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Food and water security issues in Russia II: Water security in general population of Russian Arctic, Siberia and Far East, 2000–2011

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Background. Poor state of water supply systems, shortage of water purification facilities and disinfection systems, low quality of drinking water generally in Russia and particularly in the regions of the Russian Arctic, Siberia and Far East have been defined in the literature. However, no standard protocol of water security assessment has been used in the majority of studies.

Study design and methods. Uniform water security indicators collected from Russian official statistical sources for the period 2000–2011 were used for comparison for 18 selected regions in the Russian Arctic, Siberia and Far East. The following indicators of water security were analyzed: water consumption, chemical and biological contamination of water reservoirs of Categories I and II of water sources (centralized – underground and surface, and non-centralized) and of drinking water.

Results. Water consumption in selected regions fluctuated from 125 to 340 L/person/day. Centralized water sources (both underground and surface sources) are highly contaminated by chemicals (up to 40–80%) and biological agents (up to 55% in some regions), mainly due to surface water sources. Underground water sources show relatively low levels of biological contamination, while chemical contamination is high due to additional water contamination during water treatment and transportation in pipelines. Non-centralized water sources are highly contaminated (both chemically and biologically) in 32–90% of samples analyzed. Very high levels of chemical contamination of drinking water (up to 51%) were detected in many regions, mainly in the north-western part of the Russian Arctic. Biological contamination of drinking water was generally much lower (2.5–12%) everywhere except Evenki AO (27%), and general and thermotolerant coliform bacteria predominated in drinking water samples from all regions (up to 17.5 and 12.5%, correspondingly). The presence of other agents was much lower: Coliphages – 0.2–2.7%, Clostridia spores, Giardia cysts, pathogenic bacteria, Rotavirus – up to 0.8%. Of a total of 56 chemical pollutants analyzed in water samples from centralized water supply systems, 32 pollutants were found to be in excess of hygienic limits, with the predominant pollutants being Fe (up to 55%), Cl (up to 57%), Al (up to 43%) and Mn (up to 45%).

Conclusion. In 18 selected regions of the Russian Arctic, Siberia and Far East Category I and II water reservoirs, water sources (centralized – underground, surface; non-centralized) and drinking water are highly contaminated by chemical and biological agents. Full-scale reform of the Russian water industry and water security system is urgently needed, especially in selected regions.

Keywords: *water security*; *drinking water*; *centralized*; *non-centralized water sources*; *chemical*; *biological contamination*; *pollutants*; *bacteria*; *spores*; *cysts*; *virus*; *pesticides*; *metals*; *Russian Arctic*

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Although available freshwater resources in the Arctic rank among the largest in the world (1), quality and quantity of household water may differ substantially among countries and regions. Thus, water security has been highlighted as a prioritized issue in the Arctic, and 6 indicators of water security (including quality aspects) have recently been promoted for international comparisons. These are per capita renewable water, accessibility of running water, waterborne diseases and contaminants in drinking water, authorized water quality assurance and the existence of water safety plans (2).

From a Russian perspective, the issue of drinking water-related contaminants is an urgent matter. About 70% of the population of the Russian Federation obtains drinking water from surface water sources, 40% of which do not comply with hygienic norms, which includes aspects that may be categorized as either sanitary or aesthetic norms from a western perspective. More than 27% of water pipelines from surface reservoirs are not equipped with water purification facilities and 16% lack disinfection systems (3).

Permafrost which occupies about 65% of Russian territory (including the whole Arctic, and the bulk of Siberia and Far East) is the main cause of infrequent use of underground water sources in the northern territories of Russia. In small settlements, as a rule, water pipes supply untreated and non-disinfected drinking water directly from surface water sources. A majority of these water supply systems in rural areas are used only in summer. In winter, water for household needs and drinking is mostly delivered from surrounding, often unexplored, reservoirs due to the insufficient flow rates of open water sources. Some communities have "technical" pipeline water-delivery systems from the nearest lake or river, and use constant water preheating during cold seasons, which serves as a centralized combination of house heating and hot-water supply, to avoid water freezing. In this situation, pure cold drinking water is not provided. In severe cold climate zones where wells are unavailable or impossible to construct, water will typically be delivered by trucks carrying water tanks in summer and sawn ice blocks in winter.

In rural areas, more than one-third of the population uses drinking water from non-centralized sources. The quality of this water is low due to weak protection of aquifers from pollution from surface areas, the lack of sanitary protection zones, and the delayed repair, cleaning and disinfecting of wells and interception ditches. Almost everywhere, municipal financing for these purposes is simply not appropriated (3,4).

Of particular concern from a water contaminant perspective is the serious deterioration of water distribution and sewerage networks, and the numerous accidents on these networks that leads to secondary pollution of drinking water. In recent years, the systematic preventive maintenance and repair of water supply facilities and networks have been almost completely replaced by recovery efforts after accidents. Currently in Russia, about one-third of the water-supply and sewerage networks have deterioration levels of more than 60%. Restoration of these systems (bringing them to the proper sanitary condition) will take more than 50 years, based on the current rate of repair (3).

In the Russian Federation, drinking water from centralized water supplies that do not meet hygienic standards for chemical substances is consumed by more than 10 million people, and it supplies that do not meet the standard for indicator bacteria, by more than 14 million people annually. In 2006–2007, conditionally pathogenic and pathogenic microorganisms in drinking water have been recorded in 56 administrative Russian territories. Outbreaks of gastroenteric infectious diseases, including hepatitis, are often caused by microbial contamination of drinking water (5).

About 28% of the Russian population consume highly mineralized drinking water (1.6–10 g/L), which promotes the risk of cardiovascular diseases, urolithiasis, and so on. About 85 million people consume water with low fluorine content (2–5 times lower than recommended), which leads to a 90–100% prevalence of caries among children in some regions. About 50 million people in the country (one-third of the population) consume drinking water with enhanced iron content (5,6).

The poor state of water supply systems owned by the Russian state, and the poor quality of drinking water is publicly admitted, particularly regarding the regions of the Russian Arctic, Siberia and Far East (3–6). Despite this, the Russian Federation still has no federal law on drinking water and drinking water supply. Such a law was elaborated and submitted for consideration 14 years ago and adopted by the State of Duma in December 1999, but after that, it was immediately rejected by the upper chamber of Russian Parliament mainly due to disagreements with regard to the regulations governing the mechanism for the privatization of drinking water supply systems (Information on Causes of rejection of Federal law on "Drinking water and drinking water supply" of the Federation Council of the Russian Federation, http://base.consultant.ru).

In 2006, the governing party "United Russia" initiated an all-Russia large-scale clean water project that includes investments in a unique universal "Golden Formula" nanotech water filter, known as Petrick-Gryzlov filters; these "filters" were said to be able to block any pollutants in drinking water, including radioactivity (7). When this claim was proven to be false (7,8), the project was reviewed, and in December 2010 the Federal Target Program "Clean water" for the period 2011–2017 was

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adopted by the Government (9). The total budget of the Program for 7 years was set at 331.8 billion roubles (about 10 billion USD).

On 1 January 2013, the Federal Law "On water supply and water outlet" was entered into force. This law regulates only economic and financial issues. Regional target programmes aimed at providing high-quality drinking water are operating in 33 Russian regions (among them Murmansk Oblast, Karelia, Khanty-Mansy AO, Krasnojarsk kraj, Magadan Oblast, Primorsky kraj, Chukotka); but financing of some of these programmes has been "insufficient" or "not approved" (5).

Regions of the Russian Arctic, Siberia and the Far East where the sanitary–chemical indicators of drinking water quality did not meet hygienic requirements (more than 1.5 times the limit) include Kareliya Republic, Arkhangelsk Oblast, Nenets AO, Yamalo-Nenets AO, Khanty-Mansi AO, Yakutia Republic, Chukotka AO, Sakhalin oblast, and regions where the microbiological indicators of drinking water quality did not meet hygienic requirements (more than 1.5 times the limit) include Kareliya Republic, Arkhangelsk oblast, Yakutia Republic, Sakhalin oblast, Khabarovsk kraj, Primorsky kraj and Amur Oblast (5).

The most comprehensive assessment of all aspects of water supply and water quality (including chemical and biological contamination issues) in the Russian northern regions has been carried out in several studies in Arkhangelsk city and Arkhangelsk oblast (10–16). Several studies carried out on water security have reported a great many problems in other regions: Khanty-Mancy AO (17,18), Krasnojarsk kraj (19), Yakutia (20,21) and Primorsky kraj (22). Bacterial and viral contamination of waters in the Eastern Siberian region (Krasnojarsk kraj, Yakutia, etc.) have been investigated by the Irkutsk Research Institute of Epidemiology and Microbiology (23–25) where results on Hepatitis A, Cytomegalovirus and Rotavirus in drinking water are of particular interest. The presence of the parasitic protozoan, *Giardia lamblia*, in drinking water and even in bottled water has been reported in several cities and settlements of Yakutia (20).

This study is the first complex comparative assessment of water quality (including drinking water-related chemical and biological contaminants) in the regions of the Russian Arctic, Siberia and Far East, which uses unified water security indicators collected from statistical sources.

Objectives

Our general aim was to compare water security indicators (including chemical and biological contaminants in drinking water) in 18 regions of the Russian Arctic, Siberia and Far East (for the period 2000–2011) and to assess water safety in these territories.

Study design and methods

Eighteen regions of the Russian north, Siberia and Far East (see "Food and water security issues in Russia I: food security . . ." in the current volume of IJCH) have been included in the study, and the following official statistical data sources were used (for the period 2000–2011):

a. Regional Statistical Yearbooks (trade statistics) – all regions except Khanty-Mansi AO, Taymyr AO, Evenki AO, Koryak AO and Sakhalin Oblast.
b. Regional State Reports on "Sanitary–epidemiological situation" (excesses in percentages above national hygienic limits of chemical and biological water contamination) – all regions except Taymyr AO, Evenki AO, Koryak AO and Primorsky kraj.
c. Federal Automatic system "Social–Hygienic Monitoring" (data on specific biological and chemical contaminants in different water sources and in drinking water) – all regions except Koryak AO.

The following water safety data have been analyzed in selected regions:

a. Water consumption (L/person/day)
b. Chemical and biological contamination of water reservoirs of Categories I and II
c. Chemical and biological contamination of water sources (centralized – underground and surface, as well as non-centralized) and drinking water
d. Specific chemical and biological contaminants in drinking water

Specification of Russian hygienic regulations of water contamination

All water reservoirs in Russia are divided into 2 categories. The first category includes bodies of water used for drinking and household water use, as well as for water supply used for the food industry. The second category includes bodies of water for recreational use. Water quality requirements set for the second category of water use also apply to all areas of bodies of water that are within the boundaries of built-up areas.

A set of sanitary rules and norms (Hygienic requirements for surface water) (26) regulates water quality of bodies of water used for drinking, household and recreational uses, conditions of wastewater discharge into water bodies, requirements relating to placement, design, construction, renovation and exploitation of industrial and other objects that may have an impact on surface water, as well as requirements for the organization of the monitoring of water quality of water bodies.

Another set of sanitary rules and norms (Drinking water: Hygiene requirements regarding the quality of centralized water supply systems – Quality Control) (27) is the main document in Russia that regulates the safety of drinking water in terms of chemical, biological and radioactive contamination with addenda on requirements to materials, reagents, equipment used for water purification and treatment (28). Important additional documents include "Maximum permissible concentrations (MPC) of chemical substances in bodies of water used for drinking, household, and cultural and community water uses" (29) and "Approximate permissible concentrations (APC) of chemicals in bodies of water used for drinking, household, cultural and community water uses" (30).

In accordance with the hygienic rules, the sanitary–chemical quality of water is assessed according to several criteria, including organoleptic properties (colour, smell, taste and suspended matter), pH (mineralization, hardness and oxidability), oil and oil products, surfactant species, phenol index, and non-organic and organic chemical substances.

According to the "Social–hygienic monitoring" Federal Information system for 2003–2007, the prioritized pollutants in drinking water for centralized water pipelines are due to water source contamination, water contamination during water treatment and water contamination during water transport in pipelines (5).

Examples of Russian national threshold levels for some pollutants in drinking water (mg/L) are: Hg – 0.0005; Pb – 0.03; Cd – 0.001; HCH – 0.002; DDT – 0.002.

When we evaluate data on chemical contamination of water, we must bear in mind that values such as "excess percentage over hygienic threshold" are actually combinatory hygienic appraisals that can be attributed not only to chemical substances but also to organoleptic properties, such as colour, pH, mineralization and hardness.

Microbiological quality of water is assessed according to several criteria (27): total bacterial count (heterotrophic plate count) should not be more than 50 CFU/ml of water; general and thermotolerant Coliform bacteria, Coliphages, sulphite-reducing Clostridia spores and/or Giardia cysts are not permitted.

Isolation and identification of specific pathogenic microorganisms in water is a complicated and expensive task. As searches for pathogens in water are usually substituted by the assessment of some indicator microorganisms, so the monitoring and control of microbiological water contamination is an indirect process. As it is generally considered that microbiological contamination occurs mostly by faecal waste water, the small group of non-pathogenic organisms as indicators of faecal excretion of humans and animals has been selected. These microorganisms could be isolated and identified with relative ease. They have similar (to pathogens) origin and viability, presented in water in much higher (than pathogens) quantities, and they can serve as a sufficiently reliable indicator of faecal water contamination. Despite certain shortcomings of the indirect method of assessment of contamination of water (31), this approach is applied everywhere in Russia.

Coli bacteria are able to survive in water for several weeks and are easily identified – in Russia they are the main indicators. Sulphite-reducing Clostridia (and particularly their spores) in water can exist infinitely—it is very tolerable to environmental factors. The presence of clostridia spores in water indicates long-standing faecal pollution; this agent is particularly useful when testing open water, as it gives an indication of the presence of microorganisms resistant to disinfectants (32). Giardia cysts are indicators of protozoa organisms in water, Coliphages – of enteroviruses (human enteric viruses). Depending on the time of travel between source and recipient, the relative number of *Cryptosporidium hominis* oocysts rapidly increases, particularly in warmer (summertime) waters. Hence, *Giardia lamblia* may not be the best index for the presence of other parasitic protozoa, but certainly worthwhile measuring, and as both *Giardia* and *Cryptosporidium* spp. are generally assayed together (33). Thus, if the presence of indicator organisms in water has been revealed, it is necessary to assume the presence of pathogenic agents also.

Measurement of biological and chemical contaminants in drinking water

Biological contaminants

The collection of data from "Social–Hygienic Monitoring" Federal Automatic system is estimated at about 378,000 analyzed water samples for biological contaminants from all selected regions during 2007–2011. This database has enabled us to evaluate selected biological contaminants which are monitored in the regions. Total numbers of water samples analyzed in selected regions were very different and varied from 360 to 10,000 analyses averaged per year; being adjusted to the population number of each region (per 10,000 population) to make the results more comparable – from 30 to 122 per 10,000/year with the exception of Chukotka (294 per 10,000/year), which shows the highest sampling frequency, and Khabarovsk kraj (6.7 per 10,000/year), which has the most poorly performing food contaminants laboratory monitoring of all the regions.

Chemical pollutants

In contrast to the biological water contaminants data array, the "Social–Hygienic Monitoring", the Federal Automatic system does not possess data on the number of samples analyzed for chemical pollutants (totally or with regard to specific pollutants) in the regions. However, information on concentrations of selected water pollutants that do not comply with hygienic norms is available. This database has enabled us to evaluate 2006–2011 selected chemical pollutants that are monitored by the regions.

Table I. Water consumption in selected regions (centralized water sources) in L/person/day

	Years	L/person/day
Russian Federation	2000–09	237.3
Murmansk Oblast	nd	nd
Karelia Republic	nd	nd
Arkhangelsk Oblast	2004–08	239.7
Nenets AO	2006–10	167.9
Komi Republic	2000–09	237.5
Yamalo-Nenets AO	2000–09	276.7
Khanty-Mansi AO	2008–09	260.3
Taymyr AO	nd	nd
Evenki AO	nd	nd
Yakutia Republic	2003–10	124.7
Magadan Oblast	2000–08	340
Koryak AO	nd	nd
Chukotka AO	2011	125.0*
Kamchatka kraj	2000–08	303.6
Sakhalin Oblast	nd	nd
Khabarovsk kraj	2006–10	287.7
Primorsky kraj	2006–10	224.1
Amur Oblast	2002–10	177

Sources: Regional Statistical Yearbooks (34,35).
*From the State report "On sanitary-epidemiological situation in Chukotka AO, 2011" (36). nd, no data.

A total of 56 chemical pollutants were analyzed in water samples from centralized water supply systems in all selected regions during the period specified, namely mercury, lead, selenium, ammonia and ammonium ion, strontium, sulphates, sulphides and hydrogen sulphide, carbon tetrachloride, trichloromethane, barium, formaldehyde, fluorine 1–2, fluorine 3, chlorine, chlorides, chromium (+3), chromium (+6), cyanide, zinc, ethylbenzole, benzol, beryllium, boron, 2,4-D, HCH, HCB, phenol, aluminium, aluminium chloride hydroxide, iron, ferric chloride, iodine, cadmium, potassium silicate, calcium phosphate, cobalt, silicon, lithium, magnesium, manganese, copper, methane acid, methanol, methylbenzene, molybdenum, arsenic, sodium, oil, sulphur oil, nickel, nitrates, nitrites, nitrobenzene, polyacrylamide, polyphosphates, tetrachlorethylene and trichloroethylene.

Results

Data on annual per capita water consumption from centralized water sources are available for a majority of the regions, see Table I (data collected from 34,35). In the selected regions, water consumption fluctuates from 125 to 340 L/person/day, which can be compared with the Russian average consumption of 237 L/person/day. The highest values were reported from Magadan Oblast, Kamchatka, Khabarovsk kraj and Yamalo-Nenets AO,

Table II. Chemical and biological contamination of water reservoirs of Categories I and II, percentage of water samples that do not comply with hygienic norms

		Category I		Category II	
	Years	Chemical	Biological	Chemical	Biological
Russian Federation	2002–10	27.5	21.9	26.4	23.4
Murmansk Oblast	2007–09	32.5	2	37.3	8.5
Karelia Republic	2003–11	26.8	13.5	38.2	26.7
Arkhangelsk Oblast	2007–11	59.3	31.5	39.7	51.3
Nenets AO	2009–11	59.2	30	48.6	23.7
Komi Republic	2002–11	40	8.3	16	21.6
Yamalo-Nenets AO	2007–11	54.9	22.2	46.3	12.4
Khanty-Mansi AO	2006–11	80.2	21.4	nd	25.9
Taymyr AO	2006–08	3.8	2.0	nd	nd
Evenki AO	2006–08	13.9	38.1	nd	nd
Yakutia Republic	2002–11	39.9	26.4	33.5	34.6
Magadan Oblast	2006–10	37.7	9.3	nd	nd
Koryak AO	nd	nd	nd	nd	nd
Chukotka AO	nd	nd	nd	nd	nd
Kamchatka kraj	2007–11	10.2	8.2	6.5	28.9
Sakhalin Oblast	2001–11	15.3	9.9	21.1	23.9
Khabarovsk kraj	2005–11	15.2	43.1	9.5	60.9
Primorsky kraj	nd	nd	nd	nd	nd
Amur Oblast	2003–11	21.3	26.6	32.6	37.6

Sources: Regional State reports "On sanitary-epidemiological situation" (36,37) and (5). nd, no data.

and the lowest from Nenents AO, and predominantly (less than 125 L) from Chukotka and Yakutia.

Chemical and biological contamination of water reservoirs of Categories I and II are presented in Table II (data collected from 36, 37). In general, both categories of water reservoirs are contaminated to a similar extent with regard to all types of pollutants. In some regions, the extent of contamination of drinking water sources (Category I) could be higher than that of recreational waters (Category II). This is also true for Russia, as a whole, where 22–27% of samples from all water objects are contaminated.

The worst water quality regarding both sanitary–chemical and biological contamination concerning both categories of water objects was reported from Arkhangelsk Oblast, Nenets AO. These indices are about twice as high as the Russian average. In addition, high levels of chemical contamination of Category 1 water reservoirs could be seen in Khanty-Mancy AO (80%), Yamalo-Nenets AO (54.9%), Komi Republic (40.0%), Yakitia Republic (39.9%) and Magadan Oblast (37.7%); high levels of chemical contamination of Category II water reservoirs are found in Murmansk Oblast (37%), Karelia (38%) and Yamalo-Nenets AO (46%). Biological contamination of both categories of water objects is generally substantially lower than chemical contamination, and especially lower compared to average Russian levels. Here, the "leaders" of Category 1 reservoirs are Khabarovsk kraj (43%), Evenki AO (38.1%) and the "worst pair," Arkhangelsk Oblast (31.5%) and Nenets AO (30.0%), and in the case of Category 1I reservoirs, Khabarovsk kraj (61%), Arkhangelsk Oblast (51%), Yakutia (35%) and Amur Oblast (38%).

Chemical and biological contamination of water sources (centralized, divided into underground and surface, and non-centralized) is presented in Table III (data collected from 36, 37).

Though centralized water sources (both underground and surface sources) are highly contaminated by chemicals throughout Russia (25–28%), contamination is even higher (40–80%) in Arkhangelsk Oblast, Komi Republic, Yamalo-Nenets AO, Khanty-Mancy AO and Evenki AO. Similarly, biological contamination is much higher than the national average (up to 55%, as compared to 5–18%) in Arkhangelsk Oblast, Yamalo-Nenets AO, Khanty-Mancy AO, Evenki AO, Yakutia and Khabarovsk kraj. Biological contamination of centralized water sources is mostly represented by surface waters. Underground water

Table III. Chemical and biological contamination of water sources (centralized – underground, surface, and non-centralized), percentage of water samples that do not comply with hygienic norms

		Water sources							
		Centralized		Underground		Surface		Non-centralized	
	Years	Chemical	Biological	Chemical	Biological	Chemical	Biological	Chemical	Biological
Russian Federation	2005–10	28	6.5	28.4	4.9	25.4	18.3	27.4	23.9
Murmansk Oblast	2002–11	27	1.6	35.8	0.5	28.9	1.8	20	7.4
Karelia Republic	2005–11	25.2	8.8	34.9	5.6	15.9	5	26.7	34
Arkhangelsk Oblast	2002–11	51	19	nd	nd	73.5	35.4	43.5	48.1
Nenets AO	2005–11	24.7	6.2	nd	nd	nd	nd	37	14.7
Komi Republic	2002–11	42.5	2.9	54.4	1.9	48.2	6.8	45.1	34.4
Yamalo-Nenets AO	2005–11	57.2	nd	64.3	1.9	61.9	27.5	nd	nd
Khanty-Mansi AO	2005–11	79.1	nd	76.2	1.2	79.5	4.8	nd	nd
Taymyr AO	2006–11	25.9	5.1	nd	nd	nd	nd	54.2	4.6
Evenki AO	2007–11	40.7	54.5	nd	nd	nd	nd	25.8	31.9
Yakutia Republic	2002–11	17.6	11.9	15.4	17.8	25.5	19.7	37.3	27.8
Magadan Oblast	2002–11	24.1	5.1	19	2.6	nd	nd	11.1	13.6
Koryak AO	nd	nd	nd	nd	nd	nd	nd	nd	nd
Chukotka AO	2005–11	33	5.5	13.4	1.8	48.8	11.9	90*	10.3
Kamchatka kraj	2008–11	nd	nd	3.9	2.6	8.4	6.5	8.8	8.6
Sakhalin Oblast	2001–11	24.6	6.1	nd	nd	19.2	7.1	14.5	23.6
Khabarovsk kraj	2007–11	nd	12.6	25.7	7	15.2	43	28.1	24.3
Primorsky kraj	nd	nd	10.7	nd	nd	nd	nd	nd	nd
Amur Oblast	2004–11	24.1	7.1	19.9	3.2	11.1	0.2	26.9	25.4

Source: Regional State reports "On sanitary-epidemiological situation" (36,37). nd, no data.
*Data available for 2011 only.

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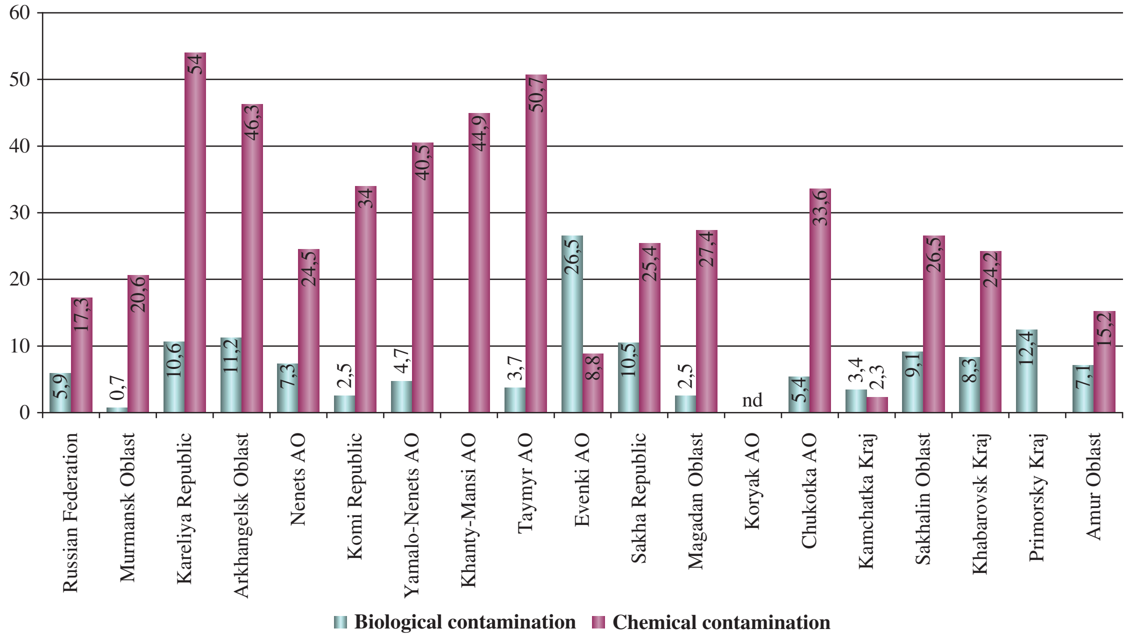

Fig. 1. Chemical and biological contamination of drinking water (running water), percentage of water samples the do not comply with hygienic norms. Data from (36,37).

sources show relatively low levels of biological contamination, while chemical contamination of both sources is relatively similar, a situation that could be caused by additional water contamination during water treatment and transport through pipelines. Non-centralized water sources are highly polluted in Arkhangelsk Oblast and Komi republic (35–48% – both chemical and biological), Nenets AO, Taymir AO, Yakutia and Chukotka (37–90% – chemical), and Evenki AO (biological – 32%).

Chemical and biological contamination of drinking water (tap water) is presented in Fig. 1. Very high levels of chemical contamination of drinking water (up to 51%) are obvious in many regions, mainly in the north-western part of the Russian Arctic (from Karelia to Taymir). Biological contamination is much lower (2.5–12%) everywhere else, with the exception of Evenki AO (27%).

Biological contaminants in water

The total distribution of these biological contaminants is presented in Fig. 2. A total of 87.5% of water samples (Fig. 2) have been analyzed for 7 contaminants – general and thermotolerant Coliform bacteria (74%), Coliphages (7%), sulphite-reducing Clostridia spores (3.3%), Giardia cysts (1.6%), Rotavirus (0.5%) and other pathogens (1.5%).

Table IV presents the number of water samples analyzed for all biological contaminants and separately, for 7 main contaminants in each selected region, on average during the specified period, and percentage of samples that exceeded Russian hygienic thresholds.

With regard to the 7 main contaminants in water samples (Table IV), general and thermotolerant Coliform bacteria and Coliphages were assessed for all selected regions. Clostridia spores have been analyzed in all regions except Magadan Oblast, Khabarovsk kraj and Amur Oblast. Giardia cysts and pathogenic bacteria are not monitored in Nenets AO and Magadan Oblast. In Komi republic, pathogenic bacteria and Rotavirus have not been analyzed. It is important to emphasize that Rotavirus is being monitored in only half of the regions studied.

As for the percentage of samples that do not comply with hygienic norms (Table IV), general and thermotolerant Coliform bacteria predominate in all regions

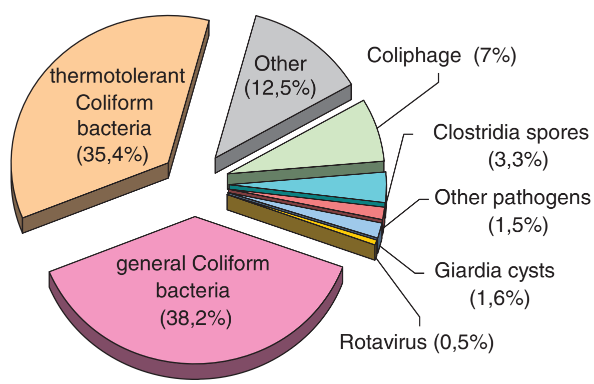

Fig. 2. Distribution of biological contaminants in all water samples from all selected regions (2007–11), percentage of total number of samples analyzed.

Table IV. Number of drinking water samples analyzed for all biological agents and specific contaminants in selected regions, on average, during specified periods, number of samples and percentage of samples where biological agents have been detected

		All biological contaminants		Total Coliform bacteria		Thermo tolerant Coliform		Coliphage		Clostridia spores	
	Years	*n* per 10,000 population	*n*	*n*	%	*n*	%	*n*	%	*n*	%
Murmansk Oblast	2007–11	104.6	8,676	3,343	1.3	3,328	1.2	749	2.3	84	0
Karelia Republic	2007–11	55.5	3,740	1,468	8	1,425	4.2	285	2.4	88	0
Arkhangelsk Oblast	2007–11	54	6,758	1,984	7.8	1,952	5.1	863	2.7	404	0.1
Nenets AO	2010–11	86.5	364	75	2.3	75	1	109	0	105	0
Komi Republic	2007–11	107.1	10,085	3,266	1.5	2,978	1	687	0.03	352	0.2
Yamalo-Nenets AO	2007–11	122.3	6,594	2,646	4.9	2,653	3.2	95	0.3	412	0
Khanty-Mansi AO	2007–11	75.1	11,458	4,745	2	4,944	1.1	539	0.6	246	0.1
Taymyr AO	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Evenki AO	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Yakutia Republic	2007–11	92.8	8,838	2,861	8.2	2,238	5.5	463	0.2	471	0.04
Magadan Oblast	2007–11	59.4	960	417	1.3	344	0.9	115	0.4	ns	ns
Koryak AO	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Chukotka AO	2008–11	293.9	1,467	620	3.7	596	2.2	61	1.2	31	0.8
Kamchatka kraj	2007–11	114.9	3,899	1,890	3.4	1,772	2.3	100	0.4	14	0
Sakhalin Oblast	2007–11	108.2	5,515	2,221	9	1,751	6.4	471	0.8	366	0
Khabarovsk kraj	2007–11	6.7	928	317	3.2	260	1.5	203	0.2	ns	ns
Primorsky kraj	2007–11	29.7	5,883	2,709	17.5	2,356	12.1	685	2.7	1	0
Amur Oblast	2007–11	29.9	2,556	1,086	3.7	869	3.7	36	0	ns	ns

		Giardia cysts		Pathogenic bacteria		Rotavirus		Other biological	
		n	%	*n*	%	*n*	%	*n*	%
Murmansk Oblast	2007–11	316	0	12	0	ns	ns	844	0
Kareliya Republic	2007–11	48	0.4	45	0	128	1.6	253	0.9
Arkhangelsk Oblast	2007–11	295	0.1	163	0	2	0	1,095	0.7
Nenets AO	2010–11	ns	ns	ns	ns	ns	ns	ns	ns
Komi Republic	2007–11	65	0	ns	ns	ns	ns	2,736	0.1
Yamalo-Nenets AO	2007–11	56	0	148	0	101	31.2	482	3.1
Khanty-Mansi AO	2007–11	26	0	24	0	26	0	908	0.9
Taymyr AO	nd	nd	nd	nd	nd	nd	nd	nd	nd
Evenki AO	nd	nd	nd	nd	nd	nd	nd	nd	nd
Yakutia Republic	2007–11	192	0	388	0.1	ns	ns	2,224	2
Magadan Oblast	2007–11	ns	ns	ns	ns	67	0	17	0
Koryak AO	nd	nd	nd	nd	nd	nd	nd	nd	nd
Chukotka AO	2008–11	10	0	10	0	ns	ns	139	0.9
Kamchatka kraj	2007–11	22	0	18	0	ns	ns	83	0
Sakhalin Oblast	2007–11	60	0	69	0	2	0	575	0.8
Khabarovsk kraj	2007–11	71	0	14	0	ns	ns	65	0
Primorsky kraj	2007–11	89	0	15	0	27	2.8	ns	ns
Amur Oblast	2007–11	12	0	240	0	12	8.3	301	3.9

Source: "Social-hygienic monitoring" system.
n, average number of samples per year; nd, no data; ns, no samples analyzed; %, of samples where biological agents have been detected.

(from 1 to 17.5%, with Primorsky kraj showing the highest values). The presence of Coliphages was not high in any region (0.2–2.7%). The presence of Clostridia spores, Giardia cysts and pathogenic bacteria did not exceed 0.8% (Clostridia in Chukotka) and was almost near zero. Rotavirus has been detected in water samples in 4 regions with the highest value of 31% in Yamalo-Nenets AO. We must remember that according to hygienic norms, the presence in drinking water of any of the biological agents listed above is not permitted. According to sanitary rules and norms (22), the "necessity of water analysis for pathogenic enteric bacteria or enteroviruses is determined by epidemiologic indications, and should be prescribed by a Sanitary Inspection Center."

Chemical contaminants in water

A total of 56 chemical pollutants (during specified period) have been analyzed in water samples from centralized water supply systems (from all selected regions). Among them the excess of hygienic limits were set on 32 chemical pollutants; 9 of them (main pollutants which concentrations over hygienic limits in water samples were recorded most frequently) are presented in Table V.

All 9 pollutants were assessed in all selected regions (Table V) with the exception of manganese, aluminium and chlorine in Nenets AO and Taymir AO. The results for these 2 regions look very strange as no excess of hygienic limits of the pollutants in water samples has been detected except for a slight rise of iron in Nenets AO. In other words, it would seem that data presented here are untrustworthy. Additionally, chlorine has not been analyzed in Yamalo-Nenets AO and Primorsky kraj, and sulphates in Murmansk Oblast.

As for the percentage of samples that exceeded the Russian hygienic threshold (Table V), iron dominated in all regions (from 2–3% in Kamchatka and Magadan Oblast to 55% in Khanty-Mancy AO). Excesses of manganese significantly fluctuate (from 0.3–0.5% in Kamchatka and Yakutia to 45% in Khanty-Mancy AO). Aluminum is high (16–43%) in Murmansk Oblast, Arkhangelsk Oblast and Komi Republic, and chlorine – in Yakutia and Arkhangelsk Oblast (22 and 57%, respectively). Excesses of other pollutants in different regions are episodic, and are generally not high, with the exception of Khanty-Mancy AO and Chukotka, 2 regions that break the records among the selected regions with respect to 4 pollutants: sulphates (6 and 12%, respectively), nitrates (6 and 15%), nitrites (5 and 19%), ammonia (24 and 19%). Obviously, local inspection of water chemical pollutants in these 2 regions function really efficiently, and local hygienic statistics work properly.

Other pollutants (among the 32 registered with excesses) have been analyzed in few regions by sporadic sampling (number of samples unknown). The list below shows examples of the highest percentages of samples that do not comply with hygienic thresholds:

a. Mercury in Chukotka in 2010 (38%)
b. Cadmium in Khanty-Mansi AO in 2007 (96%)
c. Strontium in Arkhangelsk Oblast in 2006 (57%)
d. Fluorine in Yamalo-Nenets AO in 2007 (46%)
e. Boron in Khanty-Mansi AO in 2007 (100%)
f. Nickel in Murmansk Oblast in 2007 (21%),
g. Calcium phosphate in Chukotka in 2006 (38%)

Table V. Main chemical water pollutants in samples from centralized water supply systems in selected regions, percentage of samples that do not comply with hygienic norms (averaged for specified periods)

	Years	Fe	Mn	Al	Cl	Chlorides	Sulphates	Nitrates	Nitrites	Ammonia
Murmansk Oblast	2006–11	24.2	4.6	16.2	5.2	3.6	ns	2.2	2.1	0.2
Karelia Republic	2006–11	30.4	8.8	1.3	2.1	0	0	0	0	1
Arkhangelsk Oblast	2006–11	28.9	4	43.2	57.1	0	0.9	0.5	0	0.9
Nenets AO	2006–11	3.3	ns	ns	ns	0	0	0	0	0
Komi Republic	2006–11	36.9	19.4	18.4	2.6	0.5	0.9	0.5	0.6	6.2
Yamalo-Nenets AO	2006–11	36.9	20.8	0	ns	5.9	0	0	0	1.1
Khanty-Mansi AO	2006–11	54.8	45.1	0.1	0.1	6.5	5.9	5.6	4.8	24.1
Taymyr AO	2006–11	0	ns	ns	ns	0	0	0	0	0
Evenki AO	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Yakutia Republic	2006–11	12.6	0.3	0	22.2	4.6	1.2	0	6.7	8.2
Magadan Oblast	2006–11	2.7	9.7	nd	0	0	0	0	0	3.7
Koryak AO	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Chukotka AO	2006–11	27.7	10.4	0	0	0.7	11.6	14.8	18.8	18.8
Kamchatka kraj	2006–11	1.7	0.5	0	0	6.4	2.7	1	0	0
Sakhalin Oblast	2006–11	13.4	9.7	0	7.2	0	0	0	0	1.2
Khabarovsk kraj	2006–11	26.6	8.9	0	nd	0	0.7	1.6	0	0.1
Primorsky kraj	2006–11	18.3	4.5	0.4	ns	0	0	0	0	0.4
Amur Oblast	2006–11	13.1	10.3	9.1	0	0	0	6	6.4	6.4

Source: "Social-hygienic monitoring" system.
nd, no data; ns, no samples analyzed.

h. Silicon in Yamalo-Nenets AO in 2007–2008 (97 and 78%), in Khanty-Mansi AO in 2007 (100%), Yakutia Republic in 2008 (100%)
i. Magnesium in Yakutia Republic in 2007–2010 (34, 15, 47 and 34%, respectively)
j. Copper in Yamalo-Nenets AO in 2011 (23%), in Chukotka in 2006 (14%)
k. Tetrachloromethane and trichloromethane in Kareliya Republic in 2009 (39%), in Komi Republic in 2008 (25%)
l. Sodium in Yakutia Republic in 2008 (100%)

Extremely high percentages of water samples analyzed for some toxic pollutants (which exceeded hygienic thresholds) have been observed in several regions.

In addition, it is important to emphasize that 3 pesticides (DDT, HCH and 2,4-D) must be regularly monitored in drinking water according to sanitary rules and norms (22). However, no analysis regarding DDT was carried out in the selected regions during the whole period of observation, while analyses results were below threshold limits on 2,4-D in 4 Far Eastern regions (Primorsky kraj, Amur Oblast, Sakhalin and Khabarovsky kraj), on HCH – in the latter regions and additionally, in Arkhangelsk Oblast, Komi Republic, Khanty-Mancy AO and Yakutia.

It is also important to note that in this article, we do not assess waterborne diseases which have surface contact origin such as showering, using humidifiers or toilet flushing (e.g. *Legionella pneumophila* and nontuberculous mycobacteria) (38). These environmental pathogens in Russia are not current in the assessment because no cases of *Legionella pneumophila* or nontuberculous mycobacteria have ever been detected in the studied Russian regions.

Conclusions

This study, which is based on official statistical data, confirms the poor state of water quality in 18 selected regions of the Russian Arctic, Siberia and Far East for the period 2000–2011. Chemical and biological contamination of water reservoirs of Categories I and II, of water sources (centralized – underground and surface, and non-centralized) and of drinking water in all selected regions is high, and in the majority of regions, very high. In some regions, the extent of contamination of drinking water sources could even be higher than levels found in recreational waters.

In conclusion, our data serve as a good illustration of the alarming water security situation in Russia, where the federal law on "Drinking water and drinking water supply" has still not been approved and a fortiori enforced. Even though the federal Target Program "Clean water" for the period 2011–2017 has been adopted by the Government, regional target programmes aimed at providing high-quality drinking water are "insufficient" or "not approved" in some regions. A full-scale reform of the Russian water industry and water security system is urgently needed.

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NEW AMERICA MEDIA | Environment

Behind Russia vs. Greenpeace Furor, Unreported Oil Pollution of the Arctic

Inside Climate News [URL: http://insideclimatenews.org/print/28486?page=show], News Report, Zahra Hirji, Posted: Oct 20, 2013

An environmental organization with a $350 million war chest, a giant protest vessel, 28 activists and a rubber raft have succeeded in drawing Russian President Vladimir V. Putin [3] into a very public global dispute.

Attention is now focused on the Greenpeace [URL: http://www.greenpeace.org/international/en/] [4] activists—who were arrested last month by Coast Guard agents for trying to hang a protest banner on an Arctic Ocean oil platform—and whether they will languish in prison for up to 15 years each on dubious piracy charges.

"They are obviously not pirates," Putin said in a speech [URL: http://eng.kremlin.ru/transcripts/6032] [5] to the International Arctic Forum last month. Yet Russian authorities so far seem to be throwing the book at the activists as international outrage grows to secure their freedom. Protests have been held at Russian consulates in about a half dozen cities worldwide to release the activists.

While the unfolding drama is now focused on issues of civil disobedience and human rights, underneath the uproar is a tangle of issues around Arctic drilling that Greenpeace has been campaigning to address for many years. And now it has secured the world's attention and a chance to spark a discussion—and the stakes are high.

Earlier this year in a report called Point of No Return [URL: http://www.greenpeace.org/australia/PageFiles/480942/Point_Of_No_Return.pdf] [6], the confrontational organization identified oil drilling in Arctic waters as one of the biggest climate threats being ignored by the world's governments.

"Oil companies plan to take advantage of melting sea ice ... to produce up to 8 million barrels a day of oil and gas," Greenpeace said in the report. "The drilling would add 520 million tons of CO_2 a year to global emissions by 2020."

That Greenpeace would target Russia's Prirazlomnoye oil platform [URL: http://www.gazprom.com/about/production/projects/deposits/pnm/] [7]—which this fall is expected be the world's first offshore Arctic well—should not come as a surprise. And it is equally unsurprising that Russia, currently the world's biggest oil producer, would react so sharply to protect its oil interests and the flagship project of its multibillion-dollar quest to drill, especially as the United States is overtaking Russia as the No. 1 energy producer.

"This is probably the strongest reaction we've gotten from a government since the French government blew up one of our ships [in 1985 in an anti-nuclear protest]," said Philip Radford, executive director of Greenpeace USA.

Hidden from view so far, however, has been the environmental damage the Arctic is already suffering at the hands of the Russian oil industry, a degradation that would likely get worse if the oil boom there continues without better regulation, according to Greenpeace and other Russian environmentalists and scientists.

Every year, according to Greenpeace [URL: http://www.greenpeace.org/international/en/campaigns/climate-change/arctic-impacts/The-dangers-of-Arctic-oil/Black-ice--Russian-oil-spill-disaster/][8], about 30 million barrels of oil products leak from wells and pipelines in Russia. An estimated four million barrels of that, roughly the size of BP's Gulf of Mexico spill, flows straight into the Arctic Ocean through tributaries.

The precise impact of these spills on the fragile Arctic environment and its people is unknown but is likely substantial, Greenpeace says. For them the leaks—and the alleged lack of adequate means to deal with them—are an example of an inadequate safety culture in the country's oil industry. And they're causing deep concern about Russia's aggressive push to start drilling for oil in open Arctic waters.

"Russia will not be ready for effective monitoring, supervising and working in the Arctic Ocean," said Vladimir Chuprov [9], a Russian citizen and the head of energy for Greenpeace Russia in Moscow, the country's main energy industry watchdog. Chuprov has been monitoring oil spills for the past decade.

Poor Record

While Russia produces 12 percent of the world's oil, it is responsible for roughly half the world's oil spills [URL: http://en.ria.ru/russia/20121211/178065224.html] [10], according to Greenpeace Russia figures. Broken down, the numbers reveal that some 30 million barrels of petroleum leak from 20,000 inland spills each year.

Official government records paint a different picture. Russian environmental officials say there are only hundreds of inland spills a year. Among other omissions, however, those figures don't include spills that dump less than 56 barrels, because companies a[…] report those incidents.

The two Russian oil companies that already received government approval to drill the Arctic have notorious records for oil accidents and spills.

The Prirazlomnoye platform in the Arctic's Pechora Sea that Greenpeace targeted is owned and operated by Gazprom Neft Shelf LLC [11], a subsidiary of the state-run energy giant OAO Gazprom [12]. Gazprom Neft was responsible for the country's worst offshore oil disaster [13] in December 2011, when a floating rig sank in the Sea of Okhotsk, killing 53 workers. According to the company's 2012 sustainability report [14], the company reported 2,626 pipeline ruptures that year and 3,257 ruptures in 2011.

Gazprom has landed several other licenses to build exploratory drilling wells and platforms in a half dozen other Russian Arctic seas.

Rosneft [15], another major state-run oil company and the country's biggest oil producer, has also secured licenses and is expected to begin drilling its first well in early 2014 [16].

Last year, Rosneft was named Russia’s worst environmental polluter by the regional paper Bellona after a government report found that the company had 2,727 reported spills in 2011 in a single northwestern province.

In an interview with InsideClimate News, Vladimir Antoshchenko [17], a Gazprom Neft Shelf spokesperson, said the Prirazlomnoye project was "based on strict demands on environmental and industrial safety." He said the rig has Arctic-specific ice-crushing machines to blast floating icebergs and special boats to safely navigate the icy waters.

Alexey Knizhnikov [18], an environmental policy officer based in the Moscow office of the World Wildlife Fund, said he "has not seen any effective technology to combat an oil spill in ice conditions."

Either way, environmentalists and other critics of Russia's Arctic energy plans say there are deeper reasons why the country's oil industry isn't ready for Arctic drilling.

It wasn't until the early 1990s, after the collapse of the Soviet Union, that substantial environmental regulations for energy companies were introduced in Russia. The end of Communism brought the establishment of environmental advocacy in the country, which, among other factors, led to the roll out of more and better rules, such as financial penalties for oil spills, but they're not enough.

For decades the government has been harshly criticized for concealing petroleum spills from the public and the media, levying meager fines that hardly discourage violators, and for failing to require companies to have adequate emergency response plans and spill response tools, among other criticisms.

Valentina Semyashkina [19], former chair of the Save the Pechora Committee, an environmental organization that works in the Arctic Komi Republic told InsideClimate News that "concealment of accidental oil spills" by energy companies is a regular occurrence. So is the government’s "turning a blind eye," she said.

The Komi Republic, a province the size of Germany with a largely indigenous population, has been on the frontlines of Russia's oil rush for years. Accidents have been prevalent, including a vast spill of as much as 2 million barrels from a corroded pipeline in 1994. The incident was first made public by a U.S. Department of Energy official who revealed the spill [20] to the New York Times, prompting accusations of a Russian government cover-up.

"The power is always on the side of big businesses and never on the side of the citizens," Semyashkina said.

She pointed to a recent oil spill in the Komi Republic. In late May this year, a local Komi resident on his way to work spotted a big blob of black gooey oil in the area's Kolva River from a pipeline that tore apart in the early winter months. The pipeline's operator, the Russian- and Vietnamese-owned company Rusvietpetro [21], had detected the rupture in November but nothing happened.

More than a dozen community members ran the cleanup, shoveling oil into barrels and putting them on the shore before the government emergency response officials arrived and took over about a week later. By late June, Rusvietpetro had repaired the line, which it said broke due to a drop in pressure in the line. The government response ended on July 25, after 3,500 barrels of oil spilled out.

A resident helps clean up the Kolva River oil spill/Credit: Greenpeace

The oil is still threatening the fish and cows that the local indigenous Komi people depend on to earn their living, according to Semyashkina. And several residents are still cleaning up the mess without compensation.

Rusvietpetro didn't respond to requests for comment.

Local authorities say some of the oil and oil products have reached the Pechora River, a tributary of the Arctic Ocean, as is typical following spills in the Russian tundra, the country's biggest oil-producing area, Greenpeace's Chuprov said.

Arctic Challenges

About 13 percent of the planet's undiscovered oil and 30 percent of its natural gas lie under Arctic land and water, most of it offshore, according to projections.

One-third of that oil and more than half of the gas is buried on and off Russia's coastline. And for the first time, the trove of energy is accessible to drilling, a result of both global warming—which has turned the northern ice cap into mush in the summer months—and advanced drilling technology.

Drilling for oil and gas in the Arctic Ocean poses new and difficult challenges for industry, and this is particularly worrying for conservation advocates who oppose Russia's advance into the Arctic.

"We saw how hard it was to respond to the serious offshore drilling incident in the Gulf of Mexico with the Deepwater Horizon spill," said Doug Norlen [22], director for Pacific Environment, an advocacy and research organization that supports a moratorium on Arctic drilling. Now imagine a spill in the Arctic, where "you are dealing with places that are far away from response capabilities. ... It's a recipe for a disaster."

Although drilling conditions vary across the ocean's 5.4 million square miles, the risk of a blowout and a catastrophic spill are threatening all over. Fast-developing storms can wield hurricane-force winds. Icebergs up to a mile in length drift across its choppy currents. Water temperatures typically hover well below zero. If an accident were to occur in countries lacking emergency response infrastructure along their Arctic coastlines—as in Russia—it could take emergency response crews several hours to arrive at the site under the best conditions and perhaps days.

Marilyn Heiman [23], director of the U.S. Arctic program at the Pew Charitable Trusts, said that to respond to spills immediately all countries bordering icy Arctic waters would need emergency response centers that are located within a few hundred miles of a drilling site. These centers would have to be manned by response workers 24 hours a day, because once oil enters the sea, the dark slime can be carried to distant shorelines via strong ocean currents or sink to the depths of the ocean floor.

No country with icy waters has a center this close. In Alaska, the nearest Coast Guard response unit is around 1,000 miles from planned Arctic drilling locations. (It is unclear whether U.S. Arctic drilling regulations, to be released later this year, will require closer emergency centers at planned U.S. drilling sites.)

Knizhnikov of the environmental organization WWF said he's skeptical that adequate centers will be built in Russia. "It will be very difficult to become reality because [the centers are] very costly," he said. "It will take many, many years before they will be created, if they will be created."

Companies in Control

Still, on July 1, Russia passed stricter safety standards and pollution cleanup regulations for offshore drillers than it has in place for inland operations.

Russia now requires companies to have more and better equipment to collect spilled oil—such as booms and skims on hand at all times at drilling sites. The rules also require companies to react to spills faster. According to Russian law, drilling operators must respond to spills at sea within four hours of discovering them, whereas companies have six hours to respond to spills on land.

Most experts say the regulations are not sufficient to address serious concerns about a major spill in the Arctic, one of Earth's last pristine wilderness areas. For instance, regulations dictating the type of safety equipment and spill response operators must use are too general to be effective, many say.

Even those experts who say Russia's rules are adequate have their worries.

"The regulations are good," said Alexei Bambulyak [24], a Russian environment expert at the Norwegian environment research institution Akvaplan-niva. However, "whether they are followed or not is up to the [drilling] operators."

The five counries with major Arctic claims—Canada, Denmark, Iceland, Norway, Russia and the United States—are moving somewhat slower than Russia, either because of uncertain energy prospects or environmental security and safety concerns.

Norway is the exception, but it has the world's most stringent standards for offshore drilling safety and is drilling in warmer waters than Russia with less sea ice. In 2007, Norway's Statoil [25] became the first driller in the world to produce natural gas in Arctic waters.

According to Eric Haalan, a spokesperson for Statoil, Arctic drillers everywhere have "absolutely everything to lose" by working in the Arctic Ocean unprepared.

"Meaning, if we don't do it properly, we lose more than anyone else. And we have seen the consequences of accidents that have happened in the past, and what effect that has had on even large companies," he said.

Extreme Consequences

Greenpeace has a long history of taking a strong stand against Arctic drilling and other issues and accepting the consequences, according to Radford, the Greenpeace USA executive director.

"But the consequences by Russia are unbelievably extreme and illegal and unjust," he said.

Twenty-eight Greenpeace activists and two journalists from 18 countries are sitting in prison and facing charges of piracy, which carries a sentence of up to 15 years in prison. Two of the activists tried to scale the tower on the Gazprom Neft platform before the Russian Coast Guard fired 11 warning shots into the water near their raft and ordered them to come down. They descended before they were able to hang a banner and were immediately arrested. The Coast Guard waited a day before raiding the Arctic Sunrise protest ship, where the other activists were located.

This week Russia denied bail to the U.S. captain of a Greenpeace ship and another activist.

The harsh reaction reflects Russia's new urgency to tap its Arctic resource. Almost exactly one year ago, six Greenpeace protestors climbed the same Arctic platform and hung a banner, and the Coast Guard did nothing. In fact, oil company crew members reportedly gave them soup [URL: http://bigstory.ap.org/article/greenpeace-activists-storm-russian-oil-rig] [26].

Radford said he hopes people see that the arrested Greenpeace activists were acting for the benefit of the world.

"They were doing this to alert the world of the first ever offshore deep Arctic well drilling that could cause radical climate change and could cause a huge oil spill that the [Russian] Coast Guard thinks is their nightmare scenario," Radford said. "Now, that wasn't for private gain, that was for the benefit of all of us."

Comments

RUSSIA BEYOND THE HEADLINES

Saving Siberia's crown jewel: State program aims to clean up Lake Baikal

September 16, 2014 Gleb Fedorov, RBTH

The deepest lake in the world is going through hard times due to uncontrolled tourism and the illegal dumping of liquid waste, but the state is taking steps to address the problem.

The major industrial polluter of Lake Baikal is the Baikalsk Paper and Pulp Mill. Source: ITAR-TASS

Sweeping almost 400 miles in a great arc through the taiga forest of south-eastern Siberia, Lake Baikal is the world's oldest and deepest freshwater lake. Surrounded by pristine mountain scenery, thick forest and villages full of picturesque wooden cottages, the deep blue lake is a place of stunning beauty. As such, it is no surprise that the last few years have seen a huge increase in the numbers of tourists from Russia and all over the world, who come to fish, hike, camp and relax along the shores of the 'pearl of Siberia'.

The region's tourist industry is actively developing, and plans are well underway to open up more of the lake's shoreline to ecotourism. The Bolshaya Baikalskaya Tropa (Great Baikal Trail) environmental organization is currently building, with the help of volunteers from all over the world, a continuous hiking trail that will stretch all the way around the lake when completed.

Yet as Marina Rikhvanova, the co-chair of the Baikalskaya Ekologicheskaya Volna (Baikal Environmental Wave), told RBTH, projects of this kind are useful, but they cannot make a significant contribution to the preservation of the ecology of the lake itself.

And while the growth in tourism is undoubtedly good news for the region's economy, there are fears that it is placing a serious strain on undeveloped local sanitary infrastructure and contributing to water pollution. In fact, Baikal is facing a growing challenge to keep its famously pure waters clean.

Baikalsk Paper and Pulp Mill

The major industrial polluter of Lake Baikal is the Baikalsk Paper and Pulp Mill (PPM). It was built on the shore of the lake in the 1960s, and as the website of the Russian branch of Greenpeace notes, it was even outdated then.

The problem is that the production technology did not allow for the bleached pulp product, which happens to be the main product of the plant, without the intake of Baikal water. Until 2008, the PPM was taking in 200,000 cubic meters of clean water and releasing water that had been used during work back into the lake. When the plant was forced to move to a closed water cycle, production was unprofitable and was stopped.

Since PPM was a major employer in the town of Baikalsk, thousands of jobs were placed in jeopardy. The combine stood inoperational throughout 2009, until January 2010, when Russian President Vladimir Putin intervened in its fate and allowed work to resume using the same technology. Water and soil samples in 2011 and 2012 again showed a significant excess of chemical elements in the points of discharge, so the plant was still forced to close and repurpose.

Siberian lake that inspired James Cameron

Now the main problem for the PPM is the 6 million tons of toxic lignin sludge that has accumulated on the two test sites since the 1960s. Waste did not separate from the external environment, so the groundwater was poisoned.

One of the plant's sites is 300 meters from the lake shore. The risk to Lake Baikal's ecology is increased when the fact that that the mill is located in a seismic zone is taken into consideration. The disposal of waste produced by the paper mill is outlined in the state program for the coming years.

Growth in tourism contributing to wastewater discharges

The second cause of water pollution after the PPM is the uncontrolled discharge of liquid waste, the bulk of which is feces from the cesspools of private homes not equipped with a sewage system.

According to Co-Chair of the Irkutsk Baikal Environmental Wave regional public organization Marina Rikhvanova, tons of liquid waste is dumped into the lake illegally, because "since the Soviet era, the settlements around the lake have almost no sewage treatment plants."


Siberia attracts downshifters

"While earlier it was harmless, as the population around Lake Baikal was small, the problem has begun to grow due to the appearance of tourists and the construction of tourist facilities," said Rikhvanova.

There is one place, Chivyrkuisky Bay, where 160 tons of feces wash into the waters during the summer season. This has led to a massive expansion of unusual organisms in Baikal – the green algae Spirogyra and Elodea Canadian.

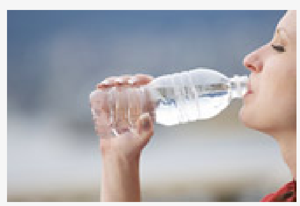
According to Rikhvanova, Baikal has very few treatment plants able to take on large volumes of liquid waste for treatment, so many of them simply dump waste into the lake or tributaries. This problem, she said, can be overcome if all projects announced in the federal program are able to be implemented.

As the site of the Environmental Monitoring of Lake Baikal website reports, even the lake's spa resorts are being polluted, as pathogenic bacteria has been found in the waste water.

State ecological project

However, there are now reasons to be optimistic about the future: Lake Baikal has now become a major state environmental project. In addition to an already-existing state law on the protection of Lake Baikal, in August 2012 the large-scale "Protection of Lake Baikal and the Socio-economic Development of the Baikal Nature Reserve for 2012-2020" state target program was adopted.

The projects that form part of this program will be funded by the state budget and include some encouraging points. For example, first of all, regulations will be developed to limit pollution levels in towns in the Baikal area and reassess all local sources of lake pollution.


Russia's battle with water pollution continues

Under the state program, the surrounding regions of Irkutsk, Buryatia and Zabaikalye will be allocated 634 million rubles ($16.5 million) in 2014 alone. Buryatia will use its 289 million allocated rubles ($7.5 million) to build a sewage treatment plant in Kyakhta, on the Mongolian border, a sewer conduit in the village of Petropavlovsk, and a solid waste landfill in the village of Zaigrayevo. In the Irkutsk region, repairs on the sewage treatment plant on the Angara River will be undertaken and a sewer plant will be built in Shelekhov, near Irkutsk.

Moreover, by 2020, there are plans to build six plants for industrial waste processing, which will help to rehabilitate about 80 percent of the contaminated areas. The results of environmental monitoring will be available on the website baikalake.ru.

After Probing Chemical Lake, Eco-Blogger Attacked in Russia

Written by Andrey Tselikov On 25 May 2013 @ 14:50 pm | 3 Comments

In Citizen Media, Eastern & Central Europe, Economics & Business, English, Environment, Feature, Health, Politics, RuNet Echo, Russia, Russian

Environmental protection has become a dangerous area of public activism in Russia—at least where industrial pollution is concerned. This is because eco-activists often directly oppose regional business interests, who sometimes react with force. A case in point: on May 9, 2013, unknown assailants attacked and severely beat an eco-blogger from the mid-sized industrial town of Pervouralsk (located 40 km from Yekaterinburg, in the Ural Mountains). The blogger, Stepan Chernogubov, claims that the assault was in retaliation for the publicity he is creating over a local chrome manufacturer dumping waste into the picturesque Chusovaya River (see archival photo below).


[1]

A cliff on the Chusovaya River. One of the color photographs made in 1912 by Prokudin-Gorsky [2]. Public domain. Wikimedia Commons.

On May 4, 2013, Chernogubov got a tip-off about an illegal waste dump making the river turn "bloody," and went to check it out and take photographs. What he found was a pipe leaking orange chemical sludge into a nearby pond, which overflowed into the river itself. Chernogubov described [3][ru] the experience on his LiveJournal blog:

> Ощущается стойкий химический запах, в носоглотке возникли болезненные ощущения. [...] А источник заполнения этого хим озера, как выяснилось, – сгнившая труба. Возможно её прорвало в праздники, но скорее всего она всегда была такой.
>
> I could feel a strong chemical smell, which created painful sensations in my nose and throat. [...] The source filling this chemical lake, as it turned out, was a rotten pipe. Perhaps it burst over the holidays, but likely it was always like this.


[3]

Orange chemicals flowing into a pond near Chusovaya from a burst pipe. Photograph from Chernogubov's blog.

Chernogubov's post was re-blogged [4] [ru] on Echo Moskvy by local economist Alexander Anikin. The factory in question, "Russian Chrome 1915 [5] [ru]," did not take lightly to such publicity. When Chernogubov returned to the dump site the next day (accompanied by a group of environmentalists from Yekaterinburg) to take chemical samples, they were met by private security guards who tried to prevent them from touching the water [6] [ru]:

[7]

Standoff between environmentalists collecting water samples and security guards. YouTube screenshot, May 23, 2013.

> Как и предполагали, они стали препятствовать сбору проб воды. [...] Впоследствии при попытке оказать на нас физическое воздействие, чтобы отобрать взятые пробы, люди, позиционирующие себя сотрудниками охраны завода "Русский Хром 1915" были остановлены моим предупреждением о возможном разливе собранных проб на их руки, лицо и тело.
>
> As we suspected, they were creating obstacles for taking water samples. [...] Later, after trying physically to force us to give up the collected samples, these people (who said they were security staff from the "Russian Chrome 1915" factory) finally backed off when I warned them that I might spill the sample on their hands, face, and body.

Local police next detained Chernogubov and his entourage after the head of the private security group reported them for "stealing" the water samples, but the authorities soon released everyone. In the same post [6] [ru], Chernogubov alleged that one of his fellow environmentalists was contacted by a local newspaper editor, who asked him not to raise the issue of "Russian Chrome" pollution, since it could harm the mayor of Pervouralsk, who apparently has ties to the factory. Here is how the factory itself describes [5][ru] what happened on May 5:

> [...] неустановленные лица в количестве 5 человек пытались проникнуть на территорию станции нейтрализации промышленных стоков ЗАО «Русский хром 1915». При себе имели бутыли, наполненные неизвестной жидкостью.
>
> [...] unknown parties, numbering 5 people, tried to gain access to the territory of the industrial wastewater neutralization station of "Russian Chrome 1915." They had with them bottles filled with an unknown liquid.

Chernogubov's troubles did not end with this, however. On May 9, a few days after he caused the stir and reported the incident of pollution to the local police [8] [ru], Chernogubov noticed on a stroll with his wife that at least four men had him under surveillance. (Oddly, he identifies one as an operative from the local chapter of "City Without Drugs," Evgeniy Roizman's anti-drug advocacy group based in Yekaterinburg.) Chernogubov approached one of these men, and asked why they were following him. What happened next [9] [ru] is chilling:

> В ответ он нанёс мне удар в лицо, затем появились ещё двое, которые подбежав заломали мне руки. В это время первый, [...] начал наносить целенаправленные удары мне в голову. Когда я вырвался и нанёс ему удар, меня повалили и стали бить ногами те двое, которые держали мне руки. [...] На очередную попытку встать один из нападавших достал пистолет и ударил мне рукоятью в голову. Я временно потерял сознание. [...] По итогу я имею разбитую голову, зашитую двумя швами и выбитые верхние передние зубы.
>
> In response, he hit me in the face, then two more ran up and twisted my arms behind my back. At the same time, the first one [...] started delivering direct blows to my head. When I managed to evade their grasp and hit him, the two that were holding me forced me to the ground and started kicking me. [...] When I tried to get up again, one of the assailants took out a gun and hit me in the head with the grip. I briefly lost consciousness. [...] As a result I have a busted head, with two stitches, and my upper front teeth are knocked out.

[10]

Chernogubov in the hospital, post assault. YouTube screenshot.
May 23, 2013.

When local police arrived in response to the fighting, one of the assailants showed them a police ID, Chernogubov says, and the three men were not detained. Chernogubov is certain that his attack was in retaliation for his reporting on “Russian Chrome.” If so, however, the cat is already out of the bag. On May 10, Greenpeace Russia activists collected their own samples from the river, and found [11][ru] that the chrome content in the water was almost 100 times above the “maximum permissible concentration.” Of course, this fact does not on its own guarantee any sort of result. This is not the first time that officials have cited “Russian Chrome” for pollution [12] [ru], but it continues to operate and pollute with relative impunity. Maybe the assault on Chernogubov will make a difference in terms of inciting public outrage, and maybe someone will get punished as a result. Even in this best case scenario, though, it's hard to see Chernogubov's story as anything but a hollow victory for Russian bloggers and activists.

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URLs in this post:

[1] Image: **http://ru.wikipedia.org/wiki/%D0%A4%D0%B0%D0%B9%D0%BB:Maksimovsky_rock_Chusovaya_river.jpg**
[2] Prokudin-Gorsky: **http://en.wikipedia.org/wiki/Sergey_Prokudin-Gorsky**
[3] described : **http://varnac.livejournal.com/8473.html**
[4] re-blogged: **http://www.echo.msk.ru/blog/alexanikin1971/1067250-echo/**
[5] Russian Chrome 1915: **http://www.chrome.ru/**
[6] tried to prevent them from touching the water: **http://varnac.livejournal.com/8791.html**
[7] Image: **http://www.youtube.com/watch?feature=player_embedded&v=uYa5zBoSwb0**
[8] reported the incident of pollution to the local police: **http://varnac.livejournal.com/9062.html**
[9] happened next: **http://varnac.livejournal.com/13356.html**
[10] Image: **http://www.youtube.com/watch?v=ajvVDdddpzA**
[11] found : **http://www.greenpeace.org/russia/ru/news/2013/17-04-pervouralsk-research/**
[12] for pollution: **http://www.pervo.ru/pervouralsk/glavnye-novosti-pervouralska/18871-v-pervouralske-v-reku-chusovuyu-massovo-sbrasyvayutsya-himicheskie-othody.html**