security and Warhead Dismantlement*, 90 AM. J. INT'L L. 89,

"motherhood and apple pie" objective has purposefully been pursued by succeeding administrations, and it is regarded by many as one of the great foreign policy achievements of our time. And so it is.

We are, however, witnessing the unraveling of unforeseen, albeit serious, consequences of Russian–US arms control, in the form of nuclear pollution. This Article addresses one aspect of this phenomena by examining how the Strategic Arms Reduction Treaty (START),[4] perhaps the most important and successful arms reduction treaty between Russia and the United States, has affected the nuclear pollution of the Arctic Ocean, particularly in the area of the shallow Barents and Kara Seas.

Unlike earlier arms control agreements that focused on test bans and preventing the spread of nuclear arms to non-nuclear countries,[5] START, for the first time in post-cold war history, aimed at *reducing* the number of nuclear weapons and warheads including submarine launched ballistic missiles (SLBMs). Since the reduction of SLBMs necessarily entails the disarming and decommissioning of many US and Russian ballistic missile submarines (SSBNs), a legislative environmental impact assessment (LEIA) was produced for START.[6] It was, however, confined to environmental impacts within the United States and did not examine the extraterritorial impact of the START-ordered reduction of SLBMs. The assessment thus did not address the decommissioning of thirty-one Russian nuclear submarines and the waste streams resulting from this exercise on the internationally-important Arctic Ocean. A fuller environmental evaluation may have avoided or eased some of the difficult and expensive environmental problems that now confront the implementation of START.

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92 (1997); J. Stephan Wood, *The Breakdown of Weapons Control Regimes?*, 89 AM. SOC'Y INT'L L. PROC. 380, 392 (1995).

4. Treaty on the Reduction and Limitation of Strategic Offensive Arms, July 31, 1991, entered into force Dec. 5, 1994, U.S.–U.S.S.R., S. Treaty Doc. No. 102-20, 102d Cong., 1st Sess. (1991), 16 U.N. DISARMAMENT Y.B., app. II, 450 (1991) [hereinafter START].

5. *See* ARMS CONTROL ASSOCIATION, ARMS CONTROLS AND NATIONAL SECURITY, AN INTRODUCTION 25 (1989). The Strategic Arms Limitation Talks II (SALT II 1972–79) put caps on the number of Multiple Independently Targetable Reentry Vehicles (MIRVs) allowed on each missile, as well as limitations on the number of missiles overall (MIRVs are small warheads located inside a larger missile). SALT I (1969–72), however, limited the number of missile launchers without limiting warheads or other weapon technology. *See id. See also* Astrid Wendlandt, *Pacifying Russia: International Aid and NATO Expansion*, 22 FLETCHER F. WORLD AFF. 131, 134 (1998).

6. *See* discussion *infra* Part V.B (regarding legislative environmental impact statements and the National Environmental Policy Act).

Part II of this Article will review the extent of past nuclear dumping in the Arctic, and discuss future concerns. It will analyze the extent to which the disarmament and consequent decommissioning of nuclear submarines pursuant to START have added to existing environmental problems caused by past nuclear dumping. Part III will discuss the present environmental quality of the Arctic based on recent studies of radioactive pollution. Part III also will examine Russia's lack of facilities to deal with present and future nuclear waste. Part IV will review the international bi- and trilateral measures taken to address the environmental problems of the Arctic. It will focus on the billions of dollars being spent by the United States to remedy environmental problems that obstruct the implementation of START.

Part V contends that an environmental impact assessment of the international effects of START would have revealed these problems, which then could have been dealt with more efficiently. Although American case law indicates that future treaties may not be subject to legally mandated environmental impact assessments, Part V argues that the United States should nonetheless adopt a more comprehensive approach to the future international environmental impacts of arms control treaties. Some form of global environmental impact assessment for arms control treaties is a political and environmental necessity that the United States has ignored at considerable cost. The present global hazards caused by nuclear pollution in the Arctic cannot be solved just by the United States, Russia, and Norway. It is an international problem that calls for international cooperation. International environmental impact assessments, by drawing attention to Russia's inability to remedy its abuse of the Arctic, will likely elicit greater international cooperation than has hitherto been the case.

II. THE RADIOACTIVE POLLUTION OF THE ARCTIC OCEAN

Soviet nuclear pollution of the Arctic is well documented.[7] The pollution has been caused by accidents on land that released radioactive

7. *See, e.g.*, A.V. Yablokov et al., *Facts and Problems Related to the Dumping of Radioactive Waste in the Seas Surrounding the Territory of the Russian Federation: Materials from a Government Report on the Dumping of Radioactive Waste, Commissioned by the President of the Russian Federation, Oct. 24, 1992, Decree No. 613* (Greenpeace Russia trans., 1993) [hereinafter Yablokov Report] (on file with the *Colorado Journal of International Environmental Law & Policy*).

material into the Arctic environment,[8] by land-based discharges of radioactive pollutants into rivers that later migrated into the neighboring Arctic seas;[9] and by the Soviet Navy. The Yablokov Report, written after the Fifteenth Consultative Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, documents the frightening extent to which dumping of various kinds took place between 1958 and 1992.[10] The report recounts how the huge Russian nuclear fleet, the largest in the world, used the shallow Barents and Kara Seas of the Arctic Ocean to dispose of its nuclear waste, including unsafe reactors.

Russian submarines remain a significant source of pollution. The fleet of over 140 retired nuclear submarines moored in the Russian naval graveyard ports of Murmansk, in the Barents Sea of the Arctic Ocean, and Vladivostok, in the Sea of Japan in the Pacific Ocean, are of particular concern.[11] These shipyards do not have safe facilities for storing the spent nuclear waste generated by nuclear submarines. While military secrecy surrounds their operations, informed observers[12] conclude that they are not managed according to recognized international standards.[13] The dangerous waste generated by the reactors in Murmansk is stored or disposed of under unsafe conditions in a manner that presents a danger to human health and to the natural environment both on land and at sea. The United States and Norway have discovered, at considerable financial cost, that retiring thirty-one submarines under START cannot be accomplished without addressing the larger issue of the Russian nuclear fleet's pollution of the Arctic.

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8. *See* discussion *infra* Part V.A. (discussing the Chernobyl accident).

9. *See infra* note 31 (discussing the Mayak Nuclear Materials complex).

10. *See* Yablokov Report, *supra* note 7.

11. *See id. See also* discussion *infra* Part II.C (for an in depth discussion of these concerns).

12. One of the most prominent of these is the Bellona Foundation of Norway, whose reports are cited throughout this paper. Bellona describes its mission thus: "Bellona Foundation was founded as an independent ideal organization in 1986. The Foundation is a science based environmental organization whose main objective is to combat problems of environmental degradation, pollution-induced dangers to human health and the ecological impacts of economic development strategies." Bellona, *An Introduction to the Bellona Foundation* (visited Feb. 17, 1999) <http://www.bellona.org/e/bellona/index.htm>. Experts at Bellona possess detailed information about the Russian nuclear submarine crisis. For example, Alexander Nikitin was a Russian Naval Submarine Commander and is a coauthor of the original Bellona report. He is currently in jail in Russia for his part in Bellona. *See* Bellona, *Nikitin Trial* (visited Mar. 10, 1999) <http://www.bellona.org/e/russia/ nikitin/overview.htm>.

13. *See* discussion *infra* Part II.C (detailing dangerous deviations from basic international standards).

The disarming and decommissioning of a nuclear submarine is a major engineering task involving four steps that have significant environmental impacts.[14] START addressed the first step concerning the disarming of submarines, but not the other steps involving the destruction of submarines; the treatment and disposal of nuclear wastes; and the disposal of other radioactive materials. START negotiators remained ignorant throughout the treaty-making process of the extent of Soviet pollution of the Arctic and of the inability of the Russians who legally succeeded the Soviet Union to cope, not only with the existing fleet of retired submarines, but also with any further fleet reductions necessitated by START SLBM provisions. START appears to leave unaddressed the environmental impacts of decommissioning thirty-one submarines in short order. Apparently, treaty negotiators did not foresee that the implementation of START might exacerbate existing Arctic nuclear pollution.

A number of physical, topographical, and oceanographic features of the Arctic Ocean give rise to deep concern about the dangers presented by increasing nuclear pollution. First, the Arctic, unlike the Antarctic, is almost completely surrounded by the continental land masses of Eurasia, North America, and Greenland. It is virtually an estuary of the Atlantic with very little circulation between itself and the Atlantic or Pacific Ocean.[15] Second, the Eurasian side of the Arctic Ocean, where radioactive dumping and land-based pollution occur, consists of shallow waters that lie over continental shelves ranging from 300 to1100 miles in length.[16] Third, while the Arctic does contain deep basins, the shallow waters in which the Soviet dumping took place are connected because the Arctic contains a high ratio of freely connected shallow seas to deep basins. Essentially, this means that pollution can become concentrated in shallow waters, rendering dilution of such wastes impossible. Unfortunately, much of the dumping of nuclear wastes and even whole reactors has taken place in the shallow Barents and Kara Seas.

Because there is little circulation between the Arctic and Atlantic Oceans, the Barents Sea, into which nuclear dumping occurred, tends to concentrate and confine such pollution. At the same time, the Barents

14. *See* discussion *infra* Part III.A (describing specific environmental impacts resulting from the decommissioning of nuclear submarines).

15. The major hydrological circulation into and out of the Arctic basin is through a single deep channel—the Fram Strait—that lies between the islands of Spitsbergen and Greenland. Small quantities of Pacific water also enter the Arctic through the Bering Strait. *See Arctic*, 14 ENCYCLOPAEDIA BRITTANICA 4 (1997).

16. *See id.* An enormous submarine mountain range named the Lomonosov Ridge, which has an average relief of 10,000 feet, divides the Arctic into the Eurasia basin on the European side and the Amerasia basin on the American side. *See id.*

Sea remains connected to the Fram Strait, the main source of outflow into the Atlantic. According to climatologists, the outflow of water from the Arctic to the Atlantic through the Fram Strait is a major factor in regulating the large-scale circulation and mean temperature of the world, with a potentially profound impact on global climate change.[17] Arctic waters, rendered more radioactive by the present patterns of pollution have the potential for affecting radioactivity in the global oceans.

In addition, the Arctic is an important global ecosystem, part of the marine food chain, and the feeding and breeding ground of many migratory fish, birds, and mammals.[18] The Arctic Ocean provides important habitats for many migratory species such as the Canadian goose, the killer whale, and the reindeer. The Arctic is also a nursery to many of the world's animals, especially birds and fish.[19] These migratory species have the capacity to carry radioactive contamination back to less contaminated lands, spreading the poison.[20] Damage to the habitat of the Arctic could result in serious ecological consequences.

A. Past Dumping

Russian dumping of approximately 2.4 million curies (Ci)[21] of radioactive material took place behind a veil of secrecy from 1958 to

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17. *See id.*

18. *See id.* at 11–13.

19. *See* James Meek, *Russians Take Plunge to Make Sunken Sub Safe*, GUARDIAN (London), June 8, 1995, at 14.

20. *See* Tom Dunkel, *Eyeballing Eiders*, AUDUBON, Sept.–Oct. 1997, at 48 (noting a decline of sea mammals, increasing pollution, and natural resource pressures in the Arctic).

21. A curie is an empirically derived unit that is used to measure the amount of inherent radioactivity in a substance—the source of the radioactivity. Other relatively common units for measuring radioactivity are rads (R) and rems (r). Each of these units is related. Whereas the Ci measures the strength of a source of radioactivity, R and r measure the absorption of the radioactivity as the absorption of energy. That is, 1 R=100 ergs of absorbed energy per gram of absorbing material. The rem, however, is a much more complicated unit that relates to the absorption of radioactivity in human tissue. *See* JOHN W. GOFMAN, RADIATION AND HUMAN HEALTH 46 (1981). For a fuller explication see NATIONAL COUNCIL ON RADIATION PROTECTION AND MEASUREMENTS, THE RELATIVE BIOLOGICAL EFFECTIVENESS OF RADIATIONS OF DIFFERENT QUALITY, NCRP Report No. 104 (1990). A large volume of radioactive waste was dumped in the Russian Arctic, most of it contained in accidentally damaged reactors. While varying records were kept of the volume and radioactivity of the dumped wastes, there is very little data for the reactors that were dumped because they were involved in accidents. The extent of radioactivity in the dumped reactors has been estimated, and the recent estimates are derived from information about the fuel in the reactors and their operating histories. *See* Yablokov Report, *supra* note 7. These estimates are admittedly not very accurate because each of the

1992.[22] According to the International Atomic Energy Agency (IAEA), the former Soviet Union's radioactive waste-dumping practices were first publicized by a Russian nongovernmental environmental group named Towards a New Earth, in 1991.[23]

At the Fifteenth Consultative Meeting of the London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, Greenpeace and the member states tasked the Russian government to report on its radioactive waste-dumping practices. Russia had previously stated that it had never dumped radioactive waste at sea, but there were indications otherwise.[24] The Yablokov Report—a stunning example of an open response under *glasnost*—officially revealed the dumping, triggering a number of news reports,[25] articles,[26] books,[27] and conferences[28] on the Russian disposal of radioactive waste.

More radioactive waste, including six or seven fully fueled nuclear reactors, has been dumped by the former Soviet Union into the Arctic Ocean than the totality of radioactive materials dumped into the rest of the world's oceans.[29] In fact, the Russians are responsible for dumping

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dumped reactors was involved in an accident that could have changed the amount of radioactivity. *See* Sjoeblom & Linsley, *infra* note 23. The best estimates of total radioactivity dumped in the Arctic range between 1 and 3 million Ci. *Id.*

22. *See* Yablokov Report, *supra* note 7, tbls. 2, 3, 8, 9.

23. *See* Kirsti-Liisa Sjoeblom & Gordon S. Linsley, *The International Arctic Seas Assessment Project: Progress Report* (visited Feb. 18, 1999) <http://www.iaea.or.at/worldatom/inforesource/bulletin/bull372/sjoeblom.html>.

24. *See id.*

25. *See* Yablokov Report, *supra* note 7. *See also* NATO, DECOMMISSIONED SUBMARINES IN THE RUSSIAN NORTHWEST: ASSESSING AND ELIMINATING RISKS (1997).

26. *See, e.g.*, Jennifer McIver, *Environmental Protection, Indigenous Rights and the Arctic Council: Rock, Paper, Scissors on the Ice?*, 10 GEO. INT'L ENVTL. L. REV. 147 (1997); Steven D. Lavine, *Russian Dumping in the Sea of Japan*, 24 DENV. J. INT'L L. & POL'Y 417 (1996); James R. McCullagh, *Russian Dumping of Radioactive Wastes in the Sea of Japan: An Opportunity to Evaluate the Effectiveness of the London Convention 1972*, 5 PAC. RIM L. & POL'Y J. 399 (1996); Kristin Moody-O'Grady, *Nuclear Waste Dumping in the Oceans: Has the Cold War Taught Us Anything?*, 35 NAT. RESOURCES J. 695 (1995); Jason H. Eaton, *Kicking the Habit: Russia's Addiction to Nuclear Waste Dumping at Sea*, 23 DENV. J. INT'L L. & POL'Y 287 (1995).

27. *See, e.g.*, MURRAY FESHBACH & ALFRED FRIENDLY JR., ECOCIDE IN THE USSR (1992); MURRAY FESHBACH, ECOLOGICAL DISASTER: CLEANING UP THE HIDDEN LEGACY OF THE SOVIET REGIME (1996).

28. *See, e.g.*, WOODS HOLE OCEANOGRAPHIC INSTITUTION, RADIOACTIVITY AND ENVIRONMENTAL SECURITY IN THE OCEANS: NEW RESEARCH AND POLICY PRIORITIES IN THE ARCTIC AND NORTH ATLANTIC (1993); NATO, ADVANCED RESEARCH WORKSHOP: RECYCLING, REMEDIATION, AND RESTORATION STRATEGIES FOR CONTAMINATED CIVILIAN AND MILITARY SITES IN THE ARCTIC FAR NORTH (1996).

29. *See* Yablokov Report *supra* note 7, tbls. 1–9.

twice as much nuclear waste as rest of the combined nuclear powers of the world.[30] The Arctic seas are also subject to radiation inputs from many other sources, including runoff from the discharge of nuclear reprocessing wastes into rivers that flow into the Arctic seas;[31] atmospheric, underwater, and underground atomic and hydrogen bomb testing

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30. *See id.*

31. *See* John Glenn, *The Mayak Nuclear Materials Production Complex and the Techa River* (visited Dec. 14, 1998) <http://news.poweronline.com/feature-articles/19980721-340.html#john>. Nuclear material reprocessing and nuclear weapons and fuel plants in the interior of Russia have dumped in excess of five million Ci of radiation into rivers flowing into the Arctic seas. *See id.*

> Near the southern Ural Mountains, in the Russian province of Chelyabinsk, there is a Soviet nuclear facility called the Mayak Chemical Combine. From 1948 until 1990 when the last of five reactors was shut down, the Combine contaminated the region to such an extent that it is now known as the most polluted area on Earth. The region received this title due to the Combine's continuous disregard for environmental and public safety. However, there are three specific incidents that stand out: (1) intentional dumping of radioactive waste into the Techa River; (2) an explosion at a radioactive waste storage facility in 1957; and (3) a 1967 wind storm that deposited irradiated sediments from Lake Karachay onto the surrounding province. *Id.*

An estimated 150 million Ci of radioactivity was released into the environment and may have been transported down the Techa and Ob Rivers and into the Kara Sea. *See id.* Ocean models show that while the highest concentrations of radioactivity are contained in the mouths of the rivers that flow from Siberia, measurable quantities of radioisotopes also appear hundreds of miles out into the Kara Sea. *See Transport of Radionuclides Kara Sea* (visited Dec. 14, 1998) <http://www.nrsc.no/New/kara.html>.

on Nova Zemlya;[32] and releases resulting from various emergencies, including Chernobyl.[33]

The elements found in spent nuclear fuel are some of the most toxic on earth. One of these, plutonium, results from the spontaneous radioactive decay of enriched uranium fuel[34] and is sometimes referred to as the single most dangerous element to human health and the environment.[35] Cesium is also a common product of nuclear fuel.[36] Chemically, cesium moves uniformly throughout the human body. In the environment, cesium binds strongly to soil and enters the food chain where it is taken up by plants and passed on to higher organisms, including humans.[37]

The constantly changing nature of radioactive substances makes them dangerous. For example, if a small amount of pure uranium is isolated in a container, it will propagate into a wide variety of radioactive substances within the same container. Radioactive substances are constantly changing their chemical form. Uranium spontaneously emits subatomic particles from its nucleus and turns itself into protactinium in a process that is called "radioactive decay." Protactinium is radioactive,

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32. *See* Jeffrey Canfield, *Soviet and Russian Nuclear Waste Dumping in the Arctic Marine Environment: Legal, Historical and Political Implications*, 6 GEO. INT'L ENVTL. L. REV. 353, 374 (1994). Nova Zemlya, or New Land, was one of the former USSR's "proving grounds" for weapons of mass destruction (see Fig. 1). The other was in Kazakhstan, which has declared a moratorium on nuclear weapons testing. The largest nuclear bomb test in the world was detonated there, having a yield of 150 megatons. In all, there were eighty-seven atmospheric, forty-two underground, and three underwater nuclear bomb tests. *See id.* The environmental result of this bomb testing is unknown, controversial, and a Russian military secret. A study by a commission of the Russian Ecology Ministry found low levels of gamma radiation, concluding that the average radiation level for the island did not exceed normal background levels. However, a relatively recent article by Jeffrey Canfield details an independent report to the Russian Supreme Soviet that found there were several areas of gamma radiation up to two milliroentgens (mR) per hour, which could result in a yearly dose of 17.52 R per year—100 to 175 times normal background levels. Background levels of radiation are normally quite low, delivering between 100 and 300 mR, depending upon where a person lives and works. *See Natural Background Radiation* (visited Dec. 12, 1998) <http://www.triumf.ca/safety/tsn/tsn_6_2/section3_9.html>.

33. *See* discussion *infra* Part V.A (describing the effects of the Chernobyl accident).

34. *See* SAMUEL GLASSTONE & WALTER JORDAN, NUCLEAR POWER AND ITS EFFECTS (1980).

35. *See* JOHN HARTE, TOXICS A TO Z: A GUIDE TO EVERYDAY POLLUTION HAZARDS 386 (1992).

36. *See id.* at 263.

37. *See id.*

so it "decays" through a series of radioactive isotopes until the element that was originally uranium becomes common lead.[38]

In the same way, spent nuclear fuel becomes more dangerous as it ages, because more and more decay products are formed. A typical used nuclear reactor core will contain many thousands of different radioactive isotopes, even though it started with only a few.[39] Each new isotope has its own chemistry, and each might be expected to behave differently in the environment. For instance, Uranium 238 is a heavy metal, similar to lead in appearance and form. However, each Uranium 238 isotope will at one time or another turn into radon gas. We might expect uranium that has been dumped into the ocean to be trapped in sediments, but the radon could diffuse out of the sediments and into the water. Further, many of the radioactive isotopes that form in the uranium decay series are metals, which means they will form salts and oxides if they are exposed to sea water. Salts dissolve easily in water, and can make the radioactive materials freely mobile in the environment. The changing nature of radioactive substances makes their potential for environmental transport enormous. Tracking or predicting this movement becomes incredibly complicated, and sometimes even impossible.[40]

In a large ecological context like the Arctic Ocean, there are many complex factors at work. Pollutants might become entrapped in the sediments or ice, or they might be mobilized through the food chain. As we have seen, the radioactive substances can spontaneously change form and chemistry, increasing the probability that they will become part of an ecological system.

Models have been developed that might help scientists approximate the movement of radioactive materials in the environment, and, to a limited extent, these models may become important tools for predicting the effects of radioactive releases in the Arctic.[41] However, recent studies[42] of the radioactive pollution of the Arctic continue to be equivocal as to future environmental impacts. The new studies echo the United States Office of Technology Assessment in 1995 that concluded,

> [e]stimates and approximations of future impacts [from Russian

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38. *See* GLASSTONE & JORDAN, *supra* note 34, fn.34. Radioactive decay can take a long time. For instance, the naturally occurring form of uranium, U_{238}, has a 4.5 billion year half life. That is, in 4.5 billion years, half of the U_{238} that was first "created" in a rock will have decayed into something else. *See id.*

39. *See id.*

40. *See generally*, Jason B. Aamodt, Note, *Naturally Occurring Radioactive Materials: Human Health and Regulation*, 33 TULSA L.J. 847 (1998).

41. *See* discussion *infra* Part III.

42. *See* discussion *infra* Part III.

> dumping] based upon information available do not suggest a noticeable effect on human health or on plant and animal populations. However, many unknowns remain, from the status of the dumped wastes, to the likely movement of radionuclides through the environment, to the dietary intakes of those most likely to be exposed.[43]

Despite all the uncertainties, a great deal is known about the quantities, and to some extent, the qualities of radioactive materials that the Russians dumped into the Arctic seas. The dumping was mainly done in three ways: (1) direct dumping of uncontained high-, medium-, and low-level liquid radioactive waste; (2) direct dumping of thousands of tons of solid, high-level radioactive waste in various forms of containment; and (3) direct dumping of sixteen to eighteen nuclear submarine reactors—six or seven with all of their fuel—reportedly after the submarines had met with accidents of varying severity.[44]

1. Uncontained Liquid Radioactive Waste

Submarines produce liquid waste in two ways. First, contaminated areas are often flushed with water to decontaminate them. This results in generally low-level or less concentrated waste.[45] Second, the coolant systems in the submarine reactors are flushed when they become too contaminated with radioactive materials to operate safely. This results in high-level or more highly concentrated radioactive waste.[46] The Yablokov Report indicates that, as of 1992, approximately 190,000 cu-

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43. OFFICE OF TECHNOLOGY ASSESSMENT, NUCLEAR WASTES IN THE ARCTIC: AN ANALYSIS OF ARCTIC AND OTHER REGIONAL IMPACTS FROM SOVIET NUCLEAR CONTAMINATION, 12–13, OTA-ENV-632 (1995).

44. *See* discussion *infra* Part II.A.1.

45. *See* Yablokov Report, *supra* note 7, at 11–12.

46. *See id.* About 200 cubic meters of liquid radioactive waste is created with each refueling — a process that takes place every 7–10 years. *See* Susanne Kopte, *Nuclear Submarine Decommissioning and Related Problems* (visited Dec. 12, 1998) <http://bicc.uni-bonn.de/weapons/paper12/content.html>.

> The yearly production of liquid waste is between 2,000-2,500 m^3. Since all storage capacity on the Kola Peninsula is full, the situation has become acute. Some liquid waste is processed at the Atomflot treatment plant in the Murmansk fjord. In 1994 the Northern Fleet delivered 1,000 m^3 here and in 1995, 200 m^3. Even if the Atomflot treatment capacity should increase, the Northern Fleet will have difficulty in footing the bill for treatment and transport.

Thomas Nilsen et al., *The Russian Northern Fleet Radioactive Waste at the Naval Bases: 4.3.4. Andreeva Bay* (visited Dec. 15, 1998) <http://www.bellona.no/e/russia/nfl/nfl4.htm#O8>.

bic meters of liquid radioactive waste, with a total activity of approximately 23,000 Ci, was dumped at five sites in the Arctic seas.[47]

2. *Dumped Solid Radioactive Waste*

Solid radioactive wastes were generated by the Russian navy during the refitting and maintenance of nuclear submarines. The Yablokov Report indicates that 6508 containers of various sizes, quantities, and concentrations of radioactivity were dumped into numerous regions in the Arctic Ocean.[48] An earlier report of such nuclear dumping indicated that few precautions were taken with many of the containers. Bullet holes were shot into floating containers, and at least one highly radioactive container floated ashore in Nova Zemlya.[49] The amount of radioactivity in these containers was summarily recorded by the Russian Fleet as they were dumped into the Kara, White, and Barents Seas, totaling about 15,000 Ci.[50] However, these measurements have been questioned,[51] and there are few details on the quality of radioactive sources that were contained in the solid waste containers. The most recent data show that at least some containers are still leaking, while the containment on others has not yet been breached.[52] All of the containers were dumped between 1960 and 1980, and the Yablokov Report specifically indicates that the metal containers only have a ten- to thirty-year life expectancy.[53] Much of the solid waste can be characterized as "high-level," or concentrated waste.[54]

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47. *See* Yablokov Report *supra* note 7. Note that the entire radioactivity of dumped waste is much larger. Liquid wastes are a subset of the many types of waste that the former Soviet Union dumped. *See id.* tbl. A.2.

48. *See id.* tbl. A.4. One hundred and fifty-four items were dumped without containers, and there is no correlation between these items and the amount of radioactivity they may contain. *See id.*

49. *See* Canfield, *supra* note 32.

50. *See* Yablokov Report, *supra* note 7, tbl. A.4.

51. *See* Canfield, *supra* note 32, *quoting* Vitaly A. Kimstach, Deputy Chairman of the Russian Committee for Hydrometerology, *in* Stella Bugge, *Russia Says 17 Nuclear Reactors Dumped in Kara Sea*, REUTER LIBR. REP., Feb. 5, 1993. The Yablokov Report translates all activity readings into strontium 90 equivalents, which is a very odd procedure and makes the exact determination of the amount of radiation difficult, or impossible. *See id.*

52. *See* IAEA, *Waste Disposal in the Arctic* Seas (visited Dec. 9, 1998) <http://www.iaea.org/worldatom/inforesource/bulletin/bull391/specialreport.html> [hereinafter *Waste Disposal*]. "[E]levated levels of radionuclides were detected in sediments within a few meters of the low-level waste containers, suggesting that the containers have leaked." *Id.*

53. *See* Yablokov Report, *supra* note 7, at 17.

54. *See id.* at 15.

The Yablokov Report further indicates that a total of eighteen submarine and naval ship nuclear reactor cores were dumped, sixteen in the Arctic seas (six fueled, one partially fueled) and two in the Sea of Japan.[55] An earlier report by a seemingly reliable source[56] indicated that seventeen nuclear reactors were dumped in the Arctic seas, seven with their fuel.[57] The IAEA-Russian-Norwegian testing missions were unable to locate all of the dumped reactors.[58]

The Yablokov and other reports state that the reactors dumped with fuel were each involved in a severe accident and had begun to "meltdown."[59] Later IAEA reports[60] indicate that the Russians encased the reactors within steel and concrete, and injected each with Furfurol[61] to stabilize them before dumping. The Yablokov Report found that one of the fully fueled reactors was not injected with Furfurol, and the report does not say whether any of the reactors were encased in steel or con-

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55. *See id.* at 10–16.

56. *See* Canfield, *supra* note 32, at 390.

57. *See id.*

58. *See* Sjoeblom & Linsley, *supra* note 23. "The cruises have succeeded in locating some of the dumped high level wastes and measurements have been made in situ and also on samples taken in the vicinity of the dumped objects (submarines, reactor compartments, waste containers)." *Id.*

59. *See* Yablokov Report, *supra* note 7, at 12. A "meltdown" refers to the uncontrolled heating of the reactor core such that it loses its physical and mechanical integrity—the core actually melts. *See id.*

60. *See Waste Disposal, supra* note 52.

> [I]n 1993, the IAEA launched the International Arctic Seas Assessment Project (IASAP). Its main objectives were to assess the risks to human health and to the environment associated with the radioactive wastes dumped in the Kara and Barents Seas; and to examine possible remedial actions related to the dumped wastes and to advise on whether they are necessary and justified. The study, which involved more than 50 experts from 14 countries and was under the direction of an International Advisory Group, concluded in late 1996. Partially supported by extrabudgetary funding from the United States, the project was coordinated with the work of the Norwegian-Russian Expert Group for Investigation of Radioactive Contamination in the Northern Areas. *Id.*

61. *See Evaluation of Waste Packages Dumped in the Kara Sea* (visited Dec. 12, 1998) <http://www.dne.bnl.gov/~heiser/kurchatv.htm>. Furfurol is an agent that is used to stabilize spent nuclear fuel and will apparently encase a reactor and make it less susceptible to environmental degradation. *See id.* Its ability to suspend the reactors in the Arctic seas is unknown and is being studied by British Nuclear Fuels. Furfurol is also an environmental pollutant that "upon rapid inhalation, irritates eye and respiratory tract mucous membranes. A chronic exposure may cause degenerative changes in kidneys, liver and peripheral nervous system, as well as disturbances in digestion and metabolism." World Health Organization, *National Environmental Health Action Plans: Latvia* (visited Dec. 12, 1998) <http://www.who.dk/NEHAP/Lat/Lchap32.htm>.

crete.[62] A Russian designer of the submarine reactors estimates that the Furfurol will keep sea water from the fuel "for hundreds of years (up to 500)." The IAEA reports estimate that a total release of radiation could occur between fifty and 1000 years from now.[63]

The amount of radiation in each dumped reactor has been estimated from Russian records, and newer data indicates that each reactor contained from 90,000 to 1.2 million Ci.[64] However, the estimates are inaccurate where the Russian data is incomplete[65] and where there is no account of the severity of the accident that led to the dumping of the reactor.[66] Although later IAEA and earlier Russian estimates differ, they are in the same order of magnitude.[67] In all, the Yablokov Report estimates 90 PBq (2.4 million Ci) of radiation in the dumped waste, and a later IAEA revision states 37 PBq (1 million Ci).[68] What this means in qualitative terms—according to Dr. Charles Hollister of the Woods Hole Oceanographic Institution—is that there "is more radioactive material in those seven reactors than in Chernobyl."[69]

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62. *See* Yablokov Report, *supra* note 7, at 12.

63. *See Waste Disposal, supra* note 52.

64. *See* Yablokov Report, *supra* note 7, at 12.

65. *See* Pavel Povinec et al., *Marine Scientists on the Arctic Seas: Documenting the Radiological Record* (visited Dec. 13, 1998) <http://www.iaea.org/worldatom/inforesource/bulletin/bull372/povinec.html#reference> [hereinafter *Documenting the Radiological Record*] (noting, among other things, that the estimates were revised, but that the Russian-supplied data upon which the revisions were made were incomplete).

66. *See* Sjoeblom & Linsley, *supra* note 23.

67. *See* IAEA, *Data on the Nuclear Reactors Dumped near Novaya Zemlya* (visited Dec. 10, 1998) <http://www.iaea.org/worldatom/inforesource/bulletin/bull372/dumptable.html>. Both the IAEA and the Russian studies estimate that there have been tens of PBqs of radioactive material released from the Russian submarines. *See id.*

68. *See id.* For a conversion of PBqs to Cis, see *Radiation Measurement* (visited Dec. 9, 1998) <http://www.physics.isu.edu/radinf/measure.htm>. In summary, 1 Bq is equal to one nuclear disintegration per second; 1 Ci = 3.7 X 10^{10} Bq. (P = Peta, which is the International unit for 10^{15}, or 1,000,000,000,000,000). *See also SI Unit Prefixes* (visited Dec. 9, 1998) <http://www-personal.umich.edu/~rcnh/gs102/ SI_prefixes.html>.

69. *See* Canfield, *supra* note 32, at 396, *citing* Anne McIlroy, *Soviet Navy Dumped Seven Plutonium Reactors in Shallow Waters; Coldwar Hangover Haunts Arctic*, TORONTO STAR, Dec. 12, 1992, at D6. *See also* OECD Nuclear Energy Agency, *Chernobyl Ten Years on* (visited Dec. 14, 1998) <http://www.nea.fr/html/rp/chernobyl/welcome.html> (describing the Chernobyl accident).

B. Nuclear Submarine Accidents[70]

Every sector of the Russian nuclear program has been plagued with accidents and consequent releases of radiation into the environment.[71] At no time in its history has this already burdened system ever been more susceptible to serious accidents than the present.[72] For example, in 1997 a reportedly defueled Russian submarine sank at its moorings while awaiting further decommissioning.[73]

In a separate incident, a Delta Class submarine burned not far out to sea on May 6, 1998. Police were ordered to issue iodine tablets to the population of Murmansk to ward off the effects of the expected radiation fallout. Order was restored on May 7 when the Russian Navy announced that the entire episode was only an exercise.[74]

On August 10, 1985, at yet another Soviet naval base—Chazhma Bay near Vladivostok—a nuclear submarine had just been refueled when a leaking gasket was discovered. While repairing the reactor, a torpedo boat swept by the floating repair station, causing the fuel rods to be jerked out of the reactor.[75] The reactor exploded. The twelve-ton lid over the reactor was blown off and the cover of the refueling station landed 100 feet away. Radioactive materials were spread across the peninsula; according to some accounts, the wind was blowing towards Vladivostok.[76] It has been estimated that the total radioactivity released was about

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70. US Navy submarines have experienced 29 accidents since 1915, while the Russian Navy has experienced 24. *See Soviet Peacetime Submarine Losses*, (visited Dec. 15, 1998) <http://freeweb.pdq.net/GStitz/Soviet.htm>; *U.S. Peacetime Submarine Losses* (visited Dec. 15, 1998) <http://freeweb.pdq.net/gstitz/peaceloss.htm>.

71. *See* Thomas Nilsen et al., *The Russian Northern Fleet Introduction* (visited Dec. 18, 1998) <http://www.bellona.no/e/russia/nfl/nfl0-2.htm>. *See generally* FESHBACH & FRIENDLY, *supra* note 27 (accident background).

72. *See* Nilsen et al., *The Russian Northern Fleet Introduction*, *supra* note 71.

73. *See* David Filipov, *Armed and Dangerous: Russia's Nuclear Fleet in Serious Disrepair*, BOSTON GLOBE, Nov. 22, 1998, at A1.

74. *See id.* Local residents and environmental groups believe that the "exercise story" was a cover up and that a fire actually occurred. They point to the fact that western military data show that the sub unexpectedly surfaced on May 6, and that no Northern Fleet subs were sent on patrol for three months following the exercise. *See id. See also* Rupert Cornwell, *The Most Dangerous Place on the Planet*, INDEPENDENT (London), Oct. 20, 1998, at 15; Thomas Nilsen, *Delta-I Incident in May Not an Exercise: No Russian Subs Patrol for Three Months* (visited Dec. 15, 1998) <http://www.bellona.no/e/russia/nfl/news/ 980917.htm>.

75. The details of the Chazhma Bay accident were first released in the Yablokov Report. *See* Yablokov Report, *supra* note 7, at 21.

76. *See id.* at 21–22. *See also* Evginiy Sholkoh, *One More Submarine Story: Nuclear Crash* (visited Dec. 15, 1998) <http://vladivostok.com/rus_mag/eng/N_2/ 1CHAZHMA.HTM> (for a uniquely personal account of the tragedy).

one-seventh of that released by Chernobyl.[77] Portions of the surrounding seabed are even now highly contaminated. This accident was covered up by the Russian Navy for seven years.[78] On January 20, 1998, the workers who were exposed to radiation while cleaning up the explosion were finally accorded the same status as the Chernobyl workers.[79]

The Chazhma Bay accident may not have been an unusual occurrence. As previously noted, the Yablokov Report indicates that six reactors were dumped into the Arctic Sea because they had begun to meltdown.[80] The Chazhma submarine and five others remain in Russian ports after accidents that have damaged their fuel, making their removal impossible.[81]

C. Future Concerns

Beyond the past dumping, there are two major causes for future concern: first, the disposal of existing stockpiles of waste; and second, disposal of waste that will be generated by submarines to be retired. Existing stockpiles present a bleak and daunting picture. To begin with, the ports of the Northern and Pacific Fleet have become the *de facto* repositories of huge volumes of highly radioactive materials.[82] For the most part, these materials remain in place in the shipyards, either in dry storage, in service ships, in pools and holding tanks, or in submarines that are to be decommissioned. Current data list these items in volumes (cubic meters) and numbers of fuel assemblies.[83]

A comparison of the past dumping to the volume of radioactivity that has yet to be disposed of frames a dystopian "big picture." A reactor similar to the types that were dumped contains approximately 280 fuel

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77. *See Accident at Chazhma Bay* (visited Dec. 15, 1998) <http://ds.dial.pipex.com/cndscot/trisaf/ch4.htm#Chazhma Bay> [hereinafter *Chazhma Bay*].

78. *See* David Hoffman, *Reactor Blast Shows Danger of Aging Subs*, WASH. POST, Nov. 16, 1998, at A22. *See also* Agency For Social Information Bulletin, *Russian Green Cross Concludes Research on Radiation and Chemical Contamination* (visited Dec. 15, 1998) <http://solar.cini.utk.edu/~ccsi/asi/1997/50-159.htm>; *Chazhma Bay, supra* note 77.

79. *See Nuke Workers Win Belated Victory* (visited Dec. 15, 1998) <http://vn.vladnews.ru/1998/iss159/text/best.htm>.

80. *See* Yablakov Report, *supra* note 7, at 12.

81. *See* Kopte, *supra* note 46.

82. *See* Yablokov Report, *supra* note 7, at 25–29.

83. For anything other than the rough and qualitative purpose to which the radioactivity concentrations are estimated here, the estimation of the radioactivity concentration is fruitless because it is constantly changing as the material decays.

assemblies.[84] Therefore, by extrapolation, there were about 1680 fuel assemblies dumped into the Arctic seas. In contrast, 30,000-plus fuel assemblies await final disposition; over 20,000 in the Northern Fleet naval bases and more than 10,000 in the Pacific naval bases. An estimated 30,000 more fuel assemblies have yet to be removed from the fifty-two inactive submarines that are derelict in the ports of the Northern Fleet naval bases. However, all reports indicate that there is little or no storage space left in the shipyards for any more spent nuclear fuel. To make matters worse, an additional fifty-five more nuclear submarines are slated to be taken out of active service and then decommissioned by 2010.[85]

Future problems are staggering when compared to the past. To date, 36,000 Ci of radioactive materials have entered the marine environment from dumping. Another one to three million Ci were dumped but are thought to be contained at this time. Comparatively, 35 to 107 million Ci of spent nuclear fuel have yet to be dealt with and are contained, to varying degrees, throughout the Russian submarine complex.[86] Millions more curies of solid and liquid radioactive waste and spent nuclear fuel will be generated in the decommissioning of the waiting submarines. Simple arithmetic shows that the yet to be addressed spent nuclear fuel and nuclear waste is approximately 2300 to 7000 times greater than that which has so far been released into the environment, and is 10 to 100 times greater than the potential harm that may be caused by the dumped reactors that have not yet leaked into the environment.

Approximately 200 of Russia's 240 submarines are slated to be decommissioned and scrapped by 2010. The former Soviet Union began this process to reduce the economic burden of maintaining such an extensive and aging fleet. Then, in 1991, the former Soviet Union agreed under START to eliminate 4166 nuclear warheads by 2005, some of which were housed on thirty-one ballistic nuclear submarines.[87]

The START treaty plays an important role in the decommissioning of the Russian nuclear submarines.[88] START negotiations between the

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84. *See* Kopte, *supra* note 46, at 31.

85. *See id.*

86. *See id.* This estimate is based upon simple calculations from existing data that one to three million curies represent the total radioactivity of the six dumped reactors, and that the 60,000 remaining fuel assemblies represent 214 additional reactors (280 fuel assemblies per reactor). *See id.*

87. *See* United States Arms Control and Disarmament Agency, *Start Treaty: Achievement of Phase I Reductions* (visited Dec. 18, 1998) <http://www.acda.gov/factshee/wmd/nuclear/start1/achieve.htm> [hereinafter *Phase I*].

88. Even though START has been successful, START II appears to be in abeyance. Although START II would have required the further reduction of nuclear warheads

United States and the Soviet Union began in 1982,[89] and ended with the signature of both nations in Moscow on July 31, 1991.[90] A few months later, the Soviet Union dissolved into a number of independent states,[91] with Belarus, Kazakhstan, Russia, and Ukraine each in control of some portion of the former Soviet Union's strategic nuclear weapons. The Lisbon Protocol, signed on May 23, 1992, made these new states parties to START.[92] The Lisbon Protocol also committed Belarus, Kazakhstan, and Ukraine to accede to the Nuclear Non-Proliferation Treaty as non-nuclear weapon states,[93] and to eliminate all nuclear weapons and strategic offensive arms from their territories.[94]

START reduces the strategic offensive weapons in the US and Russian arsenals as follows.[95] Each state must eliminate all nuclear weapons except 6000 accountable warheads, 4900 ballistic missile warheads, 1600 strategic nuclear delivery vehicles, 1540 warheads on 154 heavy ICBMs, and 1100 warheads on mobile ICBMs. In all, this means that each side will reduce its arsenals by about thirty to forty percent—more than 9000 warheads will be eliminated under the treaty.[96]

START has a fifteen-year duration and can be extended for successive five-year periods by agreement among the parties.[97] The reductions under START are to take place in three stages.[98] The first stage has ended, and was fully implemented by both sides before December 5, 1997. Additionally, Belarus, Kazakhstan, and Ukraine have already met

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and of nuclear submarines, the Russian Duma removed the ratification of START II from its agenda when the United States began its most recent bombing mission in Iraq in December 1998. There have been discussions of a START III, and of the setting of other arms reduction goals, but these plans now appear to be unsettled.

89. *See* United States Arms Control and Disarmament Agency, *START: Basic Provisions of the Treaty* (last modified May 21, 1996) <http://www.acda.gov/factshee/wmd/nuclear/start1/strtbasi.htm>.

90. *See* START *supra* note 4.

91. *See* Elizabeth Rubertin, *The Soviet Union Crumbles: Gorbachev Goes Through Motions as Leader While the Nation He Led Hurries to Regroup*, WALL ST. J. EUR., Dec. 20, 1991, at 2.

92. Protocol to the Treaty on the Reduction and Limitation of Strategic Offensive Arms, May 23, 1992, U.S.–Russia, Ukraine–Belarus–Kazakhstan, S. Treaty Doc. No. 32, 102d Cong., 2d Sess. (1992) [hereinafter Lisbon Protocol], *available in* <http://www.acda.gov/treaties/start/lisbon.htm>.

93. *See id.* art. V.

94. *See id.*

95. *See* START, *supra* note 4, art. 2.

96. *See Phase I*, *supra* note 87.

97. *See* START, *supra* note 4, art. XVII.

98. *See id.* art. II.

their requirements under the Lisbon Protocol.[99] Stage two will end in 1999, and stage three will be completed in 2001.[100]

While reductions under START are impressive, these successes have opened up new avenues for the further reductions of nuclear weapons. START II was signed on January 3, 1993, by Presidents George Bush and Boris Yeltsin.[101] It codifies a Joint Understanding signed on February 3, 1992.[102] The US Senate gave its advice and consent to the treaty on January 26, 1996.[103] Ratification of the treaty in the Russian Duma has been pending since 1996, but activities of the United States in

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99. *See* United States Arms Control and Disarmament Agency, *START I: Lisbon Protocol and the Nuclear Nonproliferation Treaty* (visited Feb. 25, 1999) <http://www.acda.gov/factshee/wmd/nuclear/start1/npt-95.htm>.

100. *See* START, *supra* note 4. START negotiators concentrated on "effective verification" that uses "National Technical Means" (NTM) and has mutually-reinforcing verification provisions consisting of data exchanges, exchanges of telemetry data from missile flight tests, a ban on the encryption of telemetry data, 12 types of on-site inspections and exhibitions, and a method for continuous monitoring at mobile ICBM plants. *See id.*

START has grown to meet the needs of the signatories through the work of the Joint Compliance and Inspection Commission (JCIC), which was established to oversee START implementation. The JCIC held ten sessions between START's signature and its entry into force and has since completed numerous agreements and joint statements. These addenda to START focus on three major issues: (1) adapting START to a multilateral context; (2) developing detailed procedures for implementation activities; and (3) resolving questions about initial data exchanges. *See id.*

101. Treaty on Further Reduction and Limitation of Strategic Offensive Arms, Jan. 3, 1993, U.S.–Russian Federation, S. Treaty Doc. No. 103-1 (1993) [hereinafter START II].

102. Nuclear Weapons Reduction Act, Pub.L. 102-484, 106 Stat. 2315, § 1321 (1992). "On February 1, 1992, the President of the United States and the President of the Russian Federation agreed in a Joint Statement that 'Russia and the United States do not regard each other as potential adversaries,' " and stated further that, "We will work to remove any remnants of cold war hostility, including taking steps to reduce our strategic arsenals." *Id. See also* Demilitarization of Independent States of Former Soviet Union, 22 U.S.C. § 5901 (Supp. 1998).

103. *See* START II, *supra* note 101. If START II is implemented, it will totally eliminate heavy intercontinental ballistic missiles and most other multiple-warhead ICBMs. Additionally, it will further reduce the total number of strategic nuclear weapons deployed by both countries. During the first phase of START II each side will reduce its total deployed strategic nuclear warheads to between 3800 and 4250. During the final phase, each side will further reduce its total deployed strategic nuclear warheads to between 3000 and 3500. Most relevant to the future of places and problems described in this article, no more than 1700 to 1750 deployed warheads may be on submarine launched ballistic missiles, and these missiles may have multiple warheads. *See id.*

Iraq[104] and Russia's recent deal to sell nuclear power plants to Iran[105] could unsettle the situation.

Even though START promises to help reduce the terror of nuclear weapons, other hard realities impede Russia's ability to manage her nuclear fleet, the most difficult of which are economic. With the breakup of the Soviet Union, the expense of maintaining this large nuclear fleet fell to Russia. Because of the huge expenses involved, and because many of the non-SSBN submarines are becoming old and reaching the end of their useful lives, Russia plans to scrap approximately 150 additional non-START submarines independently.[106] The defueling of approximately ten non-START submarines took place between 1988 and 1995.[107] The slow pace of defueling the derelict submarines is attributable to the parallel need for the same equipment in the refueling of active submarines. The Russian Navy has prioritized the refueling of the active ships.[108] Further complicating the issue is the fact that Russian funding for defueling is scarce to nonexistent. In 1996, only fourteen percent of the funds budgeted for submarine decomissionings were actually transferred to the shipyards for that purpose.[109] Russian plans were developed to pay for the scrapping of the submarines by selling salvaged scrap metal on international markets.[110] This plan has not worked, as the cost of decommissioning submarines far exceeds the value of the scrap metal sold.[111]

Reports of incidents related to widespread underfunding continued in 1998,[112] much like the disruption of the electric power supply to the Gadzhievo shipyard in 1995, which compromised the safety of a number

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104. *See* Steven Lee Myers, *U.S. Attacks Targets Just Outside Baghdad*, PORTLAND OREGONIAN, Feb. 25, 1999, at A4.

105. *See* Igor Kudrik, *Russia Boosts Iranian Nuclear Facility Despite International Criticism* (visited Feb. 25, 1999) <http://www.bellona.no/e/russia/990216.htm>.

106. It should be noted that the end of the cold war has led the other nuclear superpowers of the world to reduce their submarine fleets. The United States plans to decommission 100 submarines by 2000, and 42 of them have been dismantled already. *See infra* note 115.

107. *See* Thomas Nilsen et al., *The Russian Northern Fleet: Decommissioning of Nuclear Submarines* (visited Dec. 18, 1998) <http://www.bellona.no/e/russia/nfl/nfl6.htm>.

108. *See id.*

109. *See Russian Parliament to Adopt Another Resolution: Short Funds Slow Russian Submarine Decommissioning* (visited Dec. 18, 1998) <http://www.bellona.no/e/russia/nfl/news/060397.htm>.

110. *See Economic Aspects* (visited Dec. 18, 1998) <http://www.bellona.no/e/russia/nfl/nfl6.htm#04>.

111. *See id.*

112. *See* Kudrik, *supra* note 105.

of nuclear reactors in derelict ships.[113] Some data are available concerning the extent of the problem at the Northern Fleet bases. The following table from the Bellona website shows their findings concerning inactive nuclear submarines and the volume of liquid and solid radioactive waste at the Russian Naval bases. Bellona concluded in 1996 that these sites were in such bad shape as to constitute an immediate safety risk, and by all accounts these sources of contamination remain.

113. *See* Thomas Nilsen et al., *Economic Conditions* (visited Dec. 18, 1998) <http://www.bellona.no/e/russia/nfl/nfl1.htm#O4>.

Naval base	Active Nuclear Ships	Inactive Submarines w/fuel	Stored fuel assemblies	Inactive submarines without fuel	Liquid Radioactive waste	Solid Radioactive waste
Zapadnaya Litsa Shipyard						
Bolshaya Lopatka	22	1	-	1	Yes	Yes
Nerpichya	6	-	-	-	Yes	Yes
Andreeva Bay	-	-	Max. 23,260	-	2,000 m^3	Min. 6,000 m^3
Vidyaevo	4	14	-	-	Min. 3 m^3	Yes
Gadzhievo Shipyard						
Sayda Bay	-	-	-	12	-	-
Gadzjievo	7	6	-	-	200 m^3	2,037 m^3
Olenya	12	-	-	-	-	-
Severomorsk	2	-	-	-	-	-
Gremikha	Yes	15	795 +9 reactor cores	-	2,000 m^3	300 m^3

Table 1: Nuclear Safety Risks at Northern Fleet Naval Bases.[114]

The disarming and decommissioning of submarines creates adverse environmental impacts. These impacts relate primarily to the disposal of nuclear waste and the dangers posed by radioactivity involved in the four stages of disarming and decommissioning nuclear weapons, submarines, and reactors. While all nations agree that the first step involves the removal of the missiles containing the warheads and the launching systems in which they are housed, different countries sometimes undertake

114. *Table 6: The Objects at the Northern Fleet Bases that Represent a Nuclear Safety Risk* (visited Dec. 15, 1998) <http://www.bellona.no/e/russia/nfl/tab6pre.htm>.

the three other steps in different order.[115] The former Supreme Soviet set the following guidelines for submarine dismantling:

(1) Weapons and other important equipment to be removed; vessels to be laid up with reduced crew in suitable locations at Navy yards;

(2) Fuel elements to be removed from the reactor;

(3) Decommissioning of vessel by cutting out the reactor compartment; non-contaminated metal to be reused;

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115. The manner through which the world's nuclear superpowers are reducing their submarine fleets is instructive. The US program for submarine decommissioning was developed in the 1980s. *See* U.S. DEPARTMENT OF THE NAVY, DRAFT ENVIRONMENTAL IMPACT STATEMENT ON THE DISPOSAL OF DECOMMISSIONED, DEFUELED NAVAL SUBMARINE REACTOR PLANTS (1982), *reprinted in* NATIONAL ADVISORY COMMITTEE ON OCEANS AND ATMOSPHERE, NUCLEAR WASTE MANAGEMENT AND THE USE OF THE SEA, A SPECIAL REPORT TO THE PRESIDENT AND THE CONGRESS 68 (1984). The Navy has proceeded with a fully funded program of inactivation, dismantling, and storage. *Id.* In all, the United States built 179 nuclear submarines since 1955. Between 1986 and 1992, 31 were dismantled using the procedure described below. By 2000, 100 are scheduled to have been dismantled. *See Dismantling Nuclear Submarines*, (visited Dec. 9, 1998) <http://www.brook.edu/fp/projects/nuccost/ subs.htm>.

All US submarines are decommissioned at the Puget Sound Naval Shipyard in Washington state. There, they are drydocked, defueled, and the reactor section and any classified instruments are removed. Much of the material in the ships, including lead, copper, and steel is scrapped for recycling. The spent nuclear fuel is sent to the Hanford reservation for storage. The reactor cores are sealed at either end, loaded onto barges and moved to the mouth of the Columbia River, where they are taken to Trench 94 at Hanford by special trailers that can carry the very heavy objects. *See id.*

France has successfully decommissioned two of its twelve nuclear submarines. *See* Kopte, *supra* note 46. The French procedure is much the same as the US procedure, except for the inclusion of an interim procedure whereby the reactors are put into dry storage at Cherbourg for 15 to 20 years, after which the radioactivity should have diminished enough to allow further dismantling. The French long-term storage site cannot accept as large a parcel as a whole reactor compartment, so they must be cut into smaller pieces. The French also store the spent fuel on an interim basis before final disposal to allow the radioactivity to diminish before reprocessing or disposal. *See id.*

In England, by contrast, decommissioning procedures remain weak. Eleven of England's 24 nuclear submarines are out of active service, and are awaiting disposition at the naval docks in Devonport and Rosyth. All of the spent nuclear fuel has reportedly been removed from the 11 reactors. The British plans for submarine disposal may have been delayed because until the late 1980s the Navy recommended sinking them in the deep Atlantic Ocean as the best and safest means of disposal. No disposal site currently exists in England, but there are plans to dispose of them in deep storage at Sellafield beginning in 2012. *See id.*

(4) Sealing and transporting the reactor compartments to suitable locations for long-term storage; storage to be undertaken where radiation safety is maintained and can be verified.[116]

These guidelines, however, have never been followed, and no adequate facilities exist for doing so at this time. The reactors from those submarines that were dismantled either were dumped in the ocean, or are floating in isolated bays around the Kola Peninsula.[117] The spent fuel and other wastes are spread throughout the naval complex. At least eighty inactive nuclear submarines that are to be decommissioned remain in various Russian naval ports, most with their full load of nuclear fuel. The Bellona Organization has compiled data on seventy of these submarines, showing that fifty-two of these are fully fueled (see Table 2).

	Z. Litsa w/o	Ara w/o	Ura w/o	Sayda w/o	Olenya w/o	Shkval w/o	Sevmorput w/o	Gremikha w/o	Severodvinsk w/o
Project 627 A November	-	-	-	0/1	-	3/0	-	4/0	-
Project 658 Hotel	-	-	-	0/2	1/0	1/0	1/0	1/0	-
Project 659 Echo-II	-	5/0	6/0	0/2	1/0	1/0	-	-	-
Project 661 Papa	-	-	-	-	-	-	-	-	1/0
Project 667 A Yankee	-	-	-	1/2	-	-	-	-	10/5
Project 667 B Delta	-	-	-	-	1/0	-	-	-	-

Table 2. Summary of Locations of Laid-Up Nuclear Submarines, Including Number of Defueled Vessels (stating the number of submarines with and without fuel, respectively) (continued on next page).

116. *See* Central Committee of the Communist Party and the Supreme Soviet, Decree No. 095-296 (1988).

117. *See generally* Yablokov Report, *supra* note 7.

	Z. Litsa w/o	Ara w/o	Ura w/o	Sayda w/o	Olenya w/o	Shkval w/o	Sevmorput w/o	Gremikha w/o	Severodvinsk w/o
Project 670 Charlie-II	-	1/0	1/0	-	0/1	-	-	-	-
Project 671 Victor	-	-	-	-	0/1	3/0	-	8/0	-
Project 705 Alfa	1/1	-	-	0/1	-	-	-	-	1/2
Total:	1/1	6/0	7/0	1/8	3/2	8/0	1/0	13/0	12/7

Table 2. Summary of Locations of Laid-Up Nuclear Submarines (continued from previous page).

There is no single method by which the Russian submarines are being dismantled. Those that are not being handled pursuant to the START agreement may not be decommissioned in any systematic fashion at all. There are neither adequate facilities nor funds for removing the fuel and storing it, for scrapping the submarines, or for paying for labor to complete these tasks.[118]

III. ASSESSING THE ENVIRONMENTAL IMPLICATIONS

A. The Present Environmental Quality of the Arctic Ocean

It appears that the containment systems on the dumped nuclear reactors have not yet leaked.[119] Recent studies of the radioactivity near the reactors by the IAEA indicate that excessive concentrations of radiation are not evident in the seas surrounding the reactors.[120] Experts believe that it is unlikely that any one of the dumped reactors could again "go critical" and experience a "meltdown" in the same manner as at Chernobyl.[121] Nonetheless, the dumped reactors remain a potential threat of ra-

118. *See Economic Aspects*, *supra* note 110.

119. *See* JAMES M. BROADUS & RAPHAEL V. VARTANOV, THE OCEANS AND ENVIRONMENTAL SECURITY: SHARED US AND RUSSIAN PERSPECTIVES 146 (1994).

120. *See* Sjoeblom & Linsley, *supra* note 23.

121. Interview with Daniel Curran, Policy Fellow at the Wood's Hole Oceanographic Institution (Dec. 9, 1998).

diation pollution because they are subject to corrosion, and may even be scoured by ice floes.[122]

The depth and location of the dumped reactors makes them all the more dangerous. IAEA guidelines on the proper ocean disposal of medium- and low-level radioactive waste require that such wastes are dumped into open oceans that are 4000 meters in depth. Dumping is to take place in locations between fifty degrees north and fifty degrees south, and shall not take place in semi-enclosed areas.[123] Many of the Russian reactors have been dumped in only twenty meters of water. Contrary to IAEA guidelines, all of the dumpings took place above fifty degrees north, and in the semi-enclosed Barents and Kara Seas.[124]

The IAEA has studied the naval nuclear waste dumping in the Arctic seas under a program it calls the International Arctic Seas Assessment Project (IASAP). In response to prompting from the Fifteenth Consultative Meeting of the London Convention, the IASAP assessed the risks to human health and to the environment associated with dumped nuclear wastes in the Arctic seas, and examined possible remedial actions. Its report, issued in 1997, found that, although radioactive waste could be detected in the sea water surrounding the dump sites, the radioactivity had dispersed only minimally. The IASAP did conclude, however, that the largest portion of the radioactivity had not yet breached its containment, and that future monitoring would be necessary to catch potential breaches.[125]

Recent Russian and IAEA reports note that the radioactive releases to date have not had effects beyond the local dumping areas.[126] A study by the IAEA's Marine Environment Laboratory suggests that radioactive materials escaping containment from one of the dumped reactors in the Kara Sea should have only regional effects.[127] Even so, in 1995 Gordon Linsley, the then-acting head of the IAEA's Waste Safety Section, noted, "[though] it has been concluded that [the dumped wastes] pose no

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122. *See* Gordon Linsley, *Environmental Impact of Radioactive Releases: Addressing Global Issues* (visited Dec. 14, 1998) <http://www.iaea.org/worldatom/inforesource/bulletin/bull381/linsley.html>; *Waste Disposal, supra* note 52; Canfield, *supra* note 32; Kirsti-Liisa Sjoeblom & Gordon S. Linsley, *The International Arctic Seas Assessment Project: Progress Report* (visited Dec. 13, 1998) <http://www.iaea.org/worldatom/inforesource/bulletin/bull372/sjoeblom.html>.

123. *See* BROADUS & VARTANOV, *supra* note 119, at 136; Yablokov Report, *supra* note 7, at 2.

124. *See* Yablokov Report, *supra* note 7, at 2.

125. *See Waste Disposal, supra* note 52.

126. *See Scientists on the Arctic Seas: Documenting the Radiological Record, supra* note 65.

127. *See id.*

threat to health or to the environment at the present time . . . there remains concern about the possible hazards which might result from leakage of radionuclides from the wastes at some future time."[128]

The North Atlantic Treaty Organization (NATO) and the European Union have studied the Arctic nuclear waste problem in much the same manner as the IASAP. In 1996, NATO's Committee on the Challenges of Modern Society expanded its activities with the North Atlantic Cooperation Council (NACC) to include a study and recommendations, *inter alia,* of the environmental effects of ending the cold war. In their five volume report on the effects of dismantling nuclear military ships in the Arctic, the NACC concluded that there was no widespread contamination. However, in light of the volumes of radioactive waste dumped into the Arctic, they recommended that future monitoring be conducted to identify any problems that might arise.

Apart from the strictly chemical analyses relied upon by these studies, biological indicators reveal more widespread environmental damage. Some populations of indigenous Arctic peoples, the Chucki for instance, have recently experienced cancer mortality rates that are two to ten times greater than the world average.[129] Millions of sea animals recently died *en masse* in the White Sea.[130] While the exact cause of these problems is unknown, reports indicate that the seals and other mammals died of blood cancers.[131] Specifically, the Laboratory for the Protection of Marine Animals at the Northern Polar Institute suggested that the seals had been exposed to radioactivity.[132]

B. The Paucity of Russian Waste Treatment Facilities

Any coordinated plan for the proper treatment and disposal of the wastes from the Russian Navy has thus far been thwarted by inadequate facilities, insufficient storage space,[133] accidents,[134] and the clandestine

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128. Linsley, *supra* note 122.

129. *See* BROADUS & VARTANOV, *supra* note 119, at 165.

130. *See* Canfield, *supra* note 32, at 412, *citing* BBC Summary of World Broadcasts, *Other Reports: Seals Dying of Cancer from Radioactive Waste in Russian Seas,* Apr. 10, 1992, SU/W0225/A/1 (summarizing broadcast by ITAR-Tass, World Service in English, 0656 GMT, April 3, 1992).

131. *See id.*

132. *See id.*

133. *See* Thomas Nilsen et. al., *The Russian Northern Fleet Radioactive Waste at the Naval Bases* (visited Dec. 18, 1998)<http://www.bellona.no/e/russia/ nfl/nfl4.htm>.

134. *See Russia Incidents* (visited Dec. 18, 1998) <http://www.bellona.no/e /russia/incidents.htm>.

dumping of wastes in the Arctic and the Sea of Japan.[135] There is currently no coherent policy for dealing with these wastes. Instead, only incomplete programs and plans with no funding and poor maintenance exist.

Various Russian agencies have developed different plans of action, ranging from storage at sea to storage in caves that were built to hide the Russian submarines to disposal on the New Land test sites. None of these is currently being pursued. Instead, the waste continues to accumulate in Russian ports, much of it left in the reactors of aging submarines that have surpassed their usefulness. Many of the containment structures and plans that do exist are totally inadequate.[136] The following

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135. *See generally* Yablokov Report, *supra* note 7.

136. Both solid and liquid radioactive wastes were dumped into the Arctic and Japan Seas because the former Soviet Union did not have adequate waste repositories. Although none yet exist, a liquid waste reprocessing facility is being built in Murmansk pursuant to a trilateral Russian, Norwegian, and US agreement. *See* Declaration Among the Royal Ministry of Defense of the Kingdom of Norway, the Ministry of Defense of the Russian Federation, and the Department of Defense of the United States of America on Arctic Military Environmental Cooperation, Sept. 26, 1996 (on file with authors). A second facility is being built in the Pacific Shipyard of Zevezda, with the help of Japan and the United States. *See* Kopte, *supra* note 46. The commissioning of both of these facilities has been delayed several times. *See* Igor Kudrik, *Russian-Norwegian Commission on Radwaste Holds First Meeting in Moscow* (visited Dec. 15, 1998) <http://www.bellona.no/e/russia/nfl/news/980731.htm>. Should these efforts fail, the potential remains for future dumping since liquid wastes continue to be created through the normal servicing of the Russian Fleet and the decommissioning of the nuclear submarines. *See* Yablovok Report, *supra* note 7, at 11. A recent paper by the Brookhaven National Laboratories details a design for the upgrade of a low-level liquid radioactive waste treatment facility in Murmansk. *See U.S. snd Russian Innovations to Process Low-Level Radioactive Liquid Wastes*, INDUS. HEALTH HAZARDS UPDATE, Oct. 1, 1998, *available in* 1998 WL 2071680.

> A new floating factory for purifying liquid radioactive waste from nuclear submarines could help solve Russia's problem with the increasing accumulation of such wastes in the Far Eastern territories.
>
> Tests have begun on the Landysh (Mayflower) floating factory in the town of Bolshoi Kamen in Russia's Maritime Territory. This factory, built with the help of U.S. money, will be tested in two stages, according to Russia's Pacific Fleet headquarters. A Russian-US expert commission will assess the factory's performance in the tests.
>
> If the commission approves full operations, the first special tanker containing liquid radioactive waste will be moored alongside Landysh. The factory ship will remove all radioactive and toxic elements from the waste, returning only purified water to the sea.
>
> Russia currently has some 15,000 metric tons of liquid waste stored in tankers and shore tanks.

Judith Perera, *Russia: Floating Factory Could Ease Waste Buildup in Russia's Far East*, 18 NUCLEAR WASTE NEWS (Nov. 5, 1998).

excerpt from a Russian report of the condition of the storage in the Pacific Fleet foretells a catastrophic future:

> In facilities capable of producing a catastrophe on the scale of Chernobyl there is no coastal technical backup of security; there is no system of low- or high- pressure air for draining the compartments [of derelict subs laid-up in Vladimir Bay], no bilge pumps or compressors; the technical condition of the outer hull and the outboard systems is unsatisfactory, the main ballast cisterns are leaky . . . . Put more simply, the necessary temperature here is maintained by ordinary, everyday domestic heaters which firemen do not allow to be placed even in youth hostels . . . . There is no light in the majority of compartments . . . . All the submarines' auxiliary equipment, which might have been able to localize a potential fire, is out of order. The crew does not even have mooring ropes to secure the submarines in the event of a storm.[137]

Accounts of the problems in the Northern Fleet are just as ominous, if a bit less specific. Bellona reports that dismantled submarine compartments stored in sheltered bays have floated loose of their moorings. Spent nuclear fuel is sitting in casks open to the atmosphere, in containers that have long ago been breached.[138]

The naval bases and the waste contained in them present more cause for concern.[139] Electricity was twice shut off to the largest submarine naval base on the Kola Peninsula in 1995.[140] The waste handling facilities at the submarine bases on the Kola Peninsula and near Vladivostok are full.[141] The facilities for decommissioning the derelict submarines are decades behind,[142] and many of the submarines have already exceeded their designed life expectancy.[143]

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137. Natalya Barabash, *Will Trestles Save the Nuclear Fleet*, KOMOSOLKAYA PRAVADA, Dec. 15, 1994, at 3, *translated in* FBIS-Sov-94-242, at 31–33 (Dec. 16 1994), *cited in* Kopte, *supra* note 46, at 24.

138. To see pictures, visit <http://www.bellona.no/imgs/nfl/61f058.jpg> and < http://www.bellona.no/imgs/nfl/61f057.jpg > at the Bellona website.

139. The incidents referred to in this article represent only a fraction of the accounts that are available concerning the mismanagement of submarines and their waste releases into the environment. More accident histories can be found online at *Bellona Web* (visited Dec. 18, 1998) <http://www.bellona.no>, and at *U.S. Peacetime Submarine Accidents* (visited Dec. 18, 1998) <http://freeweb.pdq.net/gstitz/Peace.htm>.

140. *See* Fred Barbash, *Nuclear Specter Rises from Naval Graveyard; Old Soviet Base Harbors Risk of Catastrophe*, WASH. POST, Oct. 11, 1996, at A1.

141. *See* Nilsen et al., *The Russian Northern Fleet Introduction*, *supra* note 133.

142. *See id.*

143. *See* Thomas Nilsen et al., *The Russian Northern Fleet Nuclear-Powered Vessels* (visited Dec. 18, 1998) <http://www.bellona.no/e/russia/nfl/nfl2-1.htm>.

A series of cooling pools were built at the Andreeva Bay Nuclear Waste port on the Kola Peninsula in 1962 and 1973 to house spent nuclear fuel. In 1982, the storage pools were leaking. Over the next seven years, most of the spent nuclear fuel in the building was removed to storage pools originally designed to store liquid radioactive waste.[144] The water that leaked out of the cooling pools, which were constantly refilled with fresh water to keep the fuel submerged, is estimated to have contained 3000 Ci of radioactivity. As these examples illustrate, the problem created by the need to safely dispose of these radioactive wastes, and the lack of Russian, or even former Soviet capacity to do the job, is grave indeed.

IV. LEGAL OVERLAY

A number of international agreements have been concluded that either relate generally to the issues being discussed, or were concluded with the express intent to help Russia deal with the problem of nuclear pollution.

A. Multilateral Agreements[145]

Nuclear pollution of the Arctic is covered by a number of treaties and other instruments, which provide a theoretical basis for holding the Russians liable for the cleanup of any pollution they may have caused. These include the 1972 London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention),[146] the 1991 Arctic Environmental Protection Strategy of the Arctic Council (Arctic Environmental Protection Strategy),[147] and the 1993 Declaration on Environment and Development in the Arctic (1993 Dec-

144. Not all of the spent nuclear fuel could be removed, and some remains to this day. To see a recent picture of the inside of the building, see <http://www.bellona.no/imgs/nfl/61f051.jpg>.

145. This section is based on LAKSHMAN GURUSWAMY ET AL., INTERNATIONAL ENVIRONMENTAL LAW AND WORLD ORDER (2d ed. forthcoming 1999)

146. Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, Dec. 29, 1972, 26 U.S.T. 2403, 1046 U.N.T.S. 120 [hereinafter London Convention].

147. Joint Communique and Declaration on the Establishment of the Arctic Council, Sept. 19, 1996, 35 I.L.M. 1382. *See also* Arctic Environmental Protection Strategy, June 14, 1991, 30 I.L.M. 1624 (predecessor to the Joint Communique).

laration).[148] The London Convention prohibits the dumping of high-level nuclear waste.[149] The Arctic Environmental Protection Strategy, subsumed by the Arctic Council upon its establishment in 1996, calls for adherence to the strictest relevant international standards. The 1993 Declaration, in addition to reaffirming relevant principles of the 1992 Rio Declaration on Environment and Development,[150] Agenda 21,[151] and the Non-Legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation and Sustainable Development of All Types of Forests,[152] proclaims that "decisions relating to Arctic activities must be made in a transparent fashion . . . to facilitate . . . appropriate access to information concerning such decisions, . . . participation in such decisions and . . . judicial and administrative proceedings."[153]

Additional recommendations relating specifically to land-based pollution include Article 207 of the 1982 United Nations Convention on the Law of the Sea (UNCLOS);[154] the 1985 Montreal Guidelines for the Protection of the Marine Environment Against Pollution from Land-Based Sources;[155] and the 1992 Convention for the Protection of the Marine Environment of the North East Atlantic (OSPAR Convention).[156] Several treaties and instruments of general applicability relate to the problem at hand, including Part 12 of UNCLOS;[157] Principle 21 of the

148. The Nuuk Declaration on Environment and Development in the Arctic, Sept. 16, 1993, *available in* 1993 WL 645202 [hereinafter Nuuk Declaration].

149. *See* London Convention, *supra* note 146, art. IV.

150. *Rio Declaration on Environment and Development*, United Nations Conference on Environment and Development, U.N. Doc. A/CONF.151/5/Rev.1 (1992), *reprinted in* 31 I.L.M. 874 [hereinafter *Rio Declaration*].

151. *Agenda 21: Programme of Action for Sustainable Development*, United Nations Conference on Environment and Development, U.N. Doc. A/Conf.151/4 (1992).

152. Non-Legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation and Sustainable Development of All Types of Forests, United Nations Conference on Environment and Development, U.N. Doc. A/CONF.151/6/Rev.1 (1992).

153. Nuuk Declaration, *supra* note 148, at 6.

154. United Nations Convention on the Law of the Sea, Dec. 10, 1982, art. 207, U.N. Doc. No. A/CONF.62/122, *available in* 21 I.L.M. 1261 [hereinafter UNCLOS].

155. Montreal Guidelines for the Protection of the Marine Environment Against Pollution from Land-Based Sources, U.N. Doc. UNEP/WG.120/3.Annex (1985), U.N. Doc. A/40/25 (1985), *reprinted in* 14 ENVTL. POL'Y & L. 77 (1985) [hereinafter UNCLOS].

156. Convention for the Protection of the Marine Environment of the North-East Atlantic, Sept. 22, 1992, 32 I.L.M.1069.

157. *See* UNCLOS, *supra* note 154, pt. XII.

1972 Stockholm Declaration on the Human Environment;[158] and Principle 2 of the 1992 Rio Declaration,[159] which is meant to ensure that activities within the signatories' jurisdictions do not cause harm to those outside their jurisdictions.

While Russia is a party or signatory to all of these instruments except for the OSPAR Convention, it may be difficult to hold the country legally liable under them. For example, Moscow filed a declaration of non-acceptance to an extension of the London Convention to cover all radioactive materials.[160] And, the 1993 Declaration as well as the 1992 instruments it reaffirms are widely understood to be legally non-binding. Moreover, most of these treaties contain exceptions that apply to warships and military craft. For example, the London Convention does not apply to vessels entitled to sovereign immunity under international law.[161] Similarly, UNCLOS specifically states that the provisions relating to the protection and preservation of the marine environment do not apply to warships or other vessels owned and operated by the state.[162]

B. Bi- and Trilateral Agreements

1. United States and Russia

Bilateral agreements dealing with nuclear pollution include the 1994 Agreement Between the United States and the Russian Federation on Cooperation in the Prevention of Pollution of the Environment in the Arctic.[163] The agreement requires consultation on technical solutions for the elimination of radioactive and other types of pollution. The 1994 Agreement Between the United States and the Russian Federation on Cooperation in the Field of Protection of the Environment and Natural Resources[164] calls for jointly developed measures to improve the condi-

158. Stockholm Declaration on the Human Environment, June 16, 1972, 11 I.L.M. 1416, 1417.

159. *See Rio Declaration*, *supra* note 150.

160. *See All Signatories to London Convention Except Russia Accept Total Ban on Dumping*, 17 Int'l Env't Rep. (BNA) 156 (Feb. 23, 1994); James Waczewski, Comment, *Legal, Political, and Scientific Response to Ocean Dumping and Sub-Seabed Disposal of Nuclear Waste*, 7 J. TRANSNAT'L L. & POL'Y 97, 106–07 (1997).

161. *See* London Convention, *supra* note 146, art. VII(4).

162. *See* UNCLOS, *supra* note 154, art. 236.

163. Cooperation in the Prevention of Pollution of the Environment in the Arctic, Dec. 16, 1994, U.S.–Russian Federation, *available in* 1994 WL 761204.

164. *See* Cooperation in the Field of Protection of the Environment and Natural Resources, June 23, 1994, U.S.–Russian Federation, *available in* 1994 WL 449099.

tion of the environment, including the Arctic. A third agreement, the 1996 Joint Communiqué and Declaration on the Establishment of the Arctic Council,[165] creates an intergovernmental forum to promote effective cooperation on a wide range of Arctic issues.[166] Finally, the 1996 Memorandum of Understanding Between the Government of the United States and the Russian Federation on Cooperation in Natural and Man-Made Technological Emergency Prevention and Response[167] establishes that the two countries will cooperate regarding the development of emergency preparedness techniques, information sharing, and communication.

Russia's financial and economic predicament has substantially restricted its ability to comply with START. The United States has assisted Russia through a number of federal programs.[168] Congress has found that the national security of the United States requires funding of Russian programs that eliminate nuclear, chemical, and biological weapons.[169] This policy has become known as "defense by other means."[170] Approximately $1.6 billion has been appropriated through

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165. Joint Communiqué and Declaration on the Establishment of the Arctic Council, Sept. 19, 1996, U.S.–Russian Federation, 35 I.L.M. 1382.

166. *See id.* The Arctic Council is a permanent high-level intergovernmental forum whose members consist of eight Arctic states: Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden, and the United States. Established in Ottawa on September 19, 1996, the council's purpose is to promote multilateral cooperation and political action to address a wide range of Arctic issues common to its members, exclusive of matters related to military security. A key feature of the council is the involvement of the Arctic region's indigenous peoples. In addition to the eight member nations, three organizations representing the majority of indigenous peoples in the circumpolar Arctic will be permanent participants: the Inuit Circumpolar Conference, the Saami Council, and, the Association of Indigenous Minorities of the North, Siberia, and the Far East of the Russian Federation. Permanent participation is open to other Arctic organizations of indigenous peoples not currently represented by these three organizations, provided that they meet the criteria set out in the 1996 Declaration. Participation is also open to non-Arctic states and intergovernmental organizations as observers. *See id.*

167. Cooperation in Natural and Man-Made Technological Emergency Prevention and Response, July 16, 1996, U.S.–Russian Federation, *available in* 1996 WL 516876.

168. In the original Nunn-Lugar legislation, the United States allocated $400 million towards dismantling the former Soviet Union's military nuclear capacity. *See* Soviet Nuclear Threat Reduction Act, 22 U.S.C. § 2551 (1994). Nunn-Lugar was amended in 1992 to recognize the Soviet breakup. *See* Former Soviet Union Demilitarization Act, 22 U.S.C. §§ 5901–5931 (1994). Nunn-Lugar was amended again in 1993, changing the name of the program to the Cooperative Threat Reduction Program. *See* Cooperative Threat Reduction with States of the Former Soviet Union Act, 22 U.S.C. §§ 5951–5958 (Supp. 1998).

169. *See* Soviet Nuclear Threat Reduction Act, 22 U.S.C. § 2551 (1994).

170. *Id.* n.14.

Department of Defense bills to fund the Cooperative Threat Reduction (CTR) program,[171] and a total budget of $3.2 billion is planned for the CTR.[172]

The CTR program is primarily directed at ensuring the safe disposal of nuclear weapons. To this end, the program aids in the safe transport of dismantled nuclear missiles, pays for the refitting of plutonium enrichment reactors, and pays for the removal of ballistic missiles, launchers, and heavy bombers under START.[173]

START requires the removal of a large number of Russian submarine-launched ballistic missiles, though it makes no mention of the submarines themselves. Accordingly, the initial CTR program at the Russian naval bases was directed at removing the missiles and their launchers from the submarines. The CRT did not have any plans for the submarines themselves.[174] However, the reality that the Russians did not want to be left dealing with derelict submarines required the CTR to deal not only with the missiles, but also with the submarines.[175] The CTR complied, and now has a program through which thirty-one ballistic missile submarines will be decommissioned by the United States.[176] Additionally, when the CTR program began, there was no place to store the spent nuclear fuel or the reactor vessels after the SSBNs were disman-

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171. *See* Jack M. Beard, *A New Legal Regime for Bilateral Assistance Programs: International Agreements Governing the "Nunn-Lugar" Demilitarization Program in the Former Soviet Union*, 35 VA. J. INT'L L. 895, 895 n.3 (1995).

172. *See* UNITED STATES GENERAL ACCOUNTING OFFICE, WEAPONS OF MASS DESTRUCTION: STATUS OF THE COOPERATIVE THREAT REDUCTION PROGRAM (Letter Report, Sept. 27, 1996, GAO/NSIAD-96-222) (visited Mar. 17, 1999) <http://www.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=gao&docid=f:ns96222.txt> [hereinafter *Weapons of Mass Destruction*]. The $3.2 billion figure includes estimated costs through 2001. *See id.*

173. *See* Cooperative Threat Reduction Program, *Mission* (visited Mar. 17, 1999) <http://www.ctr.osd.mil/01missn.htm>.

174. The CTR program also addresses the reduction of former Soviet Union chemical weapons, the need for nonproliferation safeguards, and the need for nuclear material transport and storage. *See Weapons of Mass Destruction*, *supra* note 172.

175. Telephone Interview with Colonel Dick Rock, Deputy Director for CTR (Jan. 14, 1999). According to Colonel Rock, the Russian naval bases and the Russian Navy required that the CTR not only build the infrastructure for removing the missiles, but also the facility for decommissioning the entire submarines.

176. *See* Cooperative Threat Reduction Program, *SLBM Launcher SSBN Elimination* (visited Mar. 17, 1999) <http://www.ctr.osd.mil/projects/projrus/rpj-slbm.htm>.

tled.[177] In response, the United States is building a fissile material storage facility at Mayak, in Russia.[178]

The CTR program has enjoyed wide bipartisan support and is often characterized as successful. The Navy staff implementing the program call it "God's work."[179] During the past years, the decommissioning of five nuclear powered submarines has been funded,[180] while four or five more submarines are to be dismantled with CTR funds this year.[181]

2. *Agreement on Environmental Cooperation*

The Declaration on Arctic Military Environmental Cooperation[182] signed by the defense ministers of Norway, Russia, and the United States, marked the beginning of a process which led to the 1998 Agreement on Environmental Cooperation with the Dismantling of Russian Nuclear-Powered Submarines Withdrawn from the [Russian] Navy's Service in the Northern Region, and the Enhancement of Nuclear and Radiation Safety (Agreement on Environmental Cooperation).[183] The

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177. *See* Igor Kudrik, *CTR Funds Russian Subs Decommissioning* (visited Mar. 17, 1999) <http://www.bellona.no/e/russia/nfl/news/981201.htm>; Nilsen et al., *The Russian Northern Fleet Introduction*, *supra* note 133.

178. *See* Cooperative Threat Reduction Program, *Fissile Material Storage Facility* (visited Mar. 17, 1999) <http://www.ctr.osd.mil/projects/projrus/rpj-fmsf.htm>.

179. *See* Rock, *supra* note 175.

180. *See* Kudrik, *supra* note 177.

181. *See id.* Not all descriptions of the CTR program have been rosy, however. The General Accounting Office (GAO) of the US Congress criticized the program for failing to file statutorily required reports, inadequately reflecting budgetary uncertainties associated with "important developments," and for not having enough data to verify Russia's control over nuclear materials. *See Weapons of Mass Destruction*, *supra* note 172. The GAO's reference to "important developments" is particularly important. A 1997 White House memorandum on the CTR states that a total of $230 million was spent on the CTR by the end of 1996, whereas the GAO reports that approximately $1.5 billion had been committed to the program, and more than $500 million had already been spent in 1996. *Compare supra* Table 1, *with* OFFICE OF THE PRESS SECRETARY IN HELSINKI, FINLAND, FACT SHEET: JOINT STATEMENT ON PARAMETERS ON FURTHER REDUCTIONS IN NUCLEAR FORCES (released March 21, 1997) (visited Mar. 17, 1999) <http://www.usemb.se/press/baltic/ FUTUREREDUCTIONS-FACTS.htm>. Clearly some parts of the federal government know more about the extent of funding and work that the CTR is supposed to be completing than others. Information sharing that could reduce the barriers between federal agencies could be had by implementing a transparent international environmental planning program for future arms reduction efforts.

182. Declaration on Arctic Military Environmental Cooperation, May 26, 1998, Norway–Russian Federation, ___ I.L.M. ___ (on file with authors).

183. Agreement on Environmental Cooperation with the Dismantling of Russian Nuclear-Powered Submarines Withdrawn from the Navy's Service in the Northern Re-

agreement was signed on the occasion of a state visit of Norway's King Harald V to Russia, including as signatories Norwegian Foreign Minister Knut Vollebaek and Russian Minister for Nuclear Energy Yevgeny Adamov.

The 1998 Agreement on Environmental Cooperation enhances nuclear safety in the Arctic region, at least between Norway and Russia. In particular, as provided in Article 1, Norway agreed to render "free technical assistance" to the Russian Federation "in the form of delivery of equipment, technology transfer, provision of financial means[,] and services" for "an early, environmentally safe and cost-effective dismantling" of Russia's nuclear powered submarines, "including the management of spent nuclear fuel and radioactive waste . . . formed thereby[,]" and Russia, for its part, agreed to use the free technical assistance provided by Norway "exclusively for [these] purposes." More particularly, the agreement expressly enumerated an inexhaustive list of projects to be covered by it (Article 2), and provided that both Norway and Russia "will facilitate the involvement of third parties in [the] financing and/or practical implementation of [such] projects." (Article 8). Finally, the agreement provided for the establishment of a joint Norwegian-Russian commission to coordinate and control its implementation (Article 3), and for arbitration in accordance with internationally recognized arbitration rules in the event of disagreement between the two parties (Article 9).

It is clear that the formidable challenge of dealing with nuclear pollution, although accepted by Norway, will require substantial third-party involvement and support.[184] Hence, the 1998 Agreement includes the September 1996 Agreement as a precondition to Norway's moving ahead with the 1998 Agreement. Norway's ultimate aim is to help es-

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gion, and the Enhancement of Nuclear and Radiation Safety (1998) (on file with authors).

184. As the 1997 Norwegian Plan of action for Nuclear Safety and the Environment states:

> In the Soviet Union, the safety aspects of nuclear activities were very inadequately dealt with, but Russia and the other republics [do not] wish to improve nuclear safety standards and cleanup pollution. Although much has been done to improve nuclear safety standards by means of bilateral and multilateral cooperation, there are still major challenges to be dealt with. Thus, circumstances now favor cooperation on measures to deal with these problems, but this will require substantial, well-coordinated international participation in both financial and technological terms. Norway's efforts alone will be of little avail unless it can help to encourage both greater activity by the Russians themselves and international assistance in the use of appropriate expertise in key areas.

ROYAL NORWEGIAN MINISTRY OF FOREIGN AFFAIRS, NUCLEAR SAFETY AND THE ENVIRONMENT: PLAN OF ACTION 3 (Feb. 1997).

tablish a *multilateral* umbrella mechanism, under which third parties will enjoy the same terms of cooperation with the Russian Federation as are now in force on a Norwegian-Russian bilateral basis—providing *inter alia* for tax and nuclear liability exemption for third parties that may wish to cooperate on any relevant nuclear safety project in northwest Russia. Norwegian authorities hope that the bilateral agreement now in force will form an important building block in establishing such a mechanism.[185] This agreement presents an admirable opportunity for the United States to collaborate in cleaning up the problem created by retired submarines.

V. A PROACTIVE APPROACH

A. The Need for Environmental Impact Assessments

The unquestionable need to be alerted to the global environmental impact of arms control treaties has been underscored by the previously unforeseen but now evident threat posed by retired and abandoned nuclear submarines in Russian naval ports.[186] As we have seen, these submarines have been taken out of service because they have exceeded their operating life,[187] because the Russian Navy no longer has the funds to maintain them,[188] or because removing them meets required disarmament efforts under START.[189] START addresses the daunting challenge of reducing the balance of terror created by nuclear weapons through dramatic cuts in submarine-launched ballistic missiles.[190] The treaty also deals with the need to safely dispose of huge quantities of weapons, launchers, and nuclear and fissile materials that were the immediate con-

185. Memorandum from Bjorn Brede Hansen, Embassy Secretary, the Royal Norwegian Embassy, Washington, D.C., to Professor Burns Weston 2 (Sept. 8, 1998) (on file with authors).

186. *See generally* Nilsen et al., *The Russian Northern Fleet Radioactive Waste at the Naval Bases*, *supra* note 133.

187. *See* Kopte, *supra* note 46.

188. *See id.*

189. *See* US Arms Control and Disarmament Agency, *The Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Reduction and Limitation of Strategic Offensive Arms Signed in Moscow on July 31, 1991* (visited Mar. 17, 1999) <http://www.acda.gov/treaties/start/starttex.htm> [hereinafter *Offensive Arms Treaty*]; *Phase I*, *supra* note 87.

190. *See Offensive Arms Treaty*, *supra* note 189.

sequence of the most successful disarmament program in modern history.[191]

Unfortunately, START's focus on weapons of war alone glossed over the fact that any mismanaged nuclear facility, whether tied to a military purpose or not, is fraught with potential global risks. START negotiators embarked on the exciting and laudable pursuit of arms control, but failed to take into account the dangers of, for example, dismantled and abandoned nuclear-powered non-ballistic missile submarines.[192] In places like Murmansk and Vladivostok, decommissioning non-ballistic missile submarines poses great risks to the environment.[193] These defanged submarines might be militarily harmless, but nuclear reactors are inherently dangerous and will require careful attention.[194]

Overlooking the global threat posed by retired nuclear submarines may be attributed to a remarkable "blind spot" in the mind's eye of motivated arms control negotiators. These law and policy makers, single-mindedly driven to cutting down nuclear weaponry, ignored well established concerns about the different kinds of nuclear threats and environmental impacts created by their high principled undertaking.[195] It is not as if these other and different dangers were hidden from the public eye. On the contrary, during the negotiation of START the effects of the major chemical explosion that occurred on April 26, 1986 at the Chernobyl nuclear power plant in the Soviet Union made world headlines and was the topic of a fervent international policy discourse.[196] The fire in

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191. The implementation of START has been spurred by the Cooperative Threat Reduction Program. *See* The White House, *U.S. Nunn-Lugar Safety, Security, Dismantlement Program* (visited Mar. 17, 1999) <http://www.acda.gov/factshee/wmd/nuclear/ctr/ssd32194.htm>.

192. START requires only the reduction of Submarine Launched Ballistic Missiles (SLBMs), silos, and launchers. There was no specific directive in START to reduce SSBNs themselves. *See Offensive Arms Treaty, supra* note 189.

193. For a discussion of the extent of the Russian problem with decommissioning non-ballistic missile submarines, see Nilsen et al., *The Russian Northern Fleet Radioactive Waste at the Naval Bases, supra* note 133.

194. "There can be no doubt that the operation of a nuclear reactor and the handling and testing of nuclear wastes are inherently dangerous activities." Fried v. United States, 579 F. Supp. 1212, 1216 (N.D. Ill. 1983).

195. This is despite the fact that the safe disposition of nuclear materials and the environmental consequences of unsafe management of nuclear materials has long been one of the foci of the International Atomic Energy Agency as it sets standard rules for nuclear power plant safety. *See generally* International Atomic Energy Agency, *Nuclear Safety* (visited Mar. 17, 1999) <http://www.iaea.org/ns>.

196. *See, e.g.*, Walter Sullivan, *Nuclear Disaster: A Grim Event Still Unfolding—More Deaths Predicted*, N.Y. TIMES, May 3, 1986, S1, at 5; Karen DeYoung, *Stockholm, Bonn Ask for Details of Chernobyl Mishap*, WASH. POST, Apr. 30, 1986, at A1, *available*

the damaged reactor had released more radioactivity than any previous nuclear accident.[197] The emission of long-term radiation from Chernobyl was the equivalent of anywhere from one-tenth to one-sixth of the total radiation released by the more than 400 nuclear explosions since 1945.[198] One hundred and thirty-five thousand people, some living as far as 100 miles from the plant, were evacuated from the area.[199] Thirty–one people working at or in the immediate vicinity of the plant died, twenty-nine of them from radiation sickness.[200] As widely reported at that time, scientists had become deeply concerned about the long-term effects of the accident, estimating they would run to tens of thousands of cancer deaths.[201]

The evidence of Russian mismanagement at Chernobyl was overwhelming. At a special conference of the IAEA held in Vienna in August 1986, members of the Soviet delegation admitted that the accident at Chernobyl was largely a result of defective operating procedures that violated several Soviet safety regulations and that had been fol-

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in 1986 WL 2047681; Stuart Diamond, *Chernobyl Causing Big Revisions in Global Nuclear Power Policies*, N.Y. TIMES, Oct. 27, 1986, at A1; Irvin Molotsky, *Chernobyl and the "Global Village,"* N.Y. TIMES, May 8, 1986, at B22.

197. *See The Chernobyl Accident*, NUCLEAR NEWS, June 1986, at 87-89.

198. According to a study funded by the US Energy Department's Office of Health and Environmental Research. *See* Jillian Barron, Note, *After Chernobyl: Liability for Nuclear Accidents Under International Law*, 25 COLUM. J. TRANSNAT'L L. 647, 647 (1987)

199. *See* Vladimir Schevchenko & G.P. Signirova, *Cytogenic Effects of Ionizing Radiations on Human Populations, in* CONSEQUENCES OF THE CHERNOBYL CATASTROPHE: HUMAN HEALTH 23 (E.B. Burlakova ed., 1996).

200. *See Chernobyl: The Soviet Report*, NUCLEAR NEWS (Special), Sept. 11, 1986, at 1.

201. At that time, the estimates of expected cancer deaths ranged from 5000 to 40,000 for the Soviet Union and from 2000 to 6000 for elsewhere in Europe. *See* Stuart Diamond, *Chernobyl's Toll in Future at Issue*, N.Y. TIMES, Aug. 29, 1986, at A1. Although the most serious immediate effects of the Chernobyl accident were felt in the USSR, its impact on commerce and daily life extended as far as Wales, where radioactive rain and contamination caused the sale of lambs to be temporarily banned at the height of the usual market season. *See* Marian Pallister, *Return of the Big Bogey*, HERALD (Glasgow), Mar. 16, 1999, at 11. In Italy, the government prohibited the sale of leafy vegetables. The ban was expected to impose losses of up to one hundred million dollars on farmers there. *See Nuclear Disaster: In Europe, Shivers & Sang Froid; A Vegetable Ban Dismays Italians*, N.Y. TIMES, May 4, 1986, at A20. Swedish reindeer that had eaten radioactive lichen were declared unfit for human consumption. *See* Francis X. Clines, *Chernobyl Shakes Reindeer Culture of Lapps*, N.Y. TIMES, Sept. 14, 1986, at A1. Swedish authorities stated that the consequent loss of 100,000 contaminated reindeer would threaten the traditional livelihood of the country's Lapp population and possibly the continued survival of its unique culture. *See* James M. Markham, *Nuclear Nightmares; Europe is Bracing for Chernobyl's Grim Legacy*, N.Y. TIMES, Aug. 31, 1986, at D1.

lowed without the requisite prior approval of the plant safety authorities.[202]

Following the Chernobyl accident, the international community moved quickly to codify the responsibilities of operators of reactors involved in accidents and the responsibilities of the states where a nuclear accident has occurred. The areas of liability that had been addressed through the Conventions on Third Party Nuclear Liability[203] were almost immediately augmented by the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, which entered into force on February 26, 1987.[204] The Convention on Nuclear Accidents came into force on October 27, 1986.[205]

Even while arms control experts of the United States were negotiating START, other negotiators headed by the United States were conferring to create the 1994 Convention on Nuclear Safety.[206] All this was in addition to the existing treaties and IAEA safeguards dealing with civilian nuclear facilities.[207] It should have been clear to START negotia-

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202. *See* Serge Schmemann, *Chernobyl Answers; New Questions*, N.Y. TIMES, July 21, 1986, at A3.

203. *See* Convention on Third Party Liability in the Field of Nuclear Energy, July 29, 1960, 956 U.N.T.S. 251; Convention Supplementary to the 1960 Convention on Third Party Liability in the Field of Nuclear Energy, Jan. 31, 1963, 956 U.N.T.S. 265; Vienna Convention on Civil Liability for Nuclear Damage, May 21, 1963, 1063 U.N.T.S. 265; Convention Relating to Civil Liability in the Field of Maritime Carriage of Nuclear Material, Dec. 17, 1971, 974 U.N.T.S. 255.

204. Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, Sept. 26, 1986, 25 I.L.M. 1377.

205. Convention on Nuclear Accidents, Sept. 26, 1986, 25 I.L.M. 1369.

206. Convention on Nuclear Safety, Sept. 20, 1994, 33 I.L.M. 1514. The convention was developed out of efforts that began shortly after the Chernobyl accident. Although its framers originally intended to create "a 'framework convention' under which the parties would commit themselves to a step-by-step strengthening of nuclear safety and perhaps also create a mechanism for developing substantive protocols making more precise particular facets of that obligation," the political realities of doing so made such a framework convention unworkable. Paul C. Szasz, *Introductory Note to the Convention on Nuclear Safety,* Sept. 20, 1994, 33 I.L.M. 1514.

207. Article III(A)(6) of the Statute of the International Atomic Energy Agency, Oct. 26, 1956, 276 U.N.T.S. 3, empowers the IAEA to "establish or adopt . . . standards of safety for protection of health and minimization of danger to life and property," an activity it has for many years carried out with considerable diligence and technical expertise in promulgating dozens of "safety standards," including "safety fundamentals," "basic safety standards," "operational standards" ("specialized regulations" and "codes of practice"), "safety guides," "safety practices," and "safety reports." However, the IAEA has no enforcement function, and in practice, the development of safety standards has been left up to each country as it sees fit. Nonetheless, the IAEA promulgates model safety standards that are widely adopted and modified to each nation's needs. To see the current IAEA safety standards, see International Atomic Energy Agency, *Safety Stan-*

tors that the reactors on the submarines they were contemplating retiring were very dangerous facilities that needed to be decommissioned with the same great care and detail as required by the United States when it decommissions its own submarines.[208]

Furthermore, START negotiators should also have been aware of the much publicized risk posed by the theft of nuclear materials and of the consequential dangers.[209] Studies such as those done at Oak Ridge at the time START was being negotiated had shown how plutonium could be extracted from spent fuel rods by "bandit nations" for the purpose of making bombs.[210] In spite of this solid body of evidence that called for an assessment of the global and international environmental impacts of START, none was undertaken.

In the case of START, it seems that arms controllers themselves are becoming aware of the environmental problems they have created. This awareness is illustrated by developments in the Nunn-Lugar legislation and programs implementing START.[211] Programs like CTR[212] began by confining their operation to the dismantling of warheads and missiles, but now accept the undeniable need to deal with the equally serious issue of dismantling the reactors of nuclear submarines from which these missiles are launched,[213] and for helping the Russian government find a home for the spent fuel from these reactors.[214]

It is therefore appropriate to reinforce these developments with amendments to the Supplementary LEIS for START II, to include the

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dard Series (visited Mar. 17, 1999) <http://www.iaea.org/ns/nusafe/safstand.htm>. *See also* LAKSHMAN GURUSWAMY & BRENT HENDRICKS, INTERNATIONAL ENVIRONMENTAL LAW IN A NUTSHELL 382–88 (1997).

208. *See supra* note 115 and accompanying text (describing US, French and British procedures for decommissioning nuclear-powered submarines).

209. *See* International Atomic Energy Agency, *International Safeguards and the Peaceful Uses of Nuclear Energy* (visited Mar. 17, 1999) <http://www.iaea.or.at/worldatom/inforesource/factsheets/safeguards.html>; Gamini Seneviratne, *Incoming IAEA Director Stresses Material Security Needs to Be Improved,* 22 NUCLEAR FUEL 12 (Dec. 1, 1997).

210. *See* Peter Riley, *The Legal Control of Nuclear Energy Between States*, 21 CAL W. INT'L L.J. 303, 305 (1991).

211. There are now authorizing acts for the Nunn-Lugar Demilitarization Program. These include the Soviet Nuclear Threat Reduction Act, 22 U.S.C. § 2551 (1994); the Former Soviet Union Demilitarization Act, 22 U.S.C. §§ 5901–5931 (Supp. 1998); and, the Cooperative Threat Reduction Act, 22 U.S.C. §§ 5951–5958 (Supp. 1998).

212. *See generally* Cooperative Threat Reduction Program (visited Mar. 17, 1999) <http://www.ctr.osd.mil>.

213. *See supra* note 115.

214. *See* Cooperative Threat Reduction Program, *Fissile Material Storage Facility*, *supra* note 178; Kudrik, *supra* note 177.

international environmental impacts of future demilitarization efforts. This could be accompanied by other steps that would alleviate environmental apprehension about START. As we have seen, the LEIAs undertaken for START, while assessing the environmental impacts within the United States, did not take account of the extraterritorial implications of those treaties. By contrast, during the negotiation of NAFTA, which took place at about the same time as START, the administration refused to prepare a formal environmental impact assessment, offering instead a "review" of the environmental impacts of NAFTA.[215] In fact, the administration went further by supplementing the main NAFTA text with side agreements on safety and the environment.[216] Such a precedent could well be followed in the case of START II.

The fact that Russia and the United States have begun to understand the decommissioning of submarines as part of the arms control process does not solve the problem of how to deal with existing abandoned submarines. An analogy can be drawn to domestic US law. While the Resources Conservation and Recovery Act[217] operates prospectively to control waste, it does not address thousands of existing waste dumps. Congress therefore enacted the Comprehensive Environmental Response Compensation and Liability Act (CERCLA)[218] to clean up existing waste.[219] Similarly, there is a need for the United States and Russia to find ways of dealing with the existing nuclear submarines in Murmansk and Vladivostok along with their waste streams.

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215. OFFICE OF THE UNITED STATES TRADE REPRESENTATIVE, REVIEW OF US–MEXICO ENVIRONMENTAL ISSUES (1992).

216. *See generally* North American Agreement on Environmental Cooperation, Sept. 14, 1993, 32 I.L.M. 1480.

217. Resource Conservation and Recovery Act of 1976, Pub. L. 94-580, 90 Stat. 2795 (1976), *codified at* 42 U.S.C. § 6901 (Supp. 1998).

218. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, Pub. L. 96-510, 94 Stat. 2767 (1980), *codified at* 42 U.S.C. § 9601 (Supp. 1998).

219. *See id. See generally* Lucia Ann Silecchia, *Pinning the Blame & Piercing the Veil in the Mists of Metaphor: The Supreme Court's New Standards for the CERCLA Liability of Parent Companies and a Proposal for Legislative Reform,* 67 FORDHAM L. REV. 115 (1998); Bruce Howard, *A New Justification for Retroactive Liability in CERCLA: An Appreciation of the Synergy Between Common and Statutory Law,* 42 ST. LOUIS U. L.J. 847 (1998).

B. The Applicability of NEPA and Executive Order No. 12,114

Both the National Environmental Policy Act (NEPA) and Executive Order No. 12,114, provide legal mechanisms through which environmental impact assessments could be required for future arms control treaties. An examination of US case law indicates that while it is possible that NEPA could be amended to include international environmental impact assessments, a more feasible course of action would be to amend Executive Order No. 12,114—dealing with "Environmental Effects Abroad of Major Federal Actions"—to include EIAs. Such assessments would lead to the creation of planned, integrated, and efficient programs for addressing the myriad of problems created by the disarmament of nuclear military forces, rather than the expensive, haphazard measures currently being implemented pursuant to START.

A LEIA was prepared for START[220] when it was submitted for approval to the Senate. Article 102(2)(c) of NEPA obligates all federal agencies making any proposals for legislation to prepare an environmental impact assessment.[221] According to the regulations of the Council on Environmental Quality (CEQ),[222] created by NEPA to oversee its implementation,[223] the submission of a treaty for ratification is a proposal for legislation.[224] Despite the fact that NEPA explicitly recognizes the "worldwide and long-range character of environmental problems,"[225]

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220. *See* United States Department of the Air Force, Legislative Environmental Impact Statement: Strategic Arms Reduction Treaty (LEIS START) (Dec. 1991) [hereinafter LEIS START].

221. National Environmental Policy Act of 1969, Pub. L. No. 91-190, 83 Stat. 852 (1970), *codified at* 42 U.S.C. § 4321 (1994)

222. *See, e.g.*, COUNCIL ON ENVIRONMENTAL QUALITY ANNUAL REPORT 27 (1997); Council on Environmental Quality, 40 C.F.R. § 1500 (1998).

223. *See* National Environmental Policy Act of 1969, 42 U.S.C.A. § 4342 (West 1998) (Council on Environmental Quality).

224. *See* National Environmental Policy Act of 1969, 42 U.S.C. § 4332(2)(C)(1994). The Council on Environmental Quality has interpreted requests for ratification of treaties as proposals for legislation. *See* Council on Environmental Quality, 40 C.F.R. § 1508.17 (1994).

225. National Environmental Policy Act of 1969, 42 U.S.C. § 4332(2)(f) (1994), reads:

> The Congress authorizes and directs that, to the fullest extent possible: (1) the policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with the policies set forth in this Act, and (2) all agencies of the Federal Government shall—(F) recognize the worldwide and long-range character of environmental problems and, where consistent with the foreign policy of the United States, lend appropriate support to initia-

neither the LEIA for START[226] nor the supplemental LEIS for START II[227] addressed the environmental impacts of these treaties within the Soviet Union.

Furthermore, no environmental impact assessments were made under Executive Order 12,114.[228] Under this Executive Order, it is arguable that the action of dismantling and decommissioning nuclear submarines under START is a major federal action significantly affecting the environment of a foreign nation.[229] However, the Executive Order exempts "actions taken by the president,"[230] and it may have been felt that Presidential treaty negotiations thus fell outside the of the order's scope.[231]

NEPA mandated EISs may be required of the Department of Defense if it could be successfully argued that the United States, by entering into arms reduction agreements involving the decommissioning of hundreds of Russian nuclear submarines, was undertaking a major federal action significantly affecting the quality of the human environment. Any judicial attempt to require an EIS under NEPA, however, will have to overcome a number of hurdles. First, the "final agency action" requiring an EIS must be identified.[232] Second, NEPA does not apply to the actions of the president and cannot be invoked where a treaty has been negotiated by the president.[233] Third, the plaintiff may lack stand-

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tives, resolutions, and programs designed to maximize international cooperation in anticipating and preventing a decline in the quality of mankind's world environment. *Id.*

226. *See* LEIS START, *supra* note 220.

227. *See* United States Department of the Air Force, Strategic Arms Reduction Treaty II (START II) Supplemental Environmental Impact Statement (1993).

228. *See* Exec. Order No. 12,114, 44 FED. REG. 1957 (1979).

229. *See id.* arts. 2–3(c)(2).

230. *Id.* arts. 2–5(ii).

231. *See, e.g.*, Environmental Defense Fund, Inc. v. Massey, 986 F.2d 528 (D.C. Cir. 1993); Greenpeace v. Stone, 748 F. Supp. 749 (D. Haw. 1990). *See also* David A. Koplow, *How Do We Get Rid of These Things?: Dismantling Excess Weapons While Protecting the Environment,* 89 NW. U. L. REV. 445 (1995); David A. Wirth, *Legitimacy, Accountability, and Partnership: A Model for Advocacy on Third World Environmental Issues,* 100 YALE L.J. 2645 (1991).

232. *See* Public Citizen v. United States Trade Representative, 5 F.3d 549 (D.C. Cir. 1993) (submittal of NAFTA to Congress for ratification was not a final agency action subject to judicial review under the Administrative Procedure Act, § 704, 5 U.S.C. § 555 (1998)).

233. *See id. See also* Public Citizen v. Office of the United States Trade Representative, 782 F. Supp. 139 (D.D.C. 1992); Public Citizen v. Office of the United States Trade Representative, 822 F. Supp. 21 (D.D.C. 1993); Public Citizen v. Office of the United States Trade Representative, 970 F.2d 916 (D.C. Cir. 1993).

ing.[234] Fourth, such a challenge must overcome the presumption against the extraterritorial application of NEPA.[235] Finally, administrative judicial review may be declined by the courts because of the sensitive nature of the foreign policy issues involved.[236]

It is likely that efforts to obtain a formal EIS will fail on at least three of these five grounds. Two decisions of the Court of Appeals,[237] and a third by the District Court for the District of Columbia,[238] have severely limited, if not totally crippled, the applicability of NEPA to trade treaties negotiated by or under the direction of the president. Some of the principles found in those cases might be equally applicable to arms control treaties.

In 1991, Public Citizen filed suit to compel the Office of the Trade Representative (OTR), the designated chief US negotiator of NAFTA, to provide an EIS while NAFTA was being negotiated (hereinafter *Public Citizen I*).[239] The District Court for the District of Columbia dismissed the case for lack of standing[240] and the D.C. Circuit Court affirmed the dismissal on other jurisdictional grounds.[241] The Circuit Court held that NEPA did not create a private right of action and that the plaintiffs' application for administrative judicial review must therefore rest on the Administrative Procedure Act, which permits review only of "final

234. *See generally* Lujan v. National Wildlife Fed'n, 497 U.S. 871 (1990); Lujan v. Defenders of Wildlife, 504 U.S. 555 (1992).

235. *See* National Resources Defense Council, Inc. v. Nuclear Regulatory Comm'n, 647 F.2d 1345 (D.C. Cir. 1981); Stone, 748 F. Supp. 749.

236. In *National Resources Defense Council, Inc. v. Nuclear Regulatory Comm'n*, for example, it was held to be proper for the NRC to approve the sale for export of a nuclear reactor and complementary nuclear materials to the Philippines, without evaluating the health, safety, and environmental impacts within the recipient nation, because the export of a nuclear power plant to the Philippines furthered the US goal of nonproliferation, and was subject to executive review. Nuclear Regulatory Comm'n, 647 F.2d 1345. *See also* Stone, 748 F. Supp. 749 (a presidential agreement between the United States and West Germany requiring removal of munitions was not subject to review under the National Environmental Policy Act); Baker v. Carr, 369 U.S. 186 (1962) (a controversy is nonjusticiable (i.e., involves a political question) where there is a "textually demonstrable constitutional commitment of the issue to a coordinate political department; or a lack of judicially discoverable and manageable standards for resolving it." *Id.*).

237. *See* Public Citizen v. United States Trade Representative, 5 F.3d 549 (D.C. Cir. 1993); Public Citizen v. United States Trade Representative, 970 F 2d 916 (D.C. Cir. 1992).

238. *See* Public Citizen v. United States Trade Representative, 782 F. Supp. 139 (D.D.C. 1991).

239. *See id.*

240. *See id.*

241. United States Trade Representative, 970 F. 2d 916.

agency action."[242] Since the final form and language of NAFTA had not been agreed to, there was no final agency action that could trigger NEPA.

After NAFTA had finally been negotiated for all intent and purposes, and the president had signed and released a final draft, Public Citizen sought to compel the OTR to prepare an EIS in *Public Citizen II*.[243] The District Court ordered the OTR to prepare an EIS,[244] but the decision was reversed by the D.C. Circuit.[245] The Circuit Court reaffirmed the rule enunciated in *Public Citizen I* that only a "final agency action" can be reviewed.[246] It then further extended the restrictions set up in *Public Citizen I*, holding that the president is not obligated to submit any draft, however final, to Congress and that he is free to renegotiate any portions of NAFTA.[247] According to *Public Citizen III*, there is no final agency action until the president submits an agreement to Congress. Even more ominous for NEPA challenges, it went on to determine that "if and when the agreement is submitted to Congress, it will be the result of action by the president, action clearly not reviewable under the Administrative Procedure Act (APA)."[248]

Although the majority denied that their decision sounded the death knell of the legislative EIS,[249] Judge Randolph in a separate opinion appeared to think otherwise.[250] According to Judge Randolph, the case of *Franklin v. Massachusetts*,[251] relied upon by the court, held not only that the president falls outside the APA's definition of "agency," but also that that action cannot be considered "final" under the APA unless it "will directly affect the parties."[252] Judge Randolph felt that a proposal for legislation could not satisfy these conditions. The case of *Public Citizen III*[253] appears to support Judge Randolph's position.

In *Public Citizen III*, the plaintiffs asked that the OTR be required to prepare an EIS for the Uruguay round of the General Agreement on

242. *See id.* at 918–19.

243. *See* Public Citizen v. United States Trade Representative, 822 F. Supp. 21 (D.D.C. 1993).

244. *See id.*

245. *See* Public Citizen v. United States Trade Representative, 5 F.3d 549 (D.C. Cir. 1993).

246. *See id.* at 550, 552.

247. *See id.* at 551.

248. *Id.* at 551, 552.

249. *See id.* at 552.

250. *See id.* at 553.

251. 505 U.S. 788 (1992).

252. *Id.* at 797.

253. *See* Public Citizen v. Kantor, 864 F. Supp. 208 (D.D.C. 1994).

Tariffs and Trade (GATT).[254] The District Court found that the action mirrored the request in *Public Citizen II* and that the principles set forth in that case applied to GATT negotiations as well.[255] The court reiterated that NEPA claims for judicial review of trade agreements had been foreclosed by the two earlier cases, and held that mandamus, as distinct from APA relief, was not appropriate.[256] The court then went on to hold that it was unable to conclude that plaintiffs had suffered an injury sufficient to confer standing because the domestic effects of the Uruguay round were so speculative.[257]

The treaties in the three cases dealt with above followed "fast-*track" procedures, which provide that Congress must vote on the agreement, without amendment, within ninety legislative days after transmittal by the president.[258] The version of the treaty submitted by the president in fast-track legislation will, therefore, be identical to the version on which Congress will vote. These trade agreement procedures are quite unlike those applicable to arms control treaties which are subject to the advice and consent of two–thirds of the senators present.[259]

Three clear principles arising from the *Public Citizen* cases apply to arms control treaties. First, arms control treaties offer even more discretion to the president than do trade agreements on a fast–track. Arms control treaties only require the advice and consent of the Senate, whereas trade agreements demand the consent of both houses of Congress. In exercising their advice and consent duties, however, the Senate is not precluded from suggesting or advising amendments to the treaties submitted to them. The president is free to accept, reject, or modify the advice he receives from the Senate. This means that the submission of an arms control treaty to the Senate for advice and consent does not make that treaty a "final agency action" that attracts administrative judicial review under NEPA.

Second, the ruling in *Public Citizen II* regarding the inapplicability of NEPA to presidential actions may apply to arms control treaties as well. *Public Citizen II* bars a plaintiff from obtaining a court order requiring an EIS under NEPA for a treaty that has been negotiated by the

254. *See id.*

255. *See id.* at 211.

256. *See id.* at 212.

257. *See id.* at 214.

258. *See* Public Citizen v. United States Trade Representative, 5 F.3d 549, 550 (D.C. Cir. 1993).

259. *See* U.S. CONST. art. II, §2, cl. 2.

president.[260] Third, it will be very difficult to satisfy the standing requirement relied upon in *Public Citizen III*.[261]

The view taken of NEPA by the three *Public Citizen* cases must also affect the status of the CEQ rules that treat requests for "ratification of treaties," as proposals for legislation which require an EIS. Assuming that requests for "ratification" refer to the submission of treaties for the advice and consent of the Senate, and that CEQ regulations stipulate the need for an LEIS, it is doubtful on the basis of the foregoing analysis that plaintiffs will find courts willing to enforce the CEQ regulations.

Despite extensive litigation of the issue, the extraterritorial applicability of NEPA remains shrouded in doubt.[262] Where federal action affects both the United States and a foreign country, the courts have held that NEPA applies.[263] But NEPA does not apply when the impacts occur solely within another country.[264] In the important case of *Environmental Defense Fund v. Massey*[265] the D.C. Circuit applied NEPA to environmental impacts in Antarctica, holding the presumption against extraterritoriality inapplicable.[266] It also introduced a balancing test to determine if foreign policy interests outweighed the benefits obtained from an EIS.[267] The court narrowed its decision by stating that it did not decide how NEPA might apply in cases involving an actual sovereign. This dictum was relied upon in a subsequent case that distinguished *Massey* on the grounds that *Massey* viewed Antarctica as analogous to outer space, not a foreign sovereign.[268] In light of the foregoing case law, NEPA will probably pass the foreign policy test, but its position on extraterritoriality remains murky. As a result, a plaintiff, even if successful on the last two grounds, would fail on the first three, and would probably lose a case seeking a court mandated EIS for arms control treaties.

The United States should retreat from its current, costly and unpredictable methods for helping Russia implement START. Some manner of international environmental impact assessment or evaluation should be undertaken when negotiating arms control treaties. Such a move is

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260. *See* United States Trade Representative, 5 F.3d 549.

261. *See* Public Citizen, 864 F. Supp. 208.

262. *See* Karen A. Klick, *The Extraterritorial Reach of NEPA's EIS Requirement After Environmental Defense Fund v. Massey*, 44 AM. U. L. REV. 291 (1994); Sierra Club v. Adams, 578 F.2d 389, 390 (D.C. Cir. 1978).

263. *See* Sierra Club v. Mullen, 619 F. Supp. 1244 (1985).

264. *See* NRDC v. NRC, 647 F.2d 1345 (D.C. Cir 1981); Greenpeace v. Stone, 748 F. Supp. 749 (D. Haw. 1990).

265. 986 F.2d 528 (D.C. Cir. 1993).

266. *See id.* at 532.

267. *See id.* at 534–35.

268. *See* NEPA Coalition of Japan v. Aspin, 837 F. Supp. 466 (D.C. 1993).

consistent with State Department guidance on treaty negotiation, which directs diplomats to consider the environmental impacts of international agreements.[269] The CEQ Regulations, as we have seen, require a LEIS when a treaty is submitted for ratification. The fact that such a regulation is not judicially enforceable does not mean that it cannot be applied administratively. While arms control treaties hitherto have not considered international environmental impacts, there are ample reasons and adequate administrative directives to include such global environmental assessments in future LIEAs.

It would be preferable if the EIAs were structured along the lines required by NEPA. But as we have seen, NEPA may not apply to arms control treaties. While it is possible that NEPA could be amended to include international environmental impact assessments, it seems more feasible for a *de facto* EIA to be made through the amendment of the present Executive Order. The existing Executive Order is in need of revision and a new Executive Order would be easier to execute than an amendment to NEPA.

A comprehensive environmental assessment could have facilitated an integration of the many fragmented programs now undertaken by CTR, thus resulting in greater efficiency and effectiveness. Such an approach would permit the problems of waste disposal facilities and the cycle of waste to be addressed conclusively. Instead, a number of examples illustrate the extent to which the present policy of muddling through has led to expensive *ad hoc* measures fraught with risk.

First, the CTR is building a temporary waste storage facility at Mayak that will soon need to be augmented or replaced by a more permanent and larger facility. Had the environmental impacts been known, the program could have anticipated and planned for building much larger radioactive waste-handling facilities for the huge quantities of waste that will be created by the decommissioning of non-START submarines.

Building a larger permanent facility, while costing more at the outset, would incorporate economies of scale rendering the operation more efficient. Moreover, a larger plant would enable nuclear waste to be processed for final disposal instead of awaiting treatment at a temporary

269. *See* Koplow, *supra* note 231, at 445, 480 (1995), *citing* UNITED STATES DEPARTMENT OF STATE, HANDBOOK ON TREATIES AND OTHER INTERNATIONAL AGREEMENTS 720–22 (1985).

stopgap facility. Finally, it would avoid the danger of nuclear wastes in the temporary facilities being diverted to a weapons program.[270]

Second, in response to Russia's need to decommission over 150 non-START submarines, CTR has paid for and created additional submarine decommissioning capacities in three Russian shipyards that can handle one to two ships per year.[271] The inadequacy of this response is similar to that of the nuclear waste reprocessing plants, and if the problems of nuclear dumping are to be avoided this capacity will need to be made much greater.

Third, the United States and Russia have a cooperative agreement whereby the United States will purchase highly enriched uranium (HEU) from Russia.[272] The HEU is reprocessed from the "pits" of nuclear bombs, and is reprocessed into a form that can be used as fuel in nuclear power plants here in the United States. In this way, the special material that makes up the warheads is transformed into material that would be very difficult to turn into bombs again.

Had the full environmental impacts of START been known at the time that the CTR and HEU programs were created, they could have been combined in a way that used spent fuel from the decommissioned submarines. Submarine fuel is very highly enriched, sometimes even up to "weapons grade," so that a submarine can operate for a longer period of time with infrequent refueling. Power plants use much less enriched fuel and need to refuel more frequently. Reprocessed spent submarine fuel, even though "spent" for submarine use, is sufficiently enriched, after reprocessing, to be used in power plants. Integrating the two programs would give rise to a number of benefits. Submarine fuel, instead of requiring a separate reprocessing facility, could be diverted into a funded program that is capable of dealing with the spent fuel in an ecologically sound manner. Moreover, the HEU program would have the use of more accessible raw material that could be reprocessed into nuclear power plant fuel.[273]

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270. *See* David Albright et al., *Plutonium and Highly Enriched Uranium 1996: World Inventories, Capabilities and Policies—Summary* (visited Jan. 20, 1999) <http://www.sipri.se/pubs/pressre/abbk2.html>.

271. *See* Kudrik, *supra* note 177.

272. News Release, *US and Russian Partners Update Historic Nuclear Agreement: Conversion of Warheads into Electric Power Plant Fuel Continues* (visited Sep. 4, 1996) <http://releases.twoten.press.net/releases/date/1996/09/04/NUCLEARAgreement_Update.html>.

273. The United States performed an EIS for the removal of HEU from its stockpiles. This document provides a good deal of background information on the issues involved. *See Draft Highly Enriched Uranium EIS* (visited Jan. 20, 1999) <http://twilight.saic.com/md/DOCS/heu_eis1.htm>.

If START had been accompanied by an international environmental impact statement that alerted the United States to the much larger price tag now carried by the CTR program,[274] the United States might have been inclined to look to international rather than bilateral solutions. Other members of the international community such as the European Union, Japan, China, and Korea are closer to the Russian naval yards in the north and the east than the United States, and have as much, or even greater stake, in arresting nuclear pollution in the Arctic and the Pacific. The extent and location of the problem clearly calls for international solutions and the United States, rather than going it alone, may well have sought the help of these other nations in finding solutions to this problem.

VI. CONCLUSIONS

Given the evident political and legal concerns surrounding the Soviet and Russian record of mismanagement of nuclear facilities, the omission of these important environmental issues in START and its implementing legislation may be explained in terms of interest group politics. Legal positions are taken by different interests and actors contending for their competing perception of individual and public interest. While the regimes governing free trade and environmental protection[275] demonstrate this clash of interests, the same appears to be true of environmental protection and arms control. David Koplow points out that "environmentalism and arms control, . . . two crucial sectors of American and international public life have long existed in segregated parallel universes."[276] He suggests that environmentalists and arms controllers who viewed themselves as presumptive allies have been torn asunder by the 1993 Chemical Weapons Convention (CWC).[277] Arms controllers, according to Koplow, see environmental laws as yet another largely irrelevant hurdle that must be overcome in order to achieve the security objectives of the CWC. Environmentalists, on the other hand, see the CWC as yet another of the diverse threats to ecological stability, so

274. Congress originally allocated $400 million, but as of 1998 has allocated $1.6 billion, and CTR plans on needing $3.2 billion. *See Weapons of Mass Destruction, supra* note 172.

275. *See* Lakshman Guruswamy, *The Promise of the United Nations Convention on the Law of the Sea (UNCLOS): Justice in Trade and Environment Disputes*, 25 ECOLOGY L.Q. 189, 190 (1998).

276. Koplow, *supra* note 231, at 446.

277. *See id.* at 562.

many of which speciously claim to represent urgent national priorities.[278] While Koplow offers a cogent explanatory principle, his conclusions should be tested on a case-by-case basis. In the case of START, there appears to be a confluence of two streams of thinking that are flowing in the direction of environmental assessments. The result is a synthesis rather than a divergence of two perspectives that is contrary to an interest group hypothesis.

The START treaty and its implementing CTR program have demonstrated the need for environmental impact assessments that could lead to an integrated, rather than a fragmented, approach to arms control and environmental protection. Such a comprehensive approach must engage the community of nations, and cannot remain the bilateral or trilateral concern of the United States, Norway, and Russia. A new Executive Order making international environmental assessments obligatory in cases of arms control treaties would be a substantial step in the direction of finding an international response to international environmental problems.

278. *See id.*