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From Legacy to Heritage: The Changing Political and Symbolic Status of Military Nuclear Waste in Russia[1]

Since the dawn of the nuclear era, Russia has accumulated hundreds millions of cubic meters and tons of liquid and solid radioactive waste, the lion's share of which comes from the military; this is more than half of radioactive waste accumulated in the world. This waste is stored haphazardly in facilities that are filled above capacity and in poor condition. There are also a large number of not-yet-fully inventoried or even found contaminated sites and waste dumps. The liberalization of the Soviet political regime followed by the dissolution of the Soviet Union allowed for the disclosure of the environmental impact Soviet nuclear military complex. The revelations featured two major radioactive waste disaster areas: the vast territories in the Ural region polluted by the first Soviet plutonium production complex called Maiak Chemical combine and the nuclear waste dumps in the Arctic.[2] These revelations attracted the critical attention of international audiences and prompted an active involvement of scientists, NGO activists and policy-makers in national and international debates and investigations aiming at evaluating the extent of radioactive pollution and to offer remediation.

In the 1990s these investigations and debates met with ferocious resistance from the Russian military and security establishment, as reflected, for example, in the arrest and trial for treason, in 1996-2000, of Alexandre Nikitin, a former naval military officer who cooperated with the Norwegian NGO Bellona in gathering information on military waste dumps in the Arctic from open sources.[3] From the second half of the 2000s these attacks weakened, and state sponsored attempts to inventory and to

[1] This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement n°705577 (TechPolChange).

[2] For the first official publication on Kyshtym disaster at Maiak faciliuty see: B. V. Nikipelov, G. N. Romanov, L. A. Buldakov, N. S. Babaev. Iu. B. Kholina, E. I. Mikerin, "Ob avarii na Iuzhnom Urale 29 sentiabria 1957g.," *Informatsionnyi biulleten' TsNII Atominform* (June 30, 1989). For the first official report on radioactive waste dumps in the Arctic see below the discussion of the so called *Iablokov report*.

[3] For a detailed report on the Nikitin case, including a collection of legal documentation, press releases and press articles see: Aleksandr Nikitin, Nina Katerli, *Delo Nikitina: Stretegiia pobedy* (Saint-Petersburg: Zvezda, 2001); Iurii Shmidt (ed.), *Delo Nikitina: Strategiia pobedy. Sbornik* protsessual'nykh dokumentov zashchity (Saint-Petersburg: Zvezda, 2001).

evaluate the state of various waste sites, to clean-up both in the Arctic region and in the Urals, and better to protect the population followed. These efforts involved extensive international cooperation. Parallel to these attempts, this article argues, an important reframing of the nuclear waste problem occurred that significantly changed its symbolic and even legal status. From an illegal practice whose disclosure was presented treasonous and damaging to country's international image, if also as unavoidable and justified by the Russian nuclear establishment, waste came to be seen as the nation's "nuclear legacy/heritage" (*iadernoe nasledie*), something linked to the country's glorious military past and thus, indirectly, to present nuclear might. How and why did this reframing occur? What were the major consequences of redefining radioactive waste problems and the solutions proposed for them? What aspects of these problems were emphasized or, on the contrary, obscured? To answer these questions this article draws on such numerous primary sources as government and NGO reports, legislation, scientific-technical literature, and interviews with nuclear officials and environmental activists. Ultimately, this article enables us to consider how semantics – how definitions of military waste – in the post-Cold War period have evolved after an era of secrecy to enable inventorying of waste, its environmental and social costs, and finding of ways to stabilize it. Yet it also shows how in Russia the disposition of Cold War toxic radioactive waste remains not only a scientific, but a social and political issue.

Can the "legacy" of toxic waste be a "heritage"?

The Russian term "iadernoe (radiatsionnoe) nasledie" most likely appeared first as a translation of the English term "nuclear (radiation) legacy". The use of the English word – and now concept -- of "legacy" to identify radioactive waste in the Western countries seems to be mostly a post-Cold War phenomena, although already from the 1970s specialists referred, quite vaguely, to the "legacy of radioactive waste." In the US, in the late 1980s with a determination to clean up weapons production facilities, especially at Hanford, Washington, the designation of "legacy waste" as a special category became standard. An Office of Technology Assessment study from 1991, for

example, refers to the "legacy of waste".[4] A US Nuclear Regulatory Commission Report of 2000 called this waste precisely "legacy waste" nine years later.[5]

In Russia the term "legacy" started to be used with regard to radioactive waste in the mid- to late 1990s, was connected to growing East-West exchanges in the environmental area, and was often used in the context of public criticism of the inadequate handling of radioactive waste and its related hazards. For example, the Greenpeace Nuclear Free Sea Campaign held a conference in Moscow in September 1991 called "Violent Peace, Deadly Legacy." Historian and science journalist Vladislav Larin calls his book series and research program on the environmental impact of the Russian nuclear military program precisely the "Russian nuclear legacy," with his first book on the plutonium production facility Maiak written in 1996 and published in 2001.[6] In the early 2000s, the term "legacy" began to be widely used by Russian officials and scientists. In 2000 a large International Conference on Radiation Legacy of the 20th Century: Environmental Restoration (Radleg-2000) was held at the Russian Academy of Sciences in Moscow. Organized by the Ministry of the Russian Federation for Atomic Energy (Minatom) in co-operation with the International Atomic Energy Agency and the European Commission, it focused on former Soviet countries, and aimed to provide an overall assessment of radioactively contaminated sites and sources of potential contamination from both civil and military nuclear facilities in those countries.[7] The conference followed a similar international meeting that took place a year earlier in Arlington, Virginia, the International Symposium on the Restoration of Environments with Radioactive Residues.

The end of the Cold War, the resulting openness on nuclear and other issues, and international exchanges, including US-Russia cooperation on managing military waste – all these things gave rise to the understanding of radioactive waste as a large-scale accumulated "legacy" that urgently needed the elaboration of complex, overarching and international approaches to its safe handling. Yet it must be remembered that this idea of "legacy" and the realization of the need to act to manage

[4] United States Congress Office of Technology Assessment, *Complex Cleanup: The Environmental Legacy of Nuclear Weapons Production* (Washington: OTA, 1991).
[5] National Research Council, *Long-Term Institutional Management of U.S. Department of Energy Legacy Waste Sites* (Washington: National Academy Press, 2000).
[6] Vladislav Larin, *Kombinat "Maiak" – Problema na veka*, second edition (Moscow: Ecopresscenter, 2001).
[7] International Atomic Energy Agency, *Radiation legacy of the 20th century: Environmental restoration. Proceedings of an International Conference (RADLEG 2000) held in Moscow, Russian Federation, 30 October–2 November 2000* (Vienna: IAEA, April 2002).

and store radioactive wastes safely dates at the very least to the late 1960s and early 1970s.[8] When used with regard to nuclear technology, the English term "legacy" is clearly different from the "heritage." "Legacy," as mentioned earlier, is used to describe accumulated negative and undesirable impacts of this technology that have to be remediated.[9] However, one can argue that it has also served to conceal or attenuate the scale and the dangerous character of the damage it describes. Indeed, it covers in a somewhat euphemistic way the period when the radioactive waste was not handled in some systematic, responsible manner according to a clearly spelled out strategy or approach, and a clear division of financial responsibilities, but just stored, accumulated, dumped, or spread haphazardly while the attention of nations was preoccupied by national prestige, the Cold War arms race, and security. Heritage, on the contrary, refers to something important to preserve, for instance history, memory or artifacts related to the atomic technology past.[10]

Unlike in English, there is no distinction in the Russian language between "legacy" and "heritage," and both are translated as "*nasledie*," or if it is a synonym of "estate," than as "*nasledstvo*." Starting from late 2000s, this paper argues, the Russian nuclear "legacy" has acquired several distinct features of "heritage," and this change provides a useful glimpse at the politics of military nuclear waste in Russia.[11]

The scholarly literature on heritage presents the latter as a process of making the choice of what we want to preserve and to transmit to future generations and what, on the contrary, we want to demolish and discard. This process often involves conflicts around the interpretations of the value of the heritage, tensions between official and unofficial, often local, visions.[12] Moreover, distinctive features of this heritage and the meaning and values it is supposed to encapsulate are not chosen once and forever, but are constantly renegotiated in the present.[13] Yet if heritage is seen as a positive

[8] As one measure of changing attitudes, using JSTOR searches from the 1960s to the present and 10-year increments, the number of articles referring to "radioactive waste" grew from 3 in the 1960s; 24 in the 1970s; 71 in the 1980s; 249 in the 1990s; and 241 in the 2000s.

[9] See for instance recent book by British social scientist and environmental activist Andrew Blowers: Andrew Blowers, *The Legacy of Nuclear Power* (London and New York: Routhledge, 2016).

[10] See, for example, the website of the Atomic Heritage Foundation at https://www.atomicheritage.org. Established in 2002, it is dedicated to the preservation and interpretation of the history of the Manhattan Project.

[11] Because of the fact that one word enables two different meanings in Russian usage to define nuclear waste (legacy and heritage), I use in this paper the term "legacy/heritage" to remind the reader of this fact and its semantic and real significance in contemporary Russia.

[12] Rodney Harrison, "Introduction," in Rodney Harrison, ed., *Understanding the politics of heritage* (Manchester: Manchester University Press, 2010), 5-42.

[13] Rodney Harrison, *Heritage: Critical approaches* (New York: Routledge), 165.

resource for definition of the community or nation's identity, then the choice of what to preserve is tricky in the case of toxic substances or contaminated territories that will remain dangerous for decades or centuries. They substances and sites cannot be discarded and forgotten, but have to be properly and responsibly transmitted to the next generation.[14] When the Russian nuclear establishment was confronted with the impossibility to continue dissimulating and ignoring the problem of the accumulated military waste in the face of public and international criticism, it used this criticism to redefine the problem in a more positive light. Starting from the 2000s the new discourse on nuclear legacy/heritage portrayed this waste as part of the glorious Soviet history of the creation of the atomic weapons in response to American threat and Hiroshima and Nagasaki. The waste thus became more "positive" in two distinct heritage senses: as a celebration of nation's scientific achievements and as a mean to avoid a nuclear apocalypse to which American nuclear bomb monopoly would necessarily have led.[15]

Before engaging in the exploration of the reasons that contributed to the "heritagization" of military nuclear waste, it is useful to recall the rather astonishing career of this waste as a public problem in the 1990s and the 2000s. The waste dumps in the Arctic sea are a telling example of this itinerary.

Radioactive wastes in the Arctic : revelations of the 1990s

The first public disclosures of the Arctic sea contamination by radioactive waste took place in 1991, when Andrei Zolotkov, a Murmansk region deputy of the Congress of People's Deputies of the Soviet Union and an engineer working for the Soviet nuclear fleet (Atomflot), presented a map of radioactive waste dumps sites near Novaia Zemlia at a Greenpeace conference in Moscow in 1991, a few months before the collapse of the Soviet Union. The map was later published in an Archangelsk

[14] For recent literature that makes the case for treating the radioactive waste as "heritage" see: Cornelius Holtorf and Anders Högberg, "Communicating with future generations: what are the benefits of preserving cultural heritage? Nuclear power and beyond,"
The European Journal of Post-Classical Archaeologies 4 (2014): 343-358; Marcos Buser, *Rubbish Theory: The Heritage of Toxic Waste* (Amsterdam: Reinwardt Academy, 2015).

[15] For reflections on distinctive features of the "atomic heritage" from the heritage studies perspective see : Anna Storm, Fredrik Krohn Andersson and Egle Rindzevičiūtė, "Urban Nuclear Reactors and the Security Theatre: The Making of Atomic Heritage in Chicago, Moscow and Stockholm" in Heike Oevermann and Eszter Gantner, eds., *Securing Urban Heritage: Agents, Access, and Securitization* (New York: Routledge, forthcoming 2019).

newspaper.[16] These revelations provoked international outrage since the dumping violated Soviet commitments to the 1972 Convention on the Prevention of Marine Pollution (London Convention)[17] USSR was, indeed, among the most fervent promoters of this Convention.[18] In November 1991, during the 14th Consultative Meeting of the London Convention delegates demanded Soviet representatives to provide information on past dumping.

International pressure prompted Russian President Boris Yeltsin to order an investigation by a special governmental commission.[19] Called *Commission on Matters Related to the Disposal of the Radioactive Waste at Sea,* it was chaired by the famous Russian scientist and environmental activist Alexei Iablokov and included 15 high-ranking Russian officials from different ministries. In early 1993 the commission delivered a report presenting an inventory of submarine reactors, spent fuel and other liquid and solid radioactive waste that had been dumped between 1959 and 1992, and including data declassified for this purpose.[20]

The disclosures of Soviet waste dumping practices in the Barents and Kara Seas triggered extensive international activity across the Arctic and beyond, including by the Joint Russian-Norwegian Expert Group for Investigation of Radioactive Contamination in the Northern Areas established in 1992[21] and the closely related

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[16] United States Congress Office of Technology Assessment, *Nuclear Wastes in the Arctic: An Analysis of Arctic and Other Regional Impacts From Soviet Nuclear Contamination* (Washington: OTA, 1995), 3.

[17] See Olav Stokke, "Nuclear Dumping in Arctic Seas: Russian Implementation of the London Convention," in David Victor, Kal Raustiala and Eugene Skonikoff, eds., *The Implementation and Effectiveness of International Environmental Commitments* (Cambridge: MIT Press, 2001), 475-517.

[18] Jacob D. Hamblin, *Poison in the Well: Radioactive Waste in the Oceans at the Dawn of the Nuclear Age* (New Brunswick: Rutgers University Press, 2009), 1-2.

[19] President of the Russian Federation, "Ob obrazovanii pravitel'stvennoy komissii po voprosam, sviazannym s zakhoroneniem v more radioaktivnykh otkhodov," Rasporiazhenie n°613-rp (October 24, 1992), at http://pravo.gov.ru/proxy/ips/?docbody=&prevDoc=102043022&backlink=1&&nd=102019212.

[20] Alexei Iablokov et al., *Fakty i Problemy Sviazannye so Sbrosom Radioaktivnykh Otkhodov v Moria, Primykaiushchie k Territorii Rossiiskoi Federatsii* (Moscow: Priemnaia Prezidenta Rossiiskoi Federatsii, 1993). According to a number of sources, this document may be available as *Facts and Problems Related to Radioactive Waste Disposal in Seas Adjacent to the Territory of the Russian Federation*, translated by P. Gallager and E. Bloomstein (Albuquerque, NM: Small World Publishers, Inc.,1993), but I have been unable to locate it. For a summary of the report, see : Alexei Yablokov, "Radioactive waste disposal in seas adjacent to the territory of the Russian Federation," *Marine Pollution Bulletin*, 43, 1-6 (January - June 2001): 8-18.

[21] See the report of the first three years of the group's work and joint expeditions to the site dumps in the Arctic: Joint Russian-Norwegian Expert Group for Investigation of Radioactive Contamination in the Northern Areas, *Dumping of radioactive waste and radioactive contamination in the Kara sea: Results from 3 years of investigations (1992-1994) performed by the Joint Norwegian-Russian Expert Group* (March 1996), at https://inis.iaea.org/collection/NCLCollectionStore/_Public/28/007/28007527.pdf.

International Arctic Seas Assessment Project (IASAP) that was launched in 1993 by IAEA in cooperation with the Russian and Norwegian governments to address the potential impacts of the dumped radioactive wastes and propose remedial actions.[22] This project was carried as part of the IAEA's responsibilities with regard to the London Convention of 1972. In the US, the Congressional Office of Technology Assessment also published a study on *Nuclear Wastes in the Arctic* in 1995.[23]

NGOs contributed to growing knowledge of the legacy of radioactive waste in the Arctic. Greenpeace played the crucial role in the establishment of an international regime limiting and then prohibiting radioactive waste dumps at sea. It publicized problems of waste dumps to the members of the 1972 London convention during 1991 and 1992 meetings. In October of 1993, Greenpeace "exposed a Russian warship dumping nearly 900 metric tons of liquid low-level radioactive waste into the Sea of Japan."[24] The Russian navy explained it did not have capacity to store this waste from its nuclear powered fleet on land. The exposure led Russia to cancel plans to dispose of another 700 tons, and Japan responded by announcing it supported a nuclear dumping ban at the 1993 meeting of the London Convention on the Sea. The US followed suit in November, as announced by the Clinton administration, although the Department of Defense, and in particular the US Navy, did not support the decision. Denmark had announced in July already that it would call for formal action permanently to ban ocean radioactive waste disposal. Thirty-seven countries voted for the ban, and none against; five (Britain, France, Belgium, the Russian Federation, and China) abstained. Yet these countries, with the exception of Russia, announced they would support the ban out of embarrassment.[25]

The Norwegian environmental NGO Bellona foundation, established in 1986, played a crucial role in inventorying nuclear wastes in the Arctic region (both dumped in the sea and stored haphazardly at the Arctic shores), and in facilitating international cooperation in remediating this problem from the 1990s to the present. In 1994 it

[22] Kirsti-Liisa Sjoeblom and Gordon S. Linsley, "The International Arctic Seas Assessment Project (IASAP): Interim progress report (IAEA-SM-339/167)," in International Atomic Energy Agency, *Environmental impact of radioactive releases. Proceedings of an international symposium* (Vienna: IAEA, October 1995), 155-164, at https://inis.iaea.org/search/search.aspx?orig_q=RN:27035343.
[23] Office of Technology Assessment, *Nuclear Wastes in the Arctic.*
[24] Lasse Ringius, *Radioactive Waste Disposal at Sea* (Cambridge: MIT Press, 2001), 152.
[25] Ibid., 150-152.

published its first report, followed by another one in 1996 and a third one more recently, in 2001.[26]

All of these reports revealed that dumping included low-, intermediate- and high-level waste, both solid and liquid, and entire reactor vessels, spent fuel, and so on. The waste extended from dumping areas in the Kara Sea to the east and north, and to dumping areas in the shallow fjords of Novaia Zemlia to several harbors and inlets on the Kola Peninsula that were mostly associated with the Soviet northern fleet. The vast majority of waste was military in origin, but there was also waste of the Murmansk Shipping Company associated with nuclear ice breakers and support vessels, the Poliarnye Zory nuclear power station with its four reactors, and various ancillary waste producers (hospitals, industry, research centers). It has been difficult to determine the extent and precise location of all of this waste because its disposition was largely secret in the Soviet era, and even after the Iablokov report, there has been concern about the incompleteness of data, since it has been augmented from time to time, and because the Putin administration has a growing tendency to treat the situation as a state secret, or to be less that forthcoming about it.

Nonetheless, on the basis of a series of reports including those from the IAEA, the government of the Russian Federation, and the Bellona Foundation, it is possible to conclude the following: in the Arctic Ocean, mostly in the Kara Sea, are strewn some 17,000 containers of radioactive waste, 19 ships containing radioactive waste, 14 nuclear reactors, including five that still contain spent nuclear fuel; 735 other pieces of radioactivity contaminated heavy machinery, and several nuclear submarines.[27] In the fjords on the east of the Novaia Zemlia archipelago the buried radioactive wastes totals over 2,400 kCi that is 70% of the total of sunken radioactive wastes. There are three other ocean dumping areas in the central and northern Kara Sea, and two that are proximate to the coast of the Kola Peninsula. On land at Severodvinsk shipyards (near Arkhangelsk); and on the Kola Peninsula in Gremikha Naval Base, the eastern

[26] Thomas Nilsen, Nils Bøhmer, *Sources to radioactive contamination in Murmansk and Arkhangelsk counties*, Bellona Report Volume I (Oslo: Bellona, 1994), at https://inis.iaea.org/collection/NCLCollectionStore/_Public/26/002/26002307.pdf?r=1&r=1; Aleksandr Nikitin, Igor Kudrik, Thomas Nilsen, "The Russian Northern Fleet: Sources of Radioactive Contamination," *Bellona Foundation Reports*, no. 2 (1996); Nils Bøhmer et al., *The Arctic Nuclear Challenge*, Bellona Foundation, 2001.

[27] Charles Digges, "Russia announces enormous finds of radioactive waste and nuclear reactors in Arctic seas," *Bellona* (August 28, 2012), at http://bellona.org/news/nuclear-issues/radioactive-waste-and-spent-nuclear-fuel/2012-08-russia-announces-enormous-finds-of-radioactive-waste-and-nuclear-reactors-in-arctic-seas.

most on the Kola Peninsula, where 800 fuel elements and nine reactor cores are stored; the Nerpa Shipyard in Murmansk fjord where 40 nuclear submarines were decommissioned; Vidyaevo Naval Base on Ura Bay, Severomorsk Naval Base with the largest drydock of the Northern Fleet; Murmansk; and Zapadnaia Litsa, the most important Russian/Soviet submarine base, located on the Litsa Fjord at the westernmost point of the Kola Peninsula, about 45 kilometres from the Norwegian border, with four bases including Andreeva Bay, itself with 23,000 fuel assemblies, 2,000 m^3 of liquid and 6,000 m^3 of solid radioactive waste. At these facilities, as noted, the Russians stored on land or have floating just off shore a wide range of submarine reactors, spent fuel, and other low-, intermediate and high level radioactive waste whose amount varies according to sources and dates of publication.[28] Finally, at least five submarines have been sunk or sank in the Arctic Ocean including the "Komsomolets", "Kursk", and the "K-27" with up to 90 kg of enriched U235 and other waste within it is resting off the northeast shore of Novaia Zemlia since 1982[29]. This list does not include extensive radioactive fallout from 93 Arctic nuclear weapons tests and several peaceful nuclear explosions on the Kola Peninsula.

In spite of seemingly extensive international cooperation and the relatively liberal climate in the 1990s, researching and publicizing the materials about nuclear military pollution of the Russian Arctic turned out to be a very difficult endeavor, one that was putting activists at risk of persecution and imprisonment, as showed by the Nikitin affair (*Delo Nikitina*).

The Nikitin Affair: a turning point in official treatment of the nuclear legacy

Aleksandr Nikitin, a former naval officer, worked for the Inspectorate of the safety of the nuclear installations in the Soviet and later Russian Defense Ministry from

[28] A. A. Sarkisov et al., "Problemy Radiatsionnoi Reabilitatsii Arkticheskikh Morei, Sposoby i Puti ikh Resheniia," *Arktika. Ekologiia i Ekonomika*, no. 1 (2011): 70-81; .A. A. Sarkisov et al., *Atomnoe nasledie kholodnoi voiny na dne Arktiki. Radioekologicheskie i tekhniko-ekonomicheskie problemy radiatsionnoi reabilitatsii morei* (Moscow: Institut problem bezopasnogo razvitiia atomnoi energetiki RAN, 2015); Charles Digges, 'Decades of piled up nuclear fuel bids farewell to Andreyeva Bay', *Bellona* (June 23, 2017), at http://bellona.org/news/nuclear-issues/2017-06-decades-of-piled-up-nuclear-fuel-bids-farewell-to-andreyeva-bay.

[29] Anna Kireeva, "Murmansk conference concludes sunken Russian subs must immediately be raised," *Bellona* (May 26, 2014), at http://bellona.org/news/nuclear-issues/2014-05-murmansk-conference-concludes-sunken-russian-subs-must-immediately-raised; Bezrao, "Radioaktivnye Tainy Glubiny" (August 5, 2017), at http://bezrao.ru/n/1224, and Anna Kireeva, "No radioactive contamination from sunken subs in Barents Sea, say experts, but conditions must be monitored," *Bellona* (July 14, 2015), at http://bellona.org/news/nuclear-issues/2015-07-no-radioactive-contamination-from-sunken-subs-in-barents-sea-say-experts-but-conditions-must-be-monitored.

1987 to 1992. In 1994 Nikitin began to cooperate with the Bellona foundation to document Soviet nuclear waste dumping practices in the Arctic Ocean. This resulted in the foundation's second report study that gave a thorough overview of the "sources of potential releases of radioactivity that could harm the public health and the environment," especially nuclear waste and non-operating submarines from the Cold War, and insufficient efforts to build storage facilities.[30] The FSB (Federal Security Agency), which had monitored Nikitin and Bellona, raided his home and the Bellona office in Petersburg, arrested him and confiscated his work and papers in 1996, and also searched the home of his son-in-law, Igor Kudrik, who also worked at Bellona.[31] The second Bellona Foundation report had already been sent by email to Norway and was published. As a result of this publication of non-secret documents about Soviet – not Russian – waste dumping practices Nikitin was charged with treason. He spent 10 months in pre-trial detention in St. Petersburg in 1996, was ordered to be released, and then faced several other trials, each time was acquitted, and each time the government tried to prosecute him again and again in 1998, 1999, and 2000. The Supreme Court eventually rejected further prosecution and Nikitin was finally fully acquitted.[32] Nikitin's comment about this protracted battle was that "our goal was the liquidation in Northern Russia of nuclear dumps."[33] He became the head of the St. Petersburg Environmental Rights Center that opened as Bellona Foundation branch in 1998 in Russia and included environmentalists, lawyers and journalists. To this day, Nikitin works with Bellona to deal with the legacy of Soviet nuclear waste.

Nikitin's case remains the only example in contemporary Russian history of a person acquitted of espionage charges. For instance, in 2001 the Environmental Rights Center was involved in another treason trial concerning the disclosure of radioactive waste dumping; it provided legal support for Grigorii Pas'ko, a naval officer and a journalist, who in 1993 video recorded the dumping of radioactive waste into the Sea of Japan. He latter transmitted the video to the Japanese broadcaster

[30] Thomas Nilsen, Igor Kudrik and Alexandr Nikitin, *The Russian Northern Fleet: Sources of Radioactive Contamination*, Bellona Report vol. 2 (1996), at http://spb.org.ru/bellona/ehome/russia/nfl/index.htm.
[31] Danielle Gordon, Bartosz Weglarczyk and Linda Rothstein, "Just Like the Bad Old Days," *Bulletin of the Atomic Scientists*, 52, 5 (September/October 1996): 5-10.
[32] Jon Gausllaa, "Nikitin Application Admissible," *Bellona* (November 23, 2003), at http://bellona.org/news/russian-human-rights-issues/nikitin-case/2003-11-nikitin-application-admissible.
[33] Bellona, "Aleksandr Nikitin: ''Nashei tsel'iu byla likvidatsiia na Severe Rossii iadernoi svalki," *Bellona* (March 13, 2009), at http://bellona.ru/2009/03/13/aleksandr-nikitin-nashej-tselyu-byla-l/. For greater detail, see Nikitin and Katerli, *Delo Nikitina* and Shmidt, *Delo Nikitina*.

NHK. He was then charged with espionage and sentenced to three years in prison. During a retrial in 2001, he was acquitted on nine points out of ten, but still sentenced to four years in a labor colony for his intention to transfer sensitive information to the Japanese media.[34]

In the second half of the 2000s Nikitin's relations with Russian nuclear officials changed dramatically. In 2006 he became part of Rosatom's newly created public council, an advisory body under the head of the corporation. The council was created by a new, young and widely seen as rather liberal politician Sergei Kirienko. Kirienko came in with a professional PR team dedicated to western-style strategies that contrasted with those of the USSR based on secrecy and an adversarial approach to NGOs. Among his team's first initiatives was to contact several anti-nuclear opponents whose expertise might compliment their work, and invited them to cooperate in solving such problems as the safe removal of radioactive waste from decrepit facilities in Murmansk and Arkhangelsk regions. Although only a handful of the council members have been active in environmental protection area, above all Alexander Nikitin and Oleg Menshchikov, and the body is advisory and is unlikely to weigh in important way on the nuclear policies of Rosatom, one should appreciate its role in the Russian context where there are few possibilities for interaction between the industry and environmental activists. The council has been an important platform to raise some issues related to the radioactive waste at the highest level. It arguably helped industry-public and international cooperation in areas were the industry was itself looking for solutions, such as remediation of the nuclear waste problems in the Russian Arctic.[35]

The end of "Nikitin Affair" coincided with a turning point in the treatment of the nuclear military waste and pollution problems in the Russian nuclear, defense and law enforcement establishments. From resisting (unsuccessfully) important disclosures on the extent of the problems, they started to actively cooperate to solve these problems. Reflecting on the reasons for persecutions of Nikitin and Pas'ko a decade later, Yury

[34] Jon Gauslaa, "The case of Grigory Pasko," *Bellona* (April 23, 2002), http://bellona.org/news/russian-human-rights-issues/access-to-information/2002-04-the-case-of-grigory-pasko.
[35] Alexandr Nikitin, "Grazhdane veriat antiatomnym insinuatsiiam bol'she, chem slovam uchenykh, glava pravleniia EPTs 'Bellona'," *I A Regnum* (April 14, 2014), at https://regnum.ru/news/society/1790939.html; Alexandr Nikitin, "Atomnaia Otrasl' i Ecologicheskoe Dvizhenie: Tochki Sotrudnichestva," *X International Forum-Dialog "70 Years of the Russian Nuclear Industry. Dialog of Generations*" (Moscow, November 12–13, 2015), at http://www.osatom.ru/mediafiles/u/files/X_forum_2015/03_Nikitin_A.K._Tochki_sotrudnichestva.pdf.

Schmidt, a prominent Russian lawyer who defended Nikitin, insisted that the Russian security services' main goal in fabricating the case was not so much to prevent the disclosures of the information about nuclear waste problems, which was hard to control at the time. It was rather a sort of provocation to halt the post-Cold War improvement in Russia's relationship with the West. The initiation of Nikitin's case coincided, indeed, with the Minister of Foreign Affairs of the Russian Federation Andrei Kozyrev's official visit to Norway to sign a memorandum on cooperation including, in particular, on nuclear waste remediation. The purpose of fabricating Nikitin's case was undoing the achievements of the memorandum and contributing to maintain tensions between the two countries.[36]

In the 2000s international "détente" manifested fully in the remediation of Cold War nuclear waste in Russia. The efforts of individual states to come to grips with the problem became international, based on cooperative research, clean up and other efforts, and recognition of the high costs of the endeavor and the fact that virtually all of the legacy had transboundary impacts. An important step in cooperation was the G8 Global Partnership Against the Spread of Weapons and Materials of Mass Destruction realized at its June 2002 summit.[37] The nations agreed to raise "up to $20 billion over a period of 10 years through the '10 plus 10 over 10' initiative," with the US to contribute half of that for nonproliferation projects (nuclear, biological and chemical), and to assist Russia in particular. The Partnership was renewed in 2011, and Russian President Putin "agreed to provide contributing States the same privileges it accords the United States, namely access to sites, tax exemptions, and liability protection." But after Russia's annexation of Crimea, the G7 expelled Russia. This has not helped the program, nor have a shortfall in funding commitments and the lack of coordinating mechanisms or clear plan for moving forward.[38]

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[36] Lina Zernova, "Yury Schmidt: A nation where law enforcement run unchecked is doomed to see its civil liberties dwindle," *Bellona* (October 30, 2012), at http://bellona.org/news/climate-change/international-climate-conferences/2012-10-yury-schmidt-a-nation-where-law-enforcement-run-unchecked-is-doomed-to-see-its-civil-liberties-dwindle.

[37] European Bank for Reconstruction and Development, "NDEP Nuclear Window," at https://www.ebrd.com/what-we-do/sectors/nuclear-safety/nuclear-window.html.

[38] Global Partnership Against the Spread of Weapons and Materials of Mass Destruction, "About the Global Partnership," at https://www.gpwmd.com/about, and NTI, "Global Partnership Against the Spread of Weapons and Materials…" ("10 plus 10 over 10 program"),," at https://www.nti.org/learn/treaties-and-regimes/global-partnership-against-spread-weapons-and-materials-mass-destruction-10-plus-10-over-10-program/.

The Global Partnership came to have a focus on the environment generally, and Arctic waste in particular through its Northern Dimension Environmental Partnership (NDEP) with its "Nuclear Window." The Nuclear Window was "established with the objective of delivering environmental improvements and reduction of risks associated with the nuclear legacy in North-West Russia," that provided €165 million so far with focus on Andreeva Bay, the "Lepse" dry cargo ship that served the nuclear icebreaking fleet, and submarine NPS 501. The NDEP, with the involvement of the IAEA and Rosatom, sought to secure funding for significant cross-border environmental projects in the Northern Dimension region – roughly defined as the broad area around the Barents and Baltic Seas. The concept of the NDEP was endorsed at the EU Summit in Gothenburg in 2001, with the first meeting of the group agreeing on 12 priority environmental projects in Northwest Russia and working on a plan to finance nuclear safety projects with the help of the EBRD.[39] The European countries financed the elaboration of the "Strategic Master-plan for the management of retired nuclear fleet and environmental rehabilitation of its supporting infrastructure in Northwest Russia" between 2003 and 2006 through the Nuclear Window in which leading Russian scientific institutions and international consultants where involved. In November 2006, the European Union, Russia, Iceland and Norway adopted the new Northern Dimension Policy Framework and Political Declaration for a permanent Northern Dimension policy. NDEP support came from the European Commission, a number of – mostly northern European countries, and Russia, with total budget by 2013 of €342 million, roughly half of which went to environmental projects including energy efficiency and half on nuclear safety projects, especially on the Kola Peninsula.[40]

Inventorying waste, remembering nuclear might

The changing official attitudes to the problem of accumulated nuclear waste manifested not only in increased international cooperation, but also in the development of policies and scientific approaches to this waste on the national level, though often with support of international funding. In the early 2000s the Russian government and the industry began to encourage the work of scientists, industry, state

[39] NDEP, "Northern Dimension Environmental Partnership" at https://ndep.org/; NDEP, "History," at https://ndep.org/about/overview/history/
[40] Ibid.

institutions, public figures and national and international NGOs to create an inventory of the radioactively contaminated military objects and sites and to propose solutions. This support led to two big programs funded by the Russian government on Nuclear and Radiation Safety; one ran from 2008 to 2015, the second one is ongoing from 2016 and forecast to end in 2025. Over 50% of the 2008-2015 program funds were allocated to resolve the nuclear legacy/heritage problem[41]. These programs were preceded by yet another federal program, that lasted from 2001-2006 but was seriously under-funded.

Unsurprisingly, the task of inventorying and investigating the accumulated military nuclear waste turned out to be daunting. An official brochure on Russian radioactive waste states, somewhat euphemistically, that "in some cases, because of remoteness in time and specificity of the works on the sites of preservation of the 'historical' waste, there is a lack of information about concrete quantity of radioactive waste, its physical-chemical state and isotopic composition as well as about the state of the construction structures and the hermeticity of the buildings where it is preserved."[42] What this means in practice is that there are significant quantities of waste buried on different sites that are not clearly identified and, when identified, a lot of research is needed to understand their state, composition and associated risks. Many wastes have been dumped into underground depots or pumped into uncovered holding pools where they pose a continued threat to health.

Yet some Russian officials and researchers took on the task of inventorying this nuclear legacy almost with pride. The work of the Institute for Nuclear Safety (IBRAE) of Russian Academy of Sciences, the leading institution in the scientific inventorying of the legacy objects and in conducting and coordinating research on their state and possible remediation approaches, is instructive. The institute published three big volumes entitled "Nuclear legacy and the ways of its remediation."[43] The publication was presented as practically the first attempt "to comprehensively

[41] Organisation for Economic Co-operation and Development (OECD)/Nuclear Energy Agency (NEA), *Radioactive waste management programmes in OECD/NEA member countries: Russian Federation* (OECD/NEA, 2014), 9, at https://www.oecd-nea.org/rwm/profiles/Russian_Federation_profile_web.pdf.

[42] Public Council of the State Corporation "Rosatom," Radioaktivnye Otkhody: ot obrazovaniia do izoliatsii (Moscow: Eko-Ekspert, 2013), 22-23.

[43] E. V. Evstratov et al., eds., *Problemy iadernogo naslediia i puti ikh resheniia*, vol. 1, (Moscow: IBRAE, 2012); L. A. Bol'shov, N. P. Laverov, I. I. Linge, eds., *Problemy iadernogo naslediia i puti ikh resheniia. Razvitie sistemy obrashcheniia s radioaktivnymi otkhodami v Rossii*, vol. 2 (Moscow: IBRAE, 2013); . A. Bol'shov, N. P. Laverov, I. I. Linge, eds., *Problemy iadernogo naslediia i puti ikh resheniia. Vyvod iz èxpluatatsii*, vol. 3 (Moscow: IBRAE, 2015).

examine the problems of nuclear legacy and its scope," as well as "the potential danger of postponing the solution of problems in this area." It criticized the previous literature on the subject as written either "not on professional level" or "superficially," or "with a taint of populism that leads, as a rule, to intimidation of the reader."[44] These and similar publications go to great lengths to make sure that the reader understands that nuclear waste was an unavoidable price to pay for an exceptionally urgent, important and successful research and development military program. The second chapter of the first IBRAE volume, "Impact of the initial stages of nuclear defense programs," reminds the reader about the atmosphere of urgency and of the expectation of an imminent nuclear attack from the US: "The elimination of the US monopoly on the possession of nuclear weapons, and then the achievement of nuclear parity became the main objective of the thousands of scientists, engineers and organizers of domestic production. The priority of achieving this goal overshadowed other conditions, including those related to safety." [45]

Such discourse on nuclear legacy/heritage echoes the way many Russian historians have recently researched the (mostly) glorious history of the military atom. A large number of memoirs and commemorative brochures, books, photo albums, exhibitions, and so on have been dedicated to this history since 1990s, and especially since 2000s with establishment of Russian state nuclear corporation, Rosatom, and the reinforcement of the powerful position of the nuclear industry. These publications tend to emphasize that USSR had to develop nuclear weapons very quickly because after Hiroshima and Nagasaki leaders envisioned the USSR as the next target of a nuclear attack.[46]

Moreover, this change in the way nuclear military history and its waste legacy/heritage were treated in the official discourse is closely connected to the Russian state and President Vladimir Putin's efforts to restore the nation's scientific, technological, and military prowess, and also to restore the nation's self-image and international prestige. These efforts appeared in the rejuvenation of the atomic industry, the expansion of the military enterprise, renewed attemps to claim, control, and protect littoral Arctic spaces and beyond toward the North Pole, massive

[44] Evstratov et al., *Problemy iadernogo naslediia,* 9-10.
[45] Ibid., 79.
[46] See, for example, N. N. Bogunenko, A. D. Pelipenko, G. A. Sosnin, eds., *Geroi atomnogo proekta* (Sarov: RFIaTs-VNIIÈF, 2005)

investments in the aeronautical industry, and so on.[47] In this context Russians have been encouraged to celebrate and glorify the military atom and its Soviet history – and for example such technologies as "Tsar Bomba," the largest thermonuclear device ever detonated. This bomb, tested in 1961, became in September 2015 the central piece of the exhibition that took place in Manege Exhibition Hall close to the Kremlin (Muzeino-Vystovochnoe Ob''iedinenie Manezh) dedicated to the 70th anniversary of the Russian nuclear industry[48]. As for the waste produced by the nuclear military program acquired a particular symbolic status as the nuclear legacy/heritage of the heroic Soviet effort to produce a "nuclear shield" (*iadernyi shchit*) in the Cold War, but also a special legal status, according to the 2011 law.

An exceptional waste with special legal status

As defined in official documents and technical-scientific literature, nuclear legacy/heritage is all the waste accumulated before the legislation to deal with radioactive waste was adopted. This legislation features above all a much-needed law, "On the handling of radioactive waste and spent nuclear fuel," adopted in 2011 by the parliament[49] and in whose drafting environmental activists and independent experts contributed. In practice however, this term is used almost exclusively to describe the waste from the military nuclear industry. The law led to the creation of a National Operator that announced in October 2013 a list of 30 potential sites for long-term repositories and temporary waste storage facilities that would all be operational by 2025.

The 2011 law opened the way to create a special legal status for most of the nuclear legacy/heritage waste. According to the federal law on the handling of radioactive waste all historic or accumulated waste (*nakoplennye othody*) is divided into "special" waste (*osobye othody*) and "removable" waste (*udaliaemye othody*). "Special waste" as opposed to "removable waste" is the waste for which different

[47] Paul Josephson, *Fish Sticks, Sports Bras, and Aluminum Cans* (Baltimore: Johns Hopkins University Press, 2015), chapter 6.

[48] Muzeino-Vystovochnoe Ob''iedinenie Manezh, "70 let atomnoi otrasli. Tsepnaia reaktsiia uspekha" (2015), at http://moscowmanege.ru/70-let-atomnoj-otrasli-cepnaya-reakciya-uspexa/). See also analysis of cultural heritage practices and processes in nuclear sphere in Russia by Eglė Rindzevičiūtė, "Nuclear Energy in Russia: From Future Technology to Cultural Heritage," *The Bridge*, 6, 2 (2016): 15-20.

[49] State Duma of the Russian Federation, "Ob obrashchenii s radioaktivnymi otkhodami i o vnesenii izmeneniy v otdel'nyye zakonodatel'nyye akty Rossiyskoy Federatsii," Federal law no 190-FZ (July 11, 2011), at http://pravo.gov.ru/proxy/ips/?docbody=&prevDoc=102164278&backlink=1&&nd=102149374.

risks and expenses related to the waste extraction from existing location and transporting to another location are higher than the risks and expenses of their isolation in their current location[50]. In other words, the special waste is the waste too difficult and too costly to be removed safely. According to scientists from the Nuclear Safety Institute, in 2015 more than 99.9% of all accumulated liquid radioactive waste and more than 82% by volume of the solid radioactive waste were classified as special waste[51]. Among the sites that are considered as belonging to this category, are the highly polluted areas around the first plutonium production facility, Maiak, and its spent nuclear and radioactive waste storage facilities. These sites include Lake Karachay and three other lakes, and four artificial reservoirs in the Techa cascade of reservoirs that were transformed into radioactive waste dumps starting from late 1940s. (A Russian Academy of Sciences monograph defined such practice as "simplified schemes for the management of radioactive waste" in the context of "an acute shortage of resources and time"[52]). Radioactive waste in such places (the volumes of contaminated soils, water and bottom sediments, and so on) is dispersed on the territory in such a way that they must be buried or isolated on the spot; their excavation and transfer is extremely costly and dangerous for nature and people. What makes this waste even more exceptional is that the procedure of qualifying some of it as "special" excludes public consultations and hearings. That means that the contaminated sites become final waste repositories without local communities being able to voice objections[53].

The storage sites for special waste also have special characteristics. Natural objects legally can serve as repositories for such waste provided that they are proved to be efficient barriers against the release of radioactivity. In this case such sites may be transformed from the sites of "placement" (*razmeshenie*) of special radioactive waste to the sites of "conservation" (*konservatsia*) of radioactive waste. And if those barriers are deemed to be sufficiently stable for the entire period of the potential noxiousness of the radioactive waste, then such a site becomes a "disposal" facility

[50] Public Council of "Rosatom", *Radioaktivnye Otkhody,* 23.
[51] These estimations do not take into account the radioactive waste located in the deep disposal facilities and the zones of peaceful nuclear explosions. I. I. Linge, ed., *Osobyye radioaktivnyye otkhody* (Moscow: SAM poligrafist», 2015): 3.
[52] Evstratov et al., *Problemy iadernogo naslediia*, 96.
[53] Aleksandr Nikitin, "Zakon o RAO: itogi pervoj piatiletki", *Ekologiia i Pravo*, 2, 66 (March 2017): 8.

(*punkt zakhoronenia*)[54]. However, the decision-making process with regard to identifying the sites of "placement" and then qualifying them as suitable for "conservation" or even "disposal" is not only very slow, but in many case is officially "deferred," and this means no decision is taken[55]. These "politics of indecision"[56] have become indeed another mean of managing nuclear waste in Russia. Even the not so special status of the "special waste" is an important step towards recognition of its existence as waste. Not all the places of waste have indeed made it into the inventory. One of the rather notorious cases is the Techa river, or the part of it that is not situated on the territory of Maiak facility or the territory of the closed military city Ozersk (earlier Chelyabinsk-65, before that Chelyabinsk-40, and after 1991 Ozersk).

Techa river basin: nuclear legacy wastelands.

A "biography" of the Techa River enables understanding of the sheer extent of the radioactive waste problems and the environmental impact of Soviet nuclear weapons production that is part of what is called nuclear legacy/heritage in contemporary Russia. The Techa, a small river of 240 kilometers in length, in the eastern foothills of the Ural Mountains, has gained notoriety because of its use as a radioactive waste dump from the late 1940s and early 1950s that effected both the river and the roughly 40 villages on its shores with a total – at one time – of 28,000 inhabitants. Twenty-four of the villages relied on the Techa for water. The entire basin is roughly 2,900 km^2.[57] The Techa flows through a weakly elevated plain with a large number of often interconnected lakes and bogs and is part of the Techa-Iset'-Tobol-Irtysh-Ob' River system and of the Kara Sea basin.

The Techa River basin had been the site of farmers, fishermen, trappers and their families until the opening, in 1948, of the Maiak facility to produce plutonium for the fist Soviet atomic bomb. The first production reactor (reactor A) went into operation in June 1948 and the first batch of plutonium was produced at the nearby radiochemical Plant B. This plutonium was fabricated into nuclear device components

[54] Russian State Duma, "Ob obrashchenii," art. 3.
[55] Nikitin, "Zakon O RAO," 8.
[56] Yannick Barthe, *Le pouvoir d'indécision. La mise en politique des déchets nucléaires* (Paris: Ed. Economica, 2006).
[57] V.A. Kostiuchenko, "Sostoianie Radioaktivnogo Zagriazneniia Reki Techa," *Radiatsionnaia Biologiia. Radioekologii*, 49, 2 (2009): 212-218; Thomas Cochran, Robert Norris and Kristen Suokko, "Radioactive Contamination at Chelyabinsk-65, Russia," *Annual Review of Energy Environment*, 18 (1993): 512-513.

at Plant V. Four other uranium graphite reactors (IR-AI, AV-1, AV-2, and AV-3) came on line, too, by 1955. All five were shut down between 1987 and 1990. In 1977 a radiochemical plant was built that has been since then reprocessing nuclear fuel from civil reactors.

Beginning in 1948 the authorities started dumping waste into the source of the Techa, the Kyzyltash Lake where it was diluted five to ten times, and the Techa itself, using the river, in the words of Evlanov, of the Ozersk Technological Institute, as "a gutter."[58] From 1949 to 1956 Maiak dumped an estimated 76 million m^3 cubic meters of radioactive waste water into the Techa, a cumulative dispersal of 2.75 MCi (102 PBq) of radioactivity.[59] Perhaps the scientists believed that the swampy and slow-moving Techa was an ideal place for sedimentation of radioactivity, even if the tributaries of the Techa, including little streams and brooks, dried up in the summer, and even if there were nearly villages along the river.

The area became a site of nuclear waste disasters, both chronic and catastrophic. After the initial dumping of waste led to serious radioactive exposures of the population of the villages on the Techa river, ten of which ended up to be relocated,[60] the high-level waste began to be stored mostly in tanks. On September 29, 1957, 20 MCi (740 PBq) of radionuclides were released by a chemical explosion in a radioactive waste storage tank at Maiak facility. The accident, that received the name of the nearest non-secret city, Kyshtym, occurred when the cooling system of a radioactive waste tank failed, it began to heat up, and exploded. The waste spread over 20,000 km^2 where more than 270,000 people lived to form the East Urals Radioactive Trace (EURT).[61] Since virtually all of the information about waste and its disposition in the US and USSR was secret until the 1990s, rumors and speculation about the accident persisted until 1976 when Zhores Medvedev mentioned the disaster almost in passing in *New Scientist*. Medvedev painstakingly assembled bits and pieces

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[58] Dmitriy Evlanov, "The techa river: 50 years of radioactive problems," *in International Youth Nuclear Congress 2000: Youth, Future, Nuclear. Transactions* (Slovakia: Slovak Nuclear Society, 2000), at https://inis.iaea.org/collection/NCLCollectionStore/_Public/33/011/33011261.pdf.

[59] Cochran, Norris and Suokko, "Radioactive Contamination," 511.

[60] On this early recognition of the human impact of the radioactive contamination from Maiak waste dumping see Kate Brown, *Plutopia: nuclear families, atomic cities, and the great Soviet and American plutonium disasters* (Oxford: Oxford University Press, 2012), 189-196.

[61] William J.F. Standring, Mark Dowdall, and Per Strand, "Overview of Dose Assessment Developments and the Health of Riverside Residents Close to the 'Mayak' PA Facilities, Russia," *International Journal of Environmental Research and Public Health*, 6, 1 (2009) 1: 179. See also A. V. Akleyev et al., "Consequences of the radiation accident at the Mayak production association in 1957 (the 'Kyshtym Accident'), *Journal of Radiological Protection*, 37 (2017): R19–R42.

of information from a variety of Soviet scientific publications about radiological impacts of various isotopes on flora and such fauna as fish, deer, and determined that such information – and isotopes – could only have come from such an event as Kyshtym disaster.[62]

Doubts about Medvedev's conclusions persisted in the early 1980s with some scientists convinced that it was industrial pollution, not an accident, even after Medvedev published a second article and a book in 1979.[63] Yet further study led Oak Ridge skeptics of Medvedev to observe that "the names of 30 villages had vanished from current Soviet maps of the area, and that an elaborate canal system had been built to bypass some 15 miles of river valley below the site."[64] Finally, the disaster was officially confirmed by the Soviet authorities in 1989.[65]

The Maiak enterprise belatedly ceased release into the river of high- and intermediate level wastes. Instead they used a number of both natural lakes and artificial ponds that received the names of numbered "reservoirs" (*vodoemy*). These natural water bodies included Lake Karachay (Reservoir 9), Lake Tatysh (Reservoir 6), Lake Kyzyltash (Reservoir 2). The main artificial ponds were the Old Swamp (*Staroe Boloto*, Reservoir 17) and the reservoirs forming the so-called Techa Cascade of Reservoirs (TCR, *Techenskii kaskad vodoemov*) that was constructed in the upper reaches of the river during the period 1956-1965: it included the reservoirs that existed before Maiak (Reservoirs 3 and 4) and the artificial reservoirs created by damming the Techa River (Reservoirs 10 and 11). By-pass channels at the head of the Techa River were also built in order to reduce the amount of contamination entering the main river. The Techa river was thus transformed into a large-scale industrial object used for dumping toxic wastes resulting from nuclear weapons production.[66] The canals and dams slowed the water and led to filtration – apparently through

[62] Zhores Medvedev, "Two decades of dissidence," *New Scientist*, 1972 (November 4, 1976): 264-267. He followed this with *Nuclear Disaster in the Urals* (New York: W. W. Norton, 1980).
[63] Medvedev, *Nuclear Disaster*; Diane Soran and Danny Stillman, *An Analysis of the Alleged Kyshtym Disaster,* report LA 9217 MS (Los-Alamos: LANL, January 1982); Sarah White, Christoper Joyce, "Ural Disaster: Explosion or Just Pollution?" *New Scientist* (April 22, 1982): 200.
[64] Nicholas Wade, "The Strange Wasteland at Kyshtym," *New York Times* (May 8, 1982), at https://www.nytimes.com/1982/05/08/opinion/by-nicholas-wade-the-editorial-notebook-the-strange-wasteland-at-kyshtym.html.
[65] Nikipelov et el., "Ob avarii."
[66] A. Aarkrog, J. Simmonds, P. Strand, G. Christensen, B. Salbu, *Radiological Assessment of Past, Present and Potential Sources to Environmental Contamination in the Southern Urals and Strategies for Remedial Measures (SUCON)* (Roskilde: Risø National Laboratory, December 2000), at https://inis.iaea.org/collection/NCLCollectionStore/_Public/32/036/32036317.pdf; Thomas Cochran, Robert Norris and Kristen Suokko, "Radioactive Contamination at Chelyabinsk-65, Russia," *Annual Review of Energy Environment*, 18 (1993): 514-518.

sedimentation of radionuclides into the silts and into the soils on the right and left side of TCR.[67] While the system of ponds, used as sumps, and canals slowed the spread of radioactivity, it did not prevent it. Also, even if the creation of the Techa cascade solved some problems it created many new ones related to the remediation and stabilization of closed ponds.[68]

Evlanov notes that it is impossible to estimate how much waste in all was dumped since many relevant documents were not preserved, most workers who carried the dumping had no idea or incomplete ideas what they were doing, and even official and secret document sent to Moscow avoided using such words as "radioactivity" and "irradiation." And, of course, flow meters and other measuring devices were not used. Post hoc efforts to estimate the waste concluded as follows: from 1949 to 1956, 76 millions cubic meters of liquid waste was dumped with a total activity of about 2.75 millions Ci. Much of that waste is in ponds number 3 and 4 that were built to slow the flow and were used as sumps. Some waste managed to flow all the way into the Iset River within 20 to 25 days. Apparently 25% of activity was embedded in lake bottom sediments.[69]

Moreover, the cascade was the Maiak facility became the site of the infamous Lake Karachai disaster in 1967. In September 1951 the Soviets stopped discharging the diluted high level radioactive waste directly into the Techa and instead diverted it into Lake Karachai which served as an open-air liquid waste dump. It accumulated, according to Russian authorities' estimates, 600m curies of waste (to compare, in 1986 Soviet authorities estimated that 50m curies radiation was released by the Chernobyl disaster)[70]. In 1967, the water of the lake partially dried out, radioactive dust from its bed was blown into the air, and it contaminated several thousands of square kilometers around the site, including the reactor site and 41,500 people in 63 villages, some of whom had already suffered from Kyshtym disaster[71]. After this accident, nuclear authorities have used different techniques to prevent future spread of

[67] Kostiuchenko, "Sostoianie Radioaktivnogo Zagriazneniia." See also N. V. Shagina, "Reconstruction of the contamination of the Techa River in 1949-1951 as a result of releases from the "Mayak" Production Association," *Radiation And Environmental Biophysics*, 51, 4 (2012): 349-366.
[68] Evlanov, "The techa river."
[69] Ibid.
[70] Nuclear Engineering International, "Russia's Mayak continues clean-up of Lake Karachai" (November, 30, 2016), at http://www.neimagazine.com/news/newsrussias-mayak-continues-clean-up-of-lake-karachai-5684170; A. A. Abagian et al., "Informaciia ob avarii na Chernobyl'skoi AES i ee posledstviiakh, podgotovlennaia dlia MAGATE," *Atomnaia Energiia*, 61, 5 (november 1986): 301-320.
[71] Cochran, Norris and Suokko, "Radioactive Contamination".

waste. Since 1980 the reservoir has been filled with rock using hollow concrete blocks. Final backfilling of Karachai took place in late 2015 when it was covered with rock and dirt[72]. However, it cannot be excluded that the radioactivity trapped under several layers of soil will migrate and further contaminate groundwater in the vicinity.

Difficult remediation and ambiguous legal status of the "natural" waste storage sites at Maiak

Since the 1990, when the delegation of International Union of Radioecologists (IUR) first visited Maiak, intense research and monitoring activity involving Western institutions and laboratories started, with Northern countries, first among them Norway, taking the lead. Even if contaminated territories of Southern Ural region seemed to be less in the international spotlight than the Arctic sea, there has been serious concern about the Techa river contributing to the contamination of the Kara and Barents seas[73]. Along the Techa the possibility of new disasters loomed. The water table had begun unexpectedly to rise rapidly, perhaps partly because of the shutting down of production reactors and changing weather conditions; the danger was of massive flooding of polluted waters into the Techa. President Putin ordered action in March 2003 on the TCR. (One solution considered was the construction of a South Ural NPP on the polluted reservoirs for evaporation of the excess waters). From 2003 until 2015 the Russian nuclear industry, under the direction of the scientists from IBRAE engaged a number of projects dealing with the stabilization and remediation of the Techa River basin including the Techa Cascade of Reservoirs (TCR). IBRAE worked on a so-called *Complex Plan to ensure Solution of Ecological Problems of Maiak*, 2003-2015, and later the *Strategic Master-plan to solve finally the problem of the TCR*. The planning involved representatives of Minatom, Minzdrav, Minprirody, Gosatomnadzor and IBRAE. In any event, through the Complex Plan (strengthening of structures, improvements of filters and so on) they

[72] Nuclear Engineering International, "Russia's Mayak".

[73] Among the first important analyses of the contamination resulting from the nuclear activities at the Maiak facility see: Joint Russian-Norwegian Expert Group for Investigation ofRadioactive Contamination in the Northern Areas, *Sources contributing to radioactive contamination of the Techa River and areas surrounding the "Mayak" Production Association*, *Urals, Russia: programme on investigations of possible impacts of the "Mayak" PA activities on radioactive contamination of the Barents and Kara Seas* (Østerås: Norwegian Radiation Protection Authority, 1997). Another example was joint Russian-American cooperation in the study of radiation effects that led for example to L. I. Il'in and V. A. Gubanov, editors, *Krupnye Radiatsionnye Avarii: Posledstviia i Zashchitnye Mery* (Moscow: IzdatAT, 2001).

succeeded in eliminating the risk of a hydrodynamic accident by 2008. By the end of 2010, the TCR had reached a stable state according to Rostekhnadzor inspection, while by 2015 the water works had been modernized. Scientists anticipates that by in some two hundred years reservoirs V-10 and V-11 may be considered "normal" bodies of water, with the Techa River itself outside of the Maiak territory available for all "economic" uses.[74]

According to the Maiak's "Report on ecological safety" dated 2018, eight of the reservoirs mentioned above were in use in 2017[75]. These reservoirs, including the TCR have rather curious legal status that has been pointed out by both scientists and activists. These are indeed water bodies that according to the current environmental legislation cannot be used for discharge of the radioactive waste. To make things even more confusing, in 2010 a joint decision of Rosatom, the Ministry of Environment and Rostekhnadzor (Russian regulatory body) recognized the bodies as "special industrial reservoirs" (*spetsial'nye promyshlennye vodoemy*). The latter became "objects of nuclear energy use " (*ob''ekty ispol'zovaniia iadernoi èнergii*) : storage facilities for liquid radioactive waste[76]. Yet, as lawyer and activist Andrei Talevlin, who visited the TCR in 2016 with the working group of Rosatom's Public Council, points out, by transforming natural objects into the "objects of nuclear energy use," Rosatom is legalizing its waste dumps since it is illegal to discharge the waste into the environment[77].

Specialists from the Russian Academy of Sciences participating in the Russian nuclear legacy/heritage inventorying and remediation support this legal ambiguity, and recognize that the reservoirs "are non-isolated from the environment" and "constitute a serious potential menace". They point out however, that "bringing the TCR up to the standards that meet the legislative requirements […] is economically ineffective and, moreover, impossible." The least costly solution became to treat these

[74] REFNews, "Akademik Leonid Bol'shov: IBRAE RAN zalozhil nauchnye osnovy strategicheskogo planirovaniia v iadernoi i radiatsionnoi bezopasnosti v Rossii," *REFNews* (July 10, 2018), at https://www.refnews.ru/read/article/1474019.

[75] Federal State Unitary Enterprise "Maiak Production Association," *Otchet po ekologicheskoi bezopasnosti FGUP "PO "Maiak" za 2017 god* (Ozersk: FGUP PO Maiak, 2018), 34, at: https://www.po-mayak.ru/local/%D0%9E%D1%82%D1%87%D0%B5%D1%82_2017.pdf.

[76] For the reference to this decision see : Maiak Production Association, *Otchet po bezopasnosti*, 34-35.

[77] Andrei Talevlin, "Techenskii kaskad vodoemov bol'she Shershnevskogo vodokhranilishcha v dva raza" (October 20, 2016), at http://za-prirodu.ru/page/techenskij-kaskad-vodoemov-bolshe-shershnevskogo-vodohranilishha-v-dva-raza.

sites as facilities for "special waste" storage that can be further transformed into the sites of "conservation" and even of "disposal" of liquid radioactive wastes, provided they can be safely isolated from the environment. This is what Russian scientists and nuclear officials aim to achieve according to the Strategic Master Plan to solve finally the problem of the TCR.

These complicated remediation strategies mostly concern the part of the Techa river basin that is situated on the territory of Maiak facility. The rest of the Techa, which is also quite heavily contaminated, is not properly posted as radioactively hazardous yet remains a place where people live and work, and who rely on the river for drinking water and for their crops and animals. While many villages were evacuated because of radiation and especially after the two major accidents of Kyshtym and Lake Karachai, thousands were not. The inhabitants of the village of Musliumovo, almost at the epicenter of radioactivity, were never relocated earlier.[78] After Kirienko arrived at the head of Rosatom in 2005, he supported the decision to relocate its residents. Yet, the village was relocated only two kilometers away from its previous location, not enough to insure the safety of its residents, as a number of experts and activists argument. One of them, Nadezhda Kutepova, has been fighting to defend the rights of local residents.[79] In 2004 Kutepova established an NGO, *Planet of Hopes*, in Ozersk, in part with funding from US and European organizations. Her mission became to defend the citizens whose rights were violated as a result of activity of the nuclear weapons and energy production enterprises. Not only director of Planet of Hopes, Kutepova was public adviser to the ombudsman of Cheliabinsk region. She has represented victims of the nuclear industry in court in Russia and the European Court of Human Rights in Strasbourg. For her work, Kutepova won the Nuclear-Free Future Award 2011.

When the 2011 law on the handling of radioactive waste was adopted, it provided for the creation of "a unified state system for radioactive waste management." The government launched the process of the "primary registration" of radioactive waste and storage sites that Rosatom had to coordinate in consultation with federal and local authorities. Kutepova believed it was a great opportunity to solve the problem of the Techa River: "We addressed a claim to the local government asking them to report the Techa river as a radioactive waste storage." Unsurprisingly, the answer they

[78] Brown, Plutopia, 297-305.
[79] Author's skype interview with Nadezhda Kutepova, November 3, 2018.

received was that Techa river was not a waste storage facility.[80] This, according to Kutepova among others, contradicts the fact that the river remains heavily contaminated from the dumping of radioactive waste in late 1940s and early 1950s. Moreover, the practice of liquid waste dumping continued, as she discovered. Indeed, according to the Cheliabinsk Regional Court decision of May 11, 2006, former Maiak director Sadovnikov knowingly allowed the liquid radioactive waste to reach Techa river beyond the TCR and by-pass channels and thus the open hydrographic network, between 2001-2004. Measurements taken near the village of Musliumovo showed that according to the existing sanitary rules the river water of the River Techa during these years "was classed as liquid radioactive waste."[81] Since the hearings were closed, this decision could become public only thanks to the efforts of Kutepova and the NGO "Ecozashita!".[82] Indeed, Rosatom's official position has been to deny any discharges after the '50s. While visiting Maiak in 2011, a highly ranked Rosatom official assured journalists that from the ecological point of view Maiak was "ten times safer than any other large-scale production facility." He continued by reminding the audience that "from the mid-'50s of last century Maiak production facility has not discharged liquid radioactive waste into an open hydrographic network."[83]

In April 2010, Kutepova and a lawyer from the NGO "Ecodefence!" assisted 23 residents Musliumovo to file a lawsuit in Moscow against the Government of the Russian Federation, Rosatom, the Emergencies Ministry and the Ministry of Health. The plaintiffs demanded to recognize the Techa as a "storage site for radioactive waste" and to build a 240 km long sarcophagus to completely block access to the radioactive river. The lawsuit was still on-going when Russian investigators and law enforcement agents began to harass Kutepova, accusing her, for example, of tax evasion. They designed Planet of Hopes a "foreign agent" under new laws intended to destroy NGOs and fined it for failure to register with the authorities. The government carried out a public campaign against her including on TV. After being

[80] Ibid.
[81] Decision of the Chelyabinsk Regional Court to terminate a criminal case against V. I. Sadovnikov, May 11, 2006, translated from Russian by the European human rights advocacy centre, personal archive of Nadezhda Kutepova.
[82] Vladimir Sliviak, "Radioaktivnye otkhody s kombinata 'Maiak' pronikaiut v reki, otravliaia sredu prozhivaniia tysiach rossiian – obnarodovanie dokumenta," *Radio Ekho Moskvy* (December 23, 2011), at https://echo.msk.ru/blog/ecodefense/842189-echo/.
[83] Igor' Konyshev quoted in Sergei Taran, "Shkola dlia evropeiskikh atomshchikov," *Moskovskii Komsomolets Cheliabinsk* (February 2, 2011), at https://chel.mk.ru/articles/2011/02/02/562404-shkola-dlya-evropeyskih-atomschikov.html.

accused of "industrial espionage" in a show on state TV, Kutepova didn't wait for formal prosecution for treason or espionage and fled to France in 2015.[84]

Conclusion

The residents of littoral Arctic regions, the Nenets reindeer herders, the people of the Techa River basin, and many other Russian citizens will not be forced to flee their country as Kutepova has been. But they continue to face health and environmental threats because of legacy of nuclear waste. If, for fifty years, Soviet citizens were exposed to ionizing radiation because of hazardous, ad hoc, and illegal disposal practices. The Soviets seem not to have had any sense of legality during the Cold War about how to treat the unexpectedly vast quantities of waste they produced in the making of nuclear weapons. They dumped waste, submarine carcasses and even spent fuel into the Arctic Ocean, and in their own territory they poured it into holding basins ("technical reservoirs") that at least some specialists must have understood would limit the spread of radioactive cesium, strontium and other isotopes, but not stop it, and with significant impacts on a variety of ecosystems and citizens' health. They signed international treaties that claimed they followed the rule of law, but did not. The waste disposal practices ultimately led to a series of major accidents and events, including the Kyshtym explosion of 1957 and the Lake Karachai windstorm in 1967. But in the name of Cold War weapons production in an arms race with the US, they continued to produce vast quantities of toxic waste and dump it all too often in a profligate and haphazard fashion.

At the end of the Cold War, for a variety of reasons explored here, the Russian authorities have been far more forthcoming about the nature and extent of radioactive waste the military establishment produced, commencing with the Iablokov report to President Yeltsin in 1993, and even in the 2000s, although the authorities, especially under President Putin, have tried to shape and control information, even to the extent of tagging such people as Aleksandr Nikitin and Nadezhda Kutepova as traitors and spies. There is greater openness, to be sure, as in the United States and elsewhere about the extent and nature of legacy waste. Beginning the 1990s, the nuclear powers recognized much more directly the significant and growing public health and

[84] On Kutepova, see Women's Earth & Climate Action Network, "Nadezhda Kutepova," at https://wecaninternational.org/summit-delegates/178/nadezhda-; Vitaly Servetnik, Kjersti Album, Yngvild Lorentzen, *Pressure Toward Russian Environmental NGOs* (Naturvernforbundet, 2017), 4, 21, 25; Anne Garrels, *Putin Country* (New York: Farrar, Straus and Giroux, 2016), 197-200.

environmental problems created by toxic nuclear waste. They began to inventory it, consider how better to treat and store it, and engaged in cooperative research and development efforts to select the correct paths. Norway, the US, Russia, the EU found funding – and the will – to address the problem of legacy waste, in fact even defining it as a special category in the 1990s, as noted in US Department of Energy publications and official communications of the Russian industry. The importance of the assistance of such NGOs as the Bellona foundation and Greenpeace cannot be overstated.

Yet, soon, perhaps reflecting a revived nationalism under Putin, and certainly a belief in the need to secure the country's symbolic and geopolitical position as a leading scientific superpower, Russian scientists, military leaders and politicians developed a new semantics of dealing with waste. As noted hear, they discussed "nuclear legacy/heritage" (*iadernoe nasledie*) as something linked to the country's glorious military past, its nuclear might and its scientific authority. If cleanup of that legacy continued – in the Arctic and in the territory of Maiak, at great cost, and if leaders have seemed dedicated to this cleanup, then by defining toxic waste as heritage they have nonetheless determined to ignore full responsibility for past accidents, dumping, and exposures, claiming instead this is the heritage of a nuclear power. Various grandiose target and complex programs seek to stabilize waste, with the promise of turning even the Techa basin from "industrial reservoirs" into a "green lawn" (*zelenaia luzhaika*), yet another semantic nuance. But the effort is costly, tardy, and mitigation efforts have lagged, and when ombudsmen, scientists, foreign observers, and Russian citizens complain, then they have been denied the proper forums and legal means to challenge the authorities. As a result, many people in Russia still live with the threat of the toxic nuclear heritage of Maiak, Andreeva Bay and Novaia Zemlia.