

Bellona Foundation report. 2014

# Industrial Pollution In Russia's Barents Sea Areas



**BELLONA**



# **Industrial pollution In Russia's Barents Sea Areas**

## **Published by Bellona Foundation**

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# List of abbreviations

AS	– anionic surfactant
BTIW	– biological treatment of industrial wastes
BTP	– biological treatment plants
BOD	– biochemical oxygen demand
MPP	– mining and processing plant
CDM	– crushing-and-dressing mill
WPU	– wood preparation unit
ASI	– atmospheric soiling index
MCS	– mechanical cleansing structures
NAD	– norm of acceptable discharge
BAT	– best available technologies
FO	– floating oil
EIA	– environmental impact analysis
MAD	– maximum admissible discharge
MAC	– maximum allowable concentration
ODG	– oil-dissolved gas
SSAS	– synthetic surface active substances
SRB	– soda recovery boiler
DHEM	– department for hydrometeorology and environmental monitoring
PCWT	– physical-and-chemical water treatment
COD	– chemical oxygen demand
CoC/CW certificate	– certification of FSC-controlled wood
BREF	– Best Available Technique Reference Notes
ECF technology	– bleaching of sulphate pulp
FSC certificate	– international standard for forest management system
ISO 14001	– international standard for environmental management system
ISO 9001	– international standard for quality management system
NEFCO	– The Nordic Environment Finance Corporation
OHSAS 18001	– international standard for occupational health and safety management system

# Foreword

The Russian part of the Barents Region comprises the Murmansk region, the Arkhangelsk region, the Republic of Karelia, the Nenets Autonomous District and the Komi Republic and constitutes  $\frac{3}{4}$  of the entire area of the Barents Region. These areas, along with the other northern territories, play a significant role in the economy and strategic development of Russia. The huge raw material base, economic potential of the region and favorable geographical position are key factors in the economic development of the country.

The Russian areas of the Barents region have significant reserves of fuel and energy, mineral raw material, forest and biological resources. Over thousand deposits and occurrences of minerals are concentrated here. 100% of zirconium, rare earth metals, titanium, strontium, apatite, more than 90% of ceramic pegmatites, nephelines, more than 75% of specular stone, about 60% of tantalum and manganese, more than 40% of nickel and cobalt is mined in the region. In recent years, active development of diamond, chrome ore and high-purity quartz reserve began<sup>1</sup>.

However, the development of natural resources and the associated elaboration of production and industrial base encourage not only social and economic growth, but also have a negative impact on the environment in the region.

According to statistics, there is an alarming situation in emissions of harmful substances into the atmosphere in three Russian parts of the Barents region – the Murmansk region, the Republic of Karelia and the Komi Republic have in recent years increased pollutant emissions from stationary sources into the environment.

In recent years, all Russian territories of the Barents Region have shown a negative trend in screening and neutralization of air pollutants.

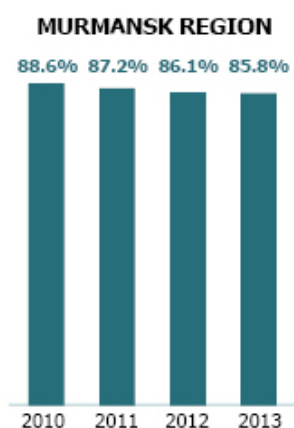
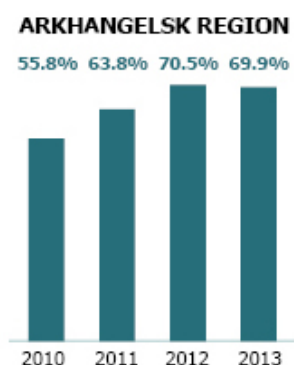
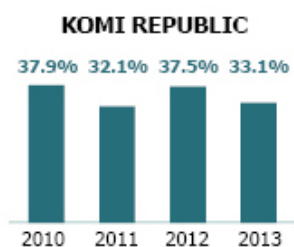
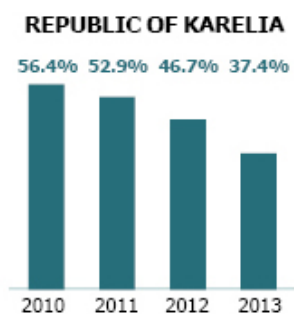
**Air pollutant emissions from stationary sources (thousand tons)<sup>2</sup>**

	<b>2011</b>	<b>2012</b>	<b>2013</b>
Republic of Karelia	96.02	106.61	118.51
Komi Republic	712.35	688.22	774.32
Arkhangelsk region	372.99	270.61	245.4
Murmansk region	263.13	258.86	269.77

<sup>1</sup> [http://www.strf.ru/material.aspx?CatalogId=222&d\\_no=19257](http://www.strf.ru/material.aspx?CatalogId=222&d_no=19257).

<sup>2</sup> <http://www.fedstat.ru/indicator/data.do>.

**The portion of screened and neutralized air pollutants in total amount emitted by stationary sources (indicator values per annum)<sup>3</sup>**



The industrialization and intensive extraction of minerals, while using outdated industrial technologies, as well as the slow modernization processes of existing productions, lead to unfavorable environmental situation in numerous areas of the Russian part of the Barents region, and to a high level of human impact on the environment.

The aim of the report by "Bellona" is to attract the attention of the authorities, scientific circles, business, and society to the problem of industrial pollution in the northern territories of the Russian Federation.

The report contains an analysis of industrial pollution in the Russian parts of the Barents region, information about the environment condition and quality, and major industrial polluters in the region which have a negative impact on the environment and human health. It also covers issues relating to environmental legislation of the Russian Federation in reducing the impact on the environment and the need to use the best available technologies (BAT).

The report is based on data from official sources of government agencies, state statistics service, reports of companies that cause the main human-induced impact in the region, as well as requests sent to these industrial enterprises for more detailed information.

"Bellona" Foundation expresses its gratitude to colleagues for their analytical work and materials provided for the report: D.S. Rybakova, Non-state educational establishment "Environmental Consulting Center" (Arkhangelsk), N.V. Kustova, S. A. Uvarov, G.A. Evdokimova, Zh.V. Vasilieva, and I.V.Lazareva.

<sup>3</sup> <http://www.fedstat.ru/indicator/data.do>.





# **Industry of the Russian part of the Barents Region and its impact on the environment**

Photo by [Florian Seiffert/flickr.com](https://www.flickr.com/photos/florianseiffert/)





Photo by Alexander Kozlov/flickr.com

## Arkhangelsk region

The Arkhangelsk region is located in the north of the European part of the Russian Federation and covers an area of 589 900 km<sup>2</sup>, which constitutes 3.4% of the territory of Russia. The population of the region is 1 191 800 inhabitants (according to 2014 data), and the average population density is 2.2 people per km<sup>2</sup>. More than 80% of the population lives in urban areas (1 million people.)<sup>4</sup>.

The region is rich in forest resources (mostly conifers, such as pine and spruce), mineral reserves (bauxites, diamonds), cement raw materials, gypsum, sand, clay, etc. At year-end of 2013, mineral mining occupies 0.8% in the structure of industrial production; manufacturing activity - 89.3%<sup>5</sup>, the most significant of which are ship-building and timber processing complexes.

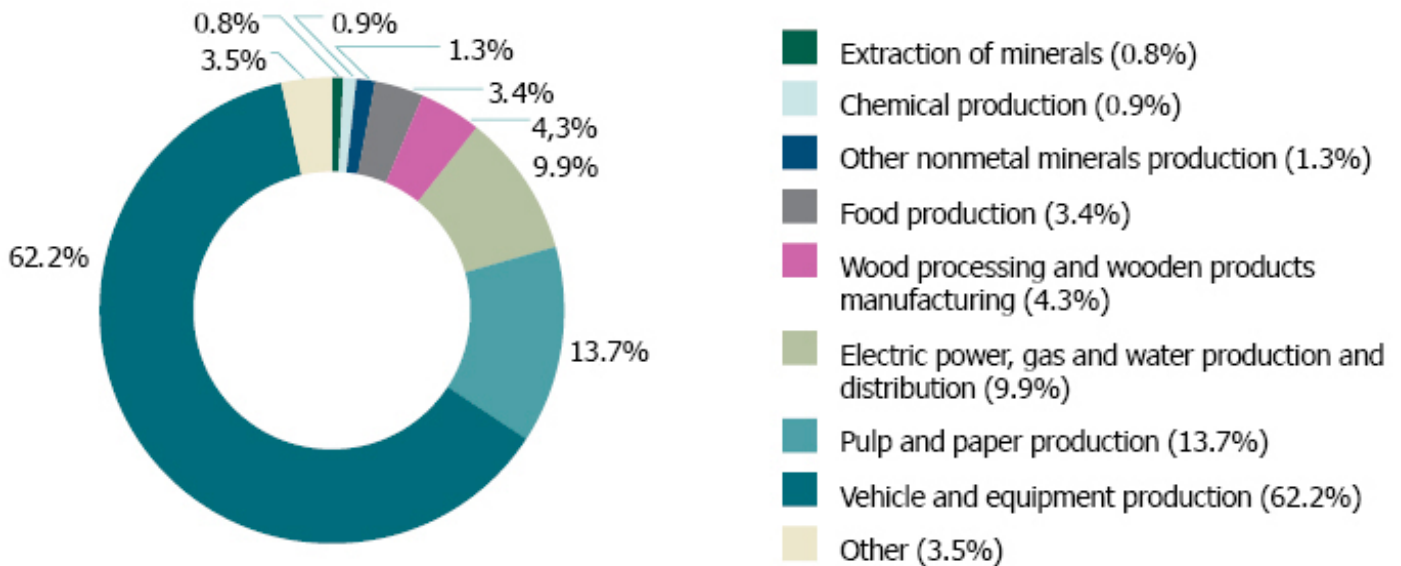
The Arkhangelsk region is characterized by patchy development of the territory. The industry is mainly concentrated in the Arkhangelsk, Kotlas and Plesetsk industrial hubs inhabited by 72% of the urban population. The environmental problems of the Arkhangelsk region continue to remain the high level of air pollution by emissions of industrial plants and vehicles, contaminated wastewater discharge into surface water bodies from industrial plants and public utility companies, environmental pollution by industrial and household wastes. The deterioration of public health is directly connected to these problems.



<sup>4</sup> <http://www.dvinaland.ru/region>.

<sup>5</sup> [http://eco29.ru/doklad/sbornik\\_2013.pdf](http://eco29.ru/doklad/sbornik_2013.pdf).





**Fig. 1. Structure of industrial production in the Arkhangelsk region by types of economic activity, 2013<sup>6</sup>**

## General description of environmental condition

### Atmospheric air condition

In 2013, gross pollutant emissions from stationary sources on the territory of the Arkhangelsk region, as compared with 2011, decreased by more than 34 thousand tons and reached 172 700 tons. The reduction in emissions took place mainly because a number of boilers were transferred to biofuel, as well as the suspension of production activity at Solombalsky pulp and paper mill (from January 2013, pulp production at Solombalsky pulp and paper mill was suspended owing to unfavorable market conditions and technological problems).<sup>7</sup> Furthermore, one of the factors of the reduction could be the correction of data on emissions.

Despite a 30% decrease in the total amount of harmful emissions into the atmosphere from stationary sources for the period of 2008-2013, air pollution by industrial plants remains a serious problem.

Air emissions from plants of Arkhangelsk, Severodvinsk, Novodvinsk, Koryazhma and Kotlas constitute more than 50% of the total air emissions in the Arkhangelsk region. The main sources of air emissions are plants of the pulp and paper industry (Arkhangelsk PPM, OJSC; Ilim Group, OJSC), heat and power companies (thermal power plants in Arkhangelsk, Severodvinsk, Novodvinsk, Koryazhma), and machine-building enterprises (Sevmash PO, OJSC; Zvezdochka Ship Repair Centre, OJSC).

<sup>6</sup>

Sbornik «Sostoyanie i okhrana okruzhayushey sredy Arkhangelskoy oblasti za 2013 god» [Collection "State and Environmental Protection of the Arkhangelsk region for 2013"], Natural Resources and Ecology Agency of the Arkhangelsk region ([http://dvinaland.ru/files/power/departments/comeco/envir/Doklad\\_2013\\_v2.pdf](http://dvinaland.ru/files/power/departments/comeco/envir/Doklad_2013_v2.pdf)).

<sup>7</sup> <http://www.solombala.com/sppm>.

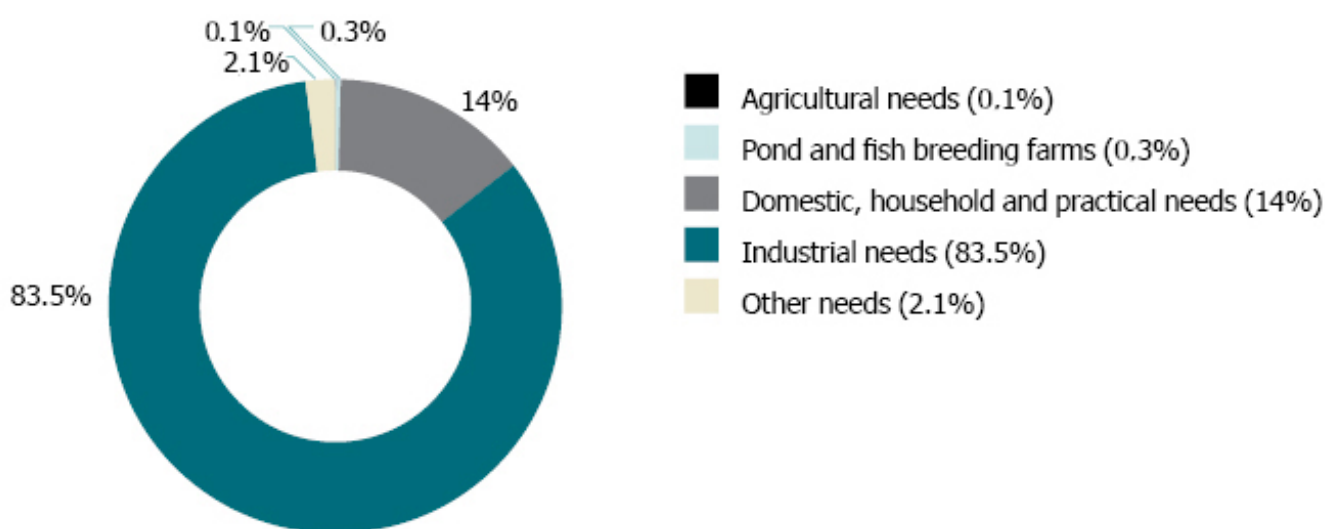


The air pollution level in 2013 in Archangelsk and Novodvinsk, where plants of the pulp and paper industry are concentrated, was classified as high, in Severodvinsk as excessive, and in Koryazhma as low<sup>8</sup>.

## State of water resources

The territory of the region is washed by the waters of three Arctic seas, the White Sea, the Barents Sea and the Kara Sea. The main water arteries, such as the Northern Dvina River, the Onega River and the Mezen River, belong to the basin of the White Sea.

Water use in the region is also involves the water system of the White Sea basin. In 2013, the volume of water taken in from natural water bodies increased by 5.95 million m<sup>3</sup> or by 0.85% compared with the previous year, and amounted to 705.11 million m<sup>3</sup>. Of the 600.75 million m<sup>3</sup> of water used, 503.47 million m<sup>3</sup> or 84% was used for industrial needs.



**Fig. 2. Structure of water use in the Arkhangelsk region, 2013<sup>9</sup>**

In recent years, there has been a positive trend in water resource usage. In 2013, industrial plants reduced water intake for industrial needs by 3.7% (19.3 million m<sup>3</sup>) compared with 2012.

Despite the reduction in total discharge of wastewater into water bodies by 0.9% in 2013, discharge of contaminated untreated water increased by 3.1%.

According to laboratory tests, a total of 30 different pollutants were detected in the plants' wastewaters. In 2013, an alarming situation arose because of an increase in pollution of water bodies by the following hazardous chemicals: suspended substances - 0.09%, COD - 1.59%, phosphates - 4.88%, nitrates - 5.61%, nitrites - 47.65%, phenols - 2.71% methanol - 9.01% formaldehyde - 6.44% aluminum - 4.26%, manganese - 2.02%, lead - 47.02%, three-valence chromium - 314.96%, cadmium - 100%.

<sup>8</sup>

Sbornik «Sostoyanie i okhrana okruzhayushey sredy Arkhangelskoy oblasti za 2013 god» [Collection "State and Environmental Protection of the Arkhangelsk region for 2013"], Natural Resources and Ecology Agency of the Arkhangelsk region ([http://dvinland.ru/files/power/departments/comeco/envir/Doklad\\_2013\\_v2.pdf](http://dvinland.ru/files/power/departments/comeco/envir/Doklad_2013_v2.pdf)).

<sup>9</sup> Ibid.

At the same time, total discharge of the following substances into water bodies of the region decreased: BOD - by 7.42%, oil products - 23.59%, dry residue - 7.99%, sulfates - 17.21%, chlorides - 23.31%, ammonia nitrogen - 9.78%, SSAS - 6.15%, tannins - 21.58%, lignin sulfate - 99.12%, turpentine - 83.73%, iron - 35.03%, copper - 16.22%, zinc - 55.71%, nickel - 85.54%, hexavalent chromium - 37.25%, vanadium - 36.7%<sup>10</sup>.

The volume of wastewater discharged into the Northern Dvina River exceeds its self-purification ability.

In 2013, there was an increase in groundwater intake for industrial needs. This was caused by the increase in pit sump by 66% connected with the start of development of the V.Grib diamond mine.

The main sources of pollution of surface water bodies in the region are plants of the pulp and paper industry.

## Soil cover condition

Emissions from industrial enterprises, as well as industrial and household wastes have a negative impact on soil cover. The main sources of soil contamination in the Arkhangelsk region are the companies of the logging, woodworking, pulp and paper industries, agriculture, vehicles, domestic and household activities. The research data for 2013 shows a rapid increase (53.6%) compared with 2011 in the percentage of soil samples not complying with sanitary-chemical standards.

## Industrial waste

In 2013, the amount of waste generated at the plants of the Arkhangelsk region increased up to 63 672 922 tons, which is 7 896 260 tons more than in 2012. Most of it (94%) was formed by mineral mining companies. The overall increase in waste took place due to the increase of waste at chemical enterprises and mineral mining companies<sup>11</sup>.

The main waste generators among mineral mining companies are: Severalmaz, OJSC (7 434 300 tons), Arkhangelsk Geological Mining Enterprise, OJSC (7 902 000 tons), North-Onega bauxite mine, OJSC (3 998 600 tons). Almost 99% of the total generated waste is V hazard class waste. Moreover, 95% of its total mass is accounted for by waste from mineral mining enterprises.

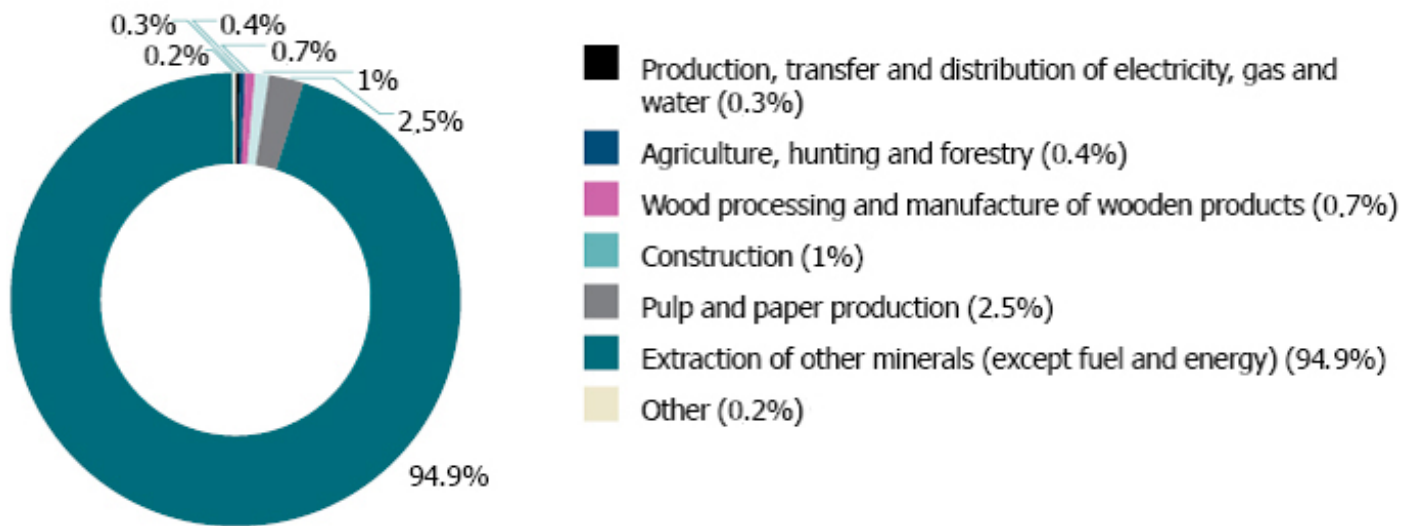
One of the major environmental problems in industrial activity is the utilization and deactivation of solid industrial waste. The use of waste remains at a very low level. Wood waste is recycled; about 80% of wood waste is burned by plants for thermal and electrical energy. Furthermore, litter, dung, and some plastic waste is recycled.

Waste is mainly collected in storages and holding lagoons, on landfills and disposal sites near cities. There are practically no plants specializing in the recycling and deactivation of industrial wastes.

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<sup>10</sup> Ibid.

<sup>11</sup> Ibid.



**Fig. 3. Contribution of industry to waste generation in the Arkhangelsk region, 2013<sup>12</sup>**

Waste sites not complying with modern environmental requirements pollute the soil with heavy metals. In 2012, it was discovered that the soil under disposal sites in Arkhangelsk, Novodvinsk and Severodvinsk was contaminated with heavy metals: zinc - up to 16 MAC, lead - 26 MAC, mercury - 3.5 MAC, as well as cadmium, copper and nickel<sup>13</sup>.

### Main polluters

The main polluters of the Arkhangelsk region are mineral mining companies, such as Severalmaz, OJSC; Arkhangelsk Geological Mining Enterprise, OJSC; North-Onega bauxite mine, OJSC; plants of the pulp and paper industry: Arkhangelsk PPM, OJSC; Ilim Group, OJSC; wood processing enterprise Sawmill 25, CJSC; cement production – Savinsky Cement Plant, CJSC; oil transfer company - RN-Arkhangelsknefteprodukt, LLC; and chemical industry company – Kotlas chemical plant, OJSC.

In addition to the information on air emissions and discharges into water bodies, information on the state of the environment (atmospheric air and/or water bodies in the zone of plants' influence) will be provided below. Unfortunately, not all areas and water bodies are monitored, so in a number of blocks of some enterprises data on the state of the environment is not available. Among these enterprises are: Arkhangelsk Geological Mining Enterprise, OJSC (Mezen district), Severalmaz, OJSC (Lomonosov mining and beneficiation complex, Pomorie village, Primorsky district), Savinsky Cement Plant, CJSC (Savinsky village, Plesetsk district), North Onega bauxite mine, OJSC (Severoonezhsk village, Plesetsk district) and RN-Arkhangelsknefteprodukt, LLC (Arkhangelsk oil terminal, Talagi village, Arkhangelsk).

The description of the enterprises is accompanied by an overview of the major industrial and economic aspects and activities aimed at modernization of the enterprise. Enterprises which lack some blocks because information is unavailable are: Kotlas chemical plant, OJSC (no information on economic and production aspects and volume of industrial waste), Savinsky Cement Plant, CJSC (no information on economic aspects), North Onega bauxite mine, OJSC (no information on production aspects, plans on production process modernization for reducing negative impact on the environment, volume of discharges into water bodies), RN-Arkhangelsknefteprodukt, LLC (there is no information on production aspects and volume of industrial waste).

<sup>12</sup> Ibid.

<sup>13</sup> Sbornik «Sostoyanie i okhrana okruzhayushey sredy Arkhangelskoy oblasti za 2013 god» [Collection "State and Environmental Protection of the Arkhangelsk region for 2013"], Natural Resources and Ecology Agency of the Arkhangelsk region (<http://www.czl29.ru/upload/medialibrary/74e/74e833fa78327c42e610e74cde1b5783.pdf>).

The factual basis of the section is data from official websites of public authorities (Arkhangelsk region), city authorities of the region, state statistics services (for the Arkhangelsk region), as well as information and reports from the websites of plants, and news from federal and regional news agencies. Additionally, information provided by enterprises in response to Bellona's official requests, as well as information from enterprises' presentations or speeches on environmental events held in Arkhangelsk was used. The list of enterprises making the main contribution to pollution of the environment is determined according to the State Statistics Service in the Arkhangelsk region. The enterprises provided information in a form convenient for them: written responses, brochures, reports on their activities, data based on web sources. The information was provided by all respondents, but not always in full. There were no refusals to provide information.

## *Affiliate of Ilim Group, OJSC*

### *General information*

The affiliate of Ilim Group, OJSC (former name – Kotlas PPM) is the township-forming enterprise of Koryazhma where 3,328 people are employed (city' population 38,600 according to data for 2013). The enterprise is owned by Ilim Group, a leader of the Russian pulp and paper industry producing more than 66% of all Russian market pulp and 24% of cardboard at plants in the Leningrad, Arkhangelsk and Irkutsk regions. 50% of Ilim Group belongs to the world's largest pulp and paper company - International Paper<sup>14</sup>.

The affiliate of Ilim Group, OJSC in Koryazhma is the largest pulp and paper enterprise in Russia and Europe, which produced 1.58 million tons of pulp (sulphate bleached hardwood pulp) in 2013. The enterprise also produces cardboard for flat layers of corrugated cardboard (kraft liner), corrugating paper (fluting), offset paper, and recycled wood chemical and biochemical products. 60% of the affiliate's products go to the domestic market, while the rest is exported to Europe and the Middle East<sup>15</sup>.

In 2013, the company produced and used for their own needs 1 715 million kWh of electricity, as well as producing and using 11 350 000 Gcal of heat energy<sup>16</sup>. Energy saving measures are taken. In 2012, 1.8 million tons of bark waste instead of carbon-based fuels was burned, and to burn organic waste the plant's bark boilers are being moved to fluidized bed technology<sup>17</sup>.

The enterprise's development strategy is to move from manufacturing semi-finished products to manufacturing high-level processing products with a high added value (paper and packaging). The priority investment project "Big Koryazhma" is underway (installation of a paper-making machine priced at more than \$270 million and a planned production capacity of 220,000 tons of office paper of standard size for the domestic market<sup>18</sup>.

### *Economic aspects*

In 2013, revenues from the enterprise's sales of products (services) amounted to 53 940 million rubles (in 2012 – 52 685 million rubles), while in 2013 the company's net losses amounted to 2 808 million rubles (in

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<sup>14</sup> <http://www.ilimgroup.ru>.

<sup>15</sup> Ibid.

<sup>16</sup> Otchet «Ekologiya, okhrana truda, pozharnaya bezopasnost» OAO «Gruppa «Ilim» za 2012 god [Report "Ecology, labor protection, fire safety" of Ilim Group, OJSC for 2012] (<http://www.ilimgroup.ru/f/1/about-company/environmental-policy/ecoIlim2012.pdf>).

<sup>17</sup> Ibid.

<sup>18</sup> Ibid.

2012, the profit amounted to 3 443 million rubles). Ilim Group is officially registered in St. Petersburg (where its central office is located), and pays income tax to the budget of this city<sup>19</sup>.

### *Air emissions*

The enterprise is a major stationary pollutant of Koryazhma. The plant's pollutant emissions (benz(a)pyrene, vanadium pentoxide, calcium oxide, sodium carbonate, sodium sulfate, sodium sulfite salts, sulfur dioxide, carbon oxide, nitrogen oxides, VOC-based hydrocarbons) are generated from fuel combustion to produce electricity and heat. In 2013, 11 030 tons were emitted (in 2012 – 11 800 tons) into the atmosphere of the city, or more than 6% of the total hazardous emissions in the region. As a whole, increase in air pollution in 2013 remained at the 2012 level.

According to 2013 monitoring data, the air pollution level in Koryazhma was characterized as low. Average annual concentrations of suspended substances, sulfur dioxide, nitrogen dioxide and single concentration of hydrogen sulfide during the year did not exceed the allowable values. Only average annual concentration of benz(a)pyrene, as well as in 2012, exceeded the established standard. Over the period of 2003-2013, the pollution level of the city from nitrogen dioxide has increased, but average annual concentrations of benz(a)pyrene declined<sup>20</sup>.

The company's environmental report states that during the period of 2007-2012 the enterprise's emissions of hydrogen sulfide decreased by 36 times, and methylmercaptan emissions by 20 times<sup>21</sup>.

### *Discharges into water bodies*

According to the Ministry of Natural Resources and Ecology of the Arkhangelsk region, thanks to conservation efforts, while production was increased, the affiliate of Ilim Group, OJSC in Koryazhma has reduced the volume of pollutants discharged into water bodies by 10 times: from 124 300 tons in 2003 to 12,400 tons in 2011. The report highlights that over the period of 2007-2012 the discharge of lingo sulfates decreased by 24 times, and organic substances by COD by 10 times. Although the enterprise's environmental report states that the indicators of the enterprise's discharge comply with (and are even better than) the standards of the best available technologies in terms of BOD, COD and suspended substances<sup>22</sup>, the water quality in the Vychegda and the Kopytovka rivers, where the enterprise's waste is discharged, did not comply with the established requirements (2013)<sup>23</sup>.

Despite a significant reduction in emissions (e.g., discharge of lingo sulfates in 2007-2012 was reduced by 24 times<sup>24</sup>), industrial environmental monitoring showed that in three out of five discharges (including the main discharge No. 4 into the Vychegda river) wastewater standards on pollutants were constantly

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<sup>19</sup> Godovoy otchet OAO «Gruppa «Ilim» za 2013 god [Annual report of Ilim Group for 2013] (<http://www.ilimgroup.ru/f/1/akcioneram/information/godotch/go2013/goilim2013.pdf>).

<sup>20</sup> Sbornik «Sostoyanie i okhrana okruzhayushey sredy Arkhangelskoy oblasti za 2013 god» [Collection "State and Environmental Protection of the Arkhangelsk region for 2013"], Natural Resources and Ecology Agency of the Arkhangelsk region ([http://dvinaland.ru/files/power/departments/comeco/envir/Doklad\\_2013\\_v2.pdf](http://dvinaland.ru/files/power/departments/comeco/envir/Doklad_2013_v2.pdf)).

<sup>21</sup> Otchet «Ekologiya, okhrana truda, pozharnaya bezopasnost» OAO «Gruppa «Ilim» za 2012 god [Report "Ecology, labor protection, fire safety" of Ilim Group, OJSC for 2012] (<http://www.ilimgroup.ru/f/1/about-company/environmental-policy/ecoIlim2012.pdf>).

<sup>22</sup> Ibid.

<sup>23</sup> Sbornik «Sostoyanie i okhrana okruzhayushey sredy Arkhangelskoy oblasti za 2013 god» [Collection "State and Environmental Protection of the Arkhangelsk region for 2013"], Natural Resources and Ecology Agency of the Arkhangelsk region ([http://dvinaland.ru/files/power/departments/comeco/envir/Doklad\\_2013\\_v2.pdf](http://dvinaland.ru/files/power/departments/comeco/envir/Doklad_2013_v2.pdf)).

<sup>24</sup> Otchet «Ekologiya, okhrana truda, pozharnaya bezopasnost» OAO «Gruppa «Ilim» za 2012 god [Report "Ecology, labor protection, fire safety" of Ilim Group, OJSC for 2012] (<http://www.ilimgroup.ru/f/1/about-company/environmental-policy/ecoIlim2012.pdf>).

exceeded (suspended substances, phenols, methanol, BOD<sub>full</sub>, COD, ligno sulfonates), while the discharge limits on quality indicators were observed. Although a number of measures were implemented (replacement of aeration systems at the station of biological treatment of industrial wastes, modernization of the site for sludge dewatering and surplus activated sludge with press filter installation, construction of reverse water supply station, etc.), the enterprise failed to realize some of the planned actions, as a result of which the conditions of permits for water use in 2013 were not met<sup>25</sup>.

Regarding the water state of the Vychegda River into which the enterprise discharges wastewater, the water of the lower reaches of the river is characterized by pollution by light and oxidation-prone organic substances in terms of COD, copper compounds (in 2013, their average annual content was 5 MAC), zinc, manganese and oil products (in 2011, the average annual content was lower than 1-2 MAC). Above Koryazhma and within the boundaries of Solvychegodsk iron compounds were added to this (average annual content - 3-5 MAC), and aluminum compound below Koryazhma and within the boundaries of Solvychegodsk. In the same area, the average annual water pollution by phenols slightly exceeded the norm. The maximum excess of the established standard was identified in the alignment below Koryazhma and constituted 1.2 MAC<sup>26</sup>. The average annual concentration of ligno sulfonates, a byproduct of pulp production using the sulphate method did not exceed the MAC (maximum concentration in 2 MAC was identified in 2012 above Koryazhma) in 2012, deviations from the standard in terms of 2-chlorophenol content were detected in 2012 within the boundaries of Solvychegodsk and below Koryazhma (the highest content (8 MAC) was found within the boundaries of Solvychegodsk)<sup>27</sup>. No information on pollution of ligno sulphonates and 2-chlorophenols for 2013 is available.

### *Industrial waste*

In 2012, at the plant in Koryazhma Ilim Group, OJSC obtained 660 080 tons of waste, or 1% of the total volume of waste generated in the Arkhangelsk region (63 672 900 tons)<sup>28</sup>. As noted above, the enterprise actively utilized bark waste by burning it in the waste-heat boilers to produce electricity and steam<sup>29</sup>.

### *Production process modernization plans for reducing the negative impact on the environment*

In the framework of investment project "Big Koryazhma" (Bolshaya Koryazhma) it is planned to introduce measures for minimizing discharges of wastewater, for returning the reclaimed pulp, filler and light filtrate to the process flow. It is planned that all recycling waters from the new paper-making machine will be treated by a Beloit multi-disk vacuum filter. As a result, fresh water consumption will be reduced, while up to 20 m<sup>3</sup>/tons of office and offset types of paper will be produced, which corresponds to the best world standards on the recommendation of the European Union. According to the latest news about the project, the paper-making machine is already in operation.

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<sup>25</sup> <http://www.rpn.atnet.ru/obsovet/13-04-30.html>.

<sup>26</sup> Sbornik «Sostoyanie i okhrana okruzhayushey sredy Arkhangelskoy oblasti za 2013 god» [Collection "State and Environmental Protection of the Arkhangelsk region for 2013"], Natural Resources and Ecology Agency of the Arkhangelsk region ([http://dvinaland.ru/files/power/departments/comeco/envir/Doklad\\_2013\\_v2.pdf](http://dvinaland.ru/files/power/departments/comeco/envir/Doklad_2013_v2.pdf)).

<sup>27</sup> Sbornik «Sostoyanie i okhrana okruzhayushey sredy Arkhangelskoy oblasti za 2012 god» [Collection "State and Environmental Protection of the Arkhangelsk region for 2012"], Natural Resources and Ecology Agency of the Arkhangelsk region (<http://www.czl29.ru/upload/medialibrary/74e/74e833fa78327c42e610e74cde1b5783.pdf>).

<sup>28</sup> Sbornik «Sostoyanie i okhrana okruzhayushey sredy Arkhangelskoy oblasti za 2013 god» [Collection "State and Environmental Protection of Arkhangelsk region for 2013"], Natural Resources and Ecology Agency of Arkhangelsk region ([http://dvinaland.ru/files/power/departments/comeco/envir/Doklad\\_2013\\_v2.pdf](http://dvinaland.ru/files/power/departments/comeco/envir/Doklad_2013_v2.pdf)).

<sup>29</sup> Otchet «Ekologiya, ohrana truda, pozharnaya bezopasnost» OAO «Gruppa «Ilim» za 2012 god [Report "Ecology, labor protection, fire safety" of OJSC "Group "Ilim" for 2012 year] (<http://www.ilimgroup.ru/f/1/about-company/environmental-policy/ecoIlim2012.pdf>).



The affiliate of Ilim Group in Koryazhma operates in accordance with international standards for quality and product stewardship, industrial safety approved by ISO 9001, ISO 14001, OHSAS 18001, FSC certificates for forest management and chain of custody (for 5.7 million hectares of forests leased by the company). Ilim Group annually publishes its environmental report on the website<sup>30</sup>.

In 2012, the company allocated about 5.2 billion rubles to reduce the impact of industrial activity on the environment<sup>31</sup>.

The environmental report states that after reconstruction, the company adopts the best available technologies (BAT). Furthermore, the company introduces improvements for definite links of the technological process. For example, in 2000, the introduction of the modern ECF-sequence on sulphate pulp bleaching technology reduced the costs for wastewater treatment. Abandoning the use of molecular chlorine and hypochlorite has made it possible to reduce by three or more times the number of chlororganic compounds flowing to the treatment facilities from the bleaching installation, and to eliminate chloroform formation completely. The evaporator station has also been modernized since 2004<sup>32</sup>.

As a part of annual target programs, various links of the technological process for pulp production are modernized at the enterprises of the company.

### *Arkhangelsk Pulp and Paper Mill, OJSC (APPM)*

#### *General Information*

APPM is situated in Novodvinsk, a non-diversified city with a population of 39 900 people (according to data for 2013). The number of employees at the enterprise is 4 001 people (according to data for 2012).

The enterprise was founded in 1940, and today APPM is one of the largest manufacturers of paperboard, market pulp and paper in the pulp and paper industry. In 2012, the volume of products made was approximately 1.7 million tons.

The main shareholder of the company is the Austrian-German group Pulp Mill Holding GmbH. The domestic market share in the sales volume in 2012 constituted 74%. The largest APPM importers are Ukraine, Belarus, Germany, Poland, and Turkey.

Arkhangelsk PPM, OJSC consumes energy produced at an isolated generating plant of the company. The consumption from the electric energy system reaches up to 40 MW, output power - up to 15 MW. In 2012, the company bought 31 706 thousand kWh of electric energy, which is two times less than in 2011 (70 766 thousand kWh). In order to get heat and electric energy, the company utilizes wood waste and sewage sludge in a Metso boiler with fluidized bed. In 2013, the company won the All-Russian Award "Green development - Evolution Awards" in the category "Best Company - manufacturer of alternative energy" for implementation of this project<sup>33</sup>. Coal and fuel oil (masut) are still used as an energy resource, although in 2012 their proportion of the total volume of fuel decreased (in 2011 – 845 134 tons of coal, 51 614 tons of fuel oil, in 2012 – 840 453 tons of coal, 49 680 tons of fuel oil).

It is planned to increase pulp production capacity up to 905 thousand tons, as well to increase production

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<sup>30</sup> Ibid.

<sup>31</sup> Ibid.

<sup>32</sup> Ibid.

<sup>33</sup>[http://www.lesprom.com/end/news/Arhangelskiy\\_TSBK\\_voshel\\_v\\_troyku\\_luchshih\\_rossiyskih\\_kompaniy-proizvoditeley\\_alternativnoy\\_yenergii\\_59414/#sthash.qi4EO1ia.lqRLyZf3.dpuf](http://www.lesprom.com/end/news/Arhangelskiy_TSBK_voshel_v_troyku_luchshih_rossiyskih_kompaniy-proizvoditeley_alternativnoy_yenergii_59414/#sthash.qi4EO1ia.lqRLyZf3.dpuf).

of cardboard by 35 thousand tons and gophered paper by 98 thousand tons, so the company's priority is to modernize and expand production<sup>34</sup>.

### *Economic aspects*

The revenues from product sales for 2013 increased by 4.9% – up to 17.93 billion rubles. The net income decreased compared with 2012 by 11% to 1.14 billion rubles<sup>35</sup>. The enterprise pays income tax to the budget of the Arkhangelsk region.

### *Air emissions*

In 2013, the company produced 39 470 tons of air pollutant emissions (in 2012 39 200 tons), or nearly 23% of total emissions in the region (172 710 tons). For the period of 2010-2013, the volume of emissions at the plant fell by 5 700 tons (by 12.7%). The reduction in emissions of solids and sulfur dioxide occurred due to replacement of SRB-1 electric filter and reducing ash percentage and sulfur content of coal.

Arkhangelsk PPM, OJSC is the main polluter of Novodvinsk and one of the pollutants in Arkhangelsk, as it is located 14 km to the south-east from the city boundary. The air pollution level in Novodvinsk and Arkhangelsk in 2013 was estimated as high. The pollution in Novodvinsk was determined to have a high content of formaldehyde in the air (the average annual rate is more than 3.2 MAC), and in Arkhangelsk the annual average concentrations of formaldehyde and benz(a)pyrene exceeded MAC. During the period from 2003 to 2013 there was also an increase of carbon oxide in the atmosphere in Novodvinsk. Although for the last ten years the level of hydrogen sulfide air pollution in Novodvinsk and Arkhangelsk has not changed, in Novodvinsk the largest single concentration of hydrogen sulfide - 9.0 MAC - was recorded<sup>36</sup>.

### *Discharges into water bodies*

The total gross discharge of pollutants also showed a tendency to decrease: in 2012 the volume of discharges into water bodies amounted to 13 969 tons, which is 4% or 575.8 tons less than in 2011. The decrease occurred due to rational use of water resources. Given the increase in production in 2012, this is an even more revealing and positive change.

According to Natural Resources and Ecology Agency of the Arkhangelsk region, over the past three years (2010-2013), the water quality of the Northern Dvina River at the estuary has not changed significantly. The typical pollutants in the water within the boundaries of Arkhangelsk and above Novodvinsk remain oxidation-prone organic substances (by COD), copper compounds (average annual concentration: 5-7 MAC in 2013, 3 MAC in 2012), zinc and manganese (3-4 MAC), iron compounds (1-2 MAC in 2013, MAC in 4-5 in 2012) and aluminum. In 2013, isolated violations of standard in relation to content of phenol (carbolic acid) were recorded in the waters of Northern Dvina River within the boundaries of Novodvinsk and Arkhangelsk (1.6 and 2.8 MAC)<sup>37</sup>. In the boundaries of Novodvinsk, in 2010, the highest value of phenol was fixed - 4

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<sup>34</sup> According to OJSC «APPM» website (<http://www.appm.ru>).

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[http://www.lesprom.com/ru/news/%D0%92\\_2013\\_%D0%B3\\_%D1%87%D0%B8%D1%81%D1%82%D0%B0%D1%8F\\_%D0%BF%D1%80%D0%B8%D0%B1%D1%8B%D0%BB%D1%8C\\_%D0%9E%D0%90%D0%9E\\_%D0%90%D1%80%D1%85%D0%B0%D0%BD%D0%B3%D0%B5%D0%BB%D1%8C%D1%81%D0%BA%D0%B8%D0%B9\\_%D0%A6%D0%91%D0%9A\\_%D1%81%D0%BE%D0%BA%D1%80%D0%B0%D1%82%D0%B8%D0%BB%D0%B0%D1%81%D1%8C\\_%D0%BD%D0%B0\\_11\\_%D0%B4%D0%BE\\_114\\_%D0%BC%D0%BB%D1%80%D0%B4\\_%D1%80%D1%83%D0%B1\\_\\_61179](http://www.lesprom.com/ru/news/%D0%92_2013_%D0%B3_%D1%87%D0%B8%D1%81%D1%82%D0%B0%D1%8F_%D0%BF%D1%80%D0%B8%D0%B1%D1%8B%D0%BB%D1%8C_%D0%9E%D0%90%D0%9E_%D0%90%D1%80%D1%85%D0%B0%D0%BD%D0%B3%D0%B5%D0%BB%D1%8C%D1%81%D0%BA%D0%B8%D0%B9_%D0%A6%D0%91%D0%9A_%D1%81%D0%BE%D0%BA%D1%80%D0%B0%D1%82%D0%B8%D0%BB%D0%B0%D1%81%D1%8C_%D0%BD%D0%B0_11_%D0%B4%D0%BE_114_%D0%BC%D0%BB%D1%80%D0%B4_%D1%80%D1%83%D0%B1__61179).

<sup>36</sup> Sbornik «Sostoyanie i okhrana okruzhayushey sredy Arhangelskoy oblasti za 2013 god» [Collection «State and Environmental Protection of the Arkhangelsk region for 2013»], Natural Resources and Ecology Agency of the Arkhangelsk region ([http://dvincialand.ru/files/power/departments/comeco/envir/Doklad\\_2013\\_v2.pdf](http://dvincialand.ru/files/power/departments/comeco/envir/Doklad_2013_v2.pdf)).

<sup>37</sup> Ibid.



MAC<sup>38</sup>. The contamination by methanol in 2013 was uneven<sup>39</sup>. In 2012, maximum concentration of methanol was recorded within the boundaries of Novodvinsk and Arkhangelsk (2 MAC)<sup>40</sup>.

### *Industrial waste*

In 2013, Arkhangelsk PPM, OJSC generated 946,700 tons (in 2012 972 400 tons) of waste, or 1.5% of the total waste in the region (63 672 900 tons)<sup>41</sup>. It is worth noting that waste oils, polyethylene waste, emulsions, waste tires and waste mercury-containing lamps were fully transferred to specialized organizations for utilization or deactivation. At the same time, the volume of waste in landfill has increased<sup>42</sup>.

### *Production process modernization plans for reducing the negative impact on the environment*

In order to reduce the negative impact on the environment, the enterprise has taken a number of effective measures. In 2013, the cost for environmental protection activities amounted to 2 008 600 000 rubles (in 2012 654 200 000 rubles), of which the majority was directed to measures for protection of atmospheric air (1 051 321 000 rubles). Over the period of 2012-2013, the modernization of SRB-1 was completed and a new electric filter with a 99% purification rate was installed; it allowed a reduction in sulfate sodium dust emissions by 542.5 tons per year (2012); modernization of SRB-5<sup>43</sup> has been started, which will enable to a significant reduction in sodium sulfate dust emissions. Construction of a new unit for production of semi-chemical pulp was completed, which will also assist in reducing pollutant emissions.

Among measures for protection of water bodies, in 2012-2013 local treatment of wastewater in wood preparation unit No. 3 (WPU-3) and modernization of the balancing reservoir for biological sewage disposal installations were organized.

Apart from the program for biomass waste utilization, among waste management activities works on completion of landfill No.1 for industrial and household solid wastes should be noted <sup>44</sup>.

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<sup>38</sup> Sbornik «Sostoyanie i okhrana okruzhayushey sredey Arhangelskoy oblasti za 2012 god» [Collection «State and Environmental Protection of the Arkhangelsk region for 2012»], Natural Resources and Ecology Agency of the Arkhangelsk region (<http://www.czl29.ru/upload/medialibrary/74e/74e833fa78327c42e610e74cde1b5783.pdf>).

<sup>39</sup> Sbornik «Sostoyanie i okhrana okruzhayushey sredey Arhangelskoy oblasti za 2013 god» [Collection «State and Environmental Protection of the Arkhangelsk region for 2013»], Natural Resources and Ecology Agency of the Arkhangelsk region ([http://dvinaland.ru/files/power/departments/comeco/envir/Doklad\\_2013\\_v2.pdf](http://dvinaland.ru/files/power/departments/comeco/envir/Doklad_2013_v2.pdf)).

<sup>40</sup> Sbornik «Sostoyanie i okhrana okruzhayushey sredey Arhangelskoy oblasti za 2012 god» [Collection «State and Environmental Protection of the Arkhangelsk region for 2012»], Natural Resources and Ecology Agency of the Arkhangelsk region (<http://www.czl29.ru/upload/medialibrary/74e/74e833fa78327c42e610e74cde1b5783.pdf>).

<sup>41</sup> Ibid.

<sup>42</sup> Ibid.

<sup>43</sup> <http://www.interfax-russia.ru/NorthWest/print.asp?id=438016&type=news>.

<sup>44</sup> Sbornik «Sostoyanie i okhrana okruzhayushey sredey Arhangelskoy oblasti za 2012 god» [Collection «State and Environmental Protection of the Arkhangelsk region for 2012»], Natural Resources and Ecology Agency of the Arkhangelsk region (<http://www.czl29.ru/upload/medialibrary/74e/74e833fa78327c42e610e74cde1b5783.pdf>); Sbornik «Sostoyanie i okhrana okruzhayushey sredey Arhangelskoy oblasti za 2013 god» [Collection «State and Environmental Protection of the Arkhangelsk region for 2013»], Natural Resources and Ecology Agency of the Arkhangelsk region ([http://dvinaland.ru/files/power/departments/comeco/envir/Doklad\\_2013\\_v2.pdf](http://dvinaland.ru/files/power/departments/comeco/envir/Doklad_2013_v2.pdf)).

According to recent reports, APPM is ready to launch a new multi-fuel heat recovery boiler by Valmet (former Metso) Power Oy for co-combustion of sewage sludge and bark wastes<sup>45</sup>. Furthermore, in early August 2014 Kadant Johnson Inc. (Westford, Massachusetts, USA) had plans to supply equipment for reconstruction of steam-condensate system of decker (drying machine) for pulp production of Arkhangelsk PPM, OJSC<sup>46</sup>. In June 2014, Austrian company Pulp Mill Holding GmbH (PMH), the sole shareholder of APPM, intended to fully reinvest the amount of dividends for 2013 into the program for modernization of the plant during 2014<sup>47</sup>.

Like almost all the major polluters of pulp and paper industry, in 2006 Arkhangelsk PPM, OJSC received certificates on the environmental Management System (ISO 14001:1996), Integrated Management System (ISO 9001, ISO 14001, OHSAS 18001), Environmental Forestry Management of the Forest Stewardship Council (FSC certificate for chain of custody, FSC certificate for controlled wood, FSC certified finished products of cardboard and paper production) and was recertified in 2011. This certification shows the serious environmental management of the company.

The program of Arkhangelsk PPM, OJSC aimed at reducing the negative impact on the environment is a long-term program, but as the obsolete equipment which was used back in the 1970s still forms the basis of production, despite all the positive activities listed above, pollution remains a serious problem. In addition, the solution of this problem could be delayed due to imposed sanctions and the worsening economic situation in the country.

The claim that Arkhangelsk PPM, OJSC "is holding constructive dialogue with the international organizations of Greenpeace and the World Wildlife Fund (WWF)"<sup>48</sup> is not confirmed by more detailed information.

## *Kotlas Chemical Plant, OJSC*

### *General Information*

Kotlas Chemical Plant, OJSC is located in Koryazhma, Kotlassky district, Arkhangelsk region (the city's population is 38,600 inhabitants, according to 2013 data).

The Kotlas Chemical Plant specializes in the production of paintwork materials: phenol-formaldehyde resins used for production of oil paints, electrical insulating varnishes, lacquers and can enamels for food canneries. The plant supplies its products to the markets of Russia (Murmansk, Samara, Perm, Astrakhan, Far East), Ukraine, Belarus, Kazakhstan, and Uzbekistan. For example, consumers of corrosion inhibitors are oil producing companies in the Tyumen region, the Yamal-Nenets Autonomous District, the Republic of Tatarstan. The plant's products have received certificates and diplomas. 373 people are employed at the plant (data for 2013)<sup>49</sup>.

### *Air emissions*

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<sup>45</sup> <http://www.appm.ru/news/1458>.

<sup>46</sup> <http://www.appm.ru/news/1461>.

<sup>47</sup> <http://www.appm.ru/news/1452>.

<sup>48</sup> <http://www1.appm.ru/ecology>.

<sup>49</sup> According to the Kotlas Chemical Plant, OJSC website (<http://www.kchz.ru>).

In 2013, emissions from Kotlas chemical plant constituted 37 tons (in 2012 19 tones), or 0.02% of the total emissions in Arkhangelsk region (172 710 tons). The emissions from 2010 to 2013 increased by 16 thousand tons, or by 43%<sup>50</sup>.

The information on atmospheric air condition in Koryazhma is provided above in the section on Ilim Group, OJSC affiliate, which is a major stationary source of emissions in the city.

### *Discharge into water bodies*

Kotlas Chemical Plant, OJSC discharges the storm and waste waters into the sewage system belonging to Ilim Group, OJSC affiliate. Waste water is cleaned at the biological industrial treatment station of Ilim Group in Koryazhma.

The information on the state of the Vychegda, the main river artery of Koryazhma, is provided above in the section on Ilim Group, OJSC affiliate.

### *Sawmill 25, CJSC*

#### *General Information*

The enterprise is located in Arkhangelsk. Unlike Koryazhma and Novodvinsk, where the above polluters are located, Arkhangelsk is not a non-diversified city. The population is 358 000 inhabitants (according to 2012 data).

The Sawmill an old enterprise founded in 1898 as the Association of the Valnev brothers. The company belongs to a large commercial and industrial group of Titan companies. Currently, Sawmill 25, CJSC is a leader in wood processing industry in the Northwest. The company produces lumber for kiln drying (397 000 m<sup>3</sup> per year) and pulp chips as associated products. Coniferous trees are used as raw materials for production. The company's products are mainly exported to Germany, the Netherlands, Belgium, France, Great Britain, Ireland, Switzerland, Denmark, Egypt, and Israel. 1,061 employees are employed at the enterprise, working on two production sites - Maimaksansky (the Maimaksan District of Arkhangelsk) and Tsiglomensky (Tsiglomen village, Arkhangelsk) with a total area of 138.9 hectares.

The Sawmill produces electricity at its own TPP (made by the Austrian company Polytechnik) with thermal power capacity of 15 MW and electrical power of 2.2 MW. Dry or wet bark mixed with flakes and substandard chips are used as fuel for the TPP. It is also planned to launch another TPP (19 MW) at the Tsiglomensky site.

Several types of productions based on waste recycling have been established at the mill. The production of wood pellets from wood scraps is carried out by using Hekotek equipment (Estonia). The enterprise uses a technology for drum drying of wood scraps by combustion gases, produced by a heat generator working on bark waste.

The unit for the production of wood pellets at the Maimaksansky site uses spruce and pine sawdust with natural moisture as raw materials. It is also intended to put into operation a unit for production of wood pellets (equipment by Munch-Edelstahl GmbH) and to use underground treatment facilities at the Tsiglomensky site<sup>51</sup>.

### *Economic aspects*

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<sup>50</sup> Sbornik «Sostoyanie i okhrana okruzhayushey sredy Arhangelskoy oblasti za 2013 god» [Collection «State and Environmental Protection of the Arkhangelsk region for 2013»], Natural Resources and Ecology Agency of the Arkhangelsk region ([http://dvinland.ru/files/power/departments/comeco/envir/Doklad\\_2013\\_v2.pdf](http://dvinland.ru/files/power/departments/comeco/envir/Doklad_2013_v2.pdf)).

<sup>51</sup> <http://www.sawmill25.ru>.

With a turnover of 277 770 000 rubles, the net profit of the enterprise in 2012 was 211 570 000 rubles. Income tax amounted to 4 697 000 rubles. As Sawmill 25, CJSC is registered in Arkhangelsk, income tax goes to the budget of the Arkhangelsk region<sup>52</sup>.

### *Air emissions*

In 2012, the enterprise discharged 688 tons of pollutants into the atmosphere, including 278 tons of solid pollutants. However, it should be noted that in 2012 Sawmill 25, CJSC used the leased boiler station (belonging to housing settlement), emissions from which have made a significant contribution to the total amount of emissions. During the first half of 2013, 282 tons of pollutants were emitted into the atmosphere.

To clean the flue gases from pollutants, modern high-performance dust-extraction plants (multicyclones) were mounted<sup>53</sup>.

Sawmill 25, CJSC makes its own contribution to the pollution of Arkhangelsk along with other more major polluters. Air pollution level is assessed as high. According to 2013 observations in Arkhangelsk, 6 cases (in 2012 12 cases) of high air pollution (above 10 MAC) by benz(a)pyrene were recorded. The maximum mean daily concentration of these impurities was in January and constituted 20.9 MAC (in 2012 30.6 MAC). Over the past five years, the level of air pollution by carbon oxide, nitrogen dioxide, formaldehyde has increased in Arkhangelsk, but there was a reduction in emissions of carbon disulfide, sulfur dioxide, benz(a)pyrene, nitrogen oxide and suspended substances<sup>54</sup>.

### *Discharges into water bodies*

During 2012 the mill discharged 64.43 tons of storm water in terms of qualitative composition: SSAS - 0.710 kg, BOD<sub>full</sub> – 0.151 tons, suspended substances – 0.331 tons, COD - 30 kg, ammonium nitrogen - 0.01 tons. At present the Maimaksansky site has local treatment facilities manufactured by Polikhim Research and Production Enterprise<sup>55</sup>.

The Maimaksansky site of Sawmill 25 is located on the right bank of the Maimaksa River (one of the shipping arms of the Northern Dvina), and the Tsiglomensky site is on the left bank of the Nikolsky arm of the Northern Dvina (river estuary section). According to 2013 data, the Maimaksa flow was assessed as "polluted" (4 class quality, category "b"), and the waters of the Nikolsky arm - as "highly polluted" (3 quality class, category "b"), which marks a deterioration compared with 2010, when it was described as "polluted" (3 quality class, category "a").

In general, compared to 2012, water pollution level in this section of the river has not changed much. In 2013, the average annual concentration of iron compounds in the Nikolsky arm and the Maimaksa was 1.5-2 MAC. Maximum concentrations of iron compounds were recorded at 13 MAC in the Maimaksa flow. Maximum concentrations of copper in both basins reached 4-6 MAC, and in the Nikolsky arm maximum copper concentration exceeded the maximum allowable limits by 11 times (11 MAC). The annual average concentration of zinc in 2013 was fixed at 3 MAC, and its maximum concentration reached 6 MAC. In addition to the above characteristic pollutants of the Maimaksansky and the Nikolsky sections of the Northern Dvina, a high concentration of manganese (maximum concentration in both sections of the river

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<sup>52</sup> <http://www.list-org.com/company/18767>.

<sup>53</sup> Information letter from CJSC «Sawmill 25» dated 21.11.13, Ref. № 1518.

<sup>54</sup> Sbornik «Sostoyanie i okhrana okruzhayushey sredy Arkhangelskoy oblasti za 2013 god» [Collection «State and Environmental Protection of the Arkhangelsk region for 2013»], Natural Resources and Ecology Agency of the Arkhangelsk region ([http://dvinaland.ru/files/power/departments/comeco/envir/Doklad\\_2013\\_v2.pdf](http://dvinaland.ru/files/power/departments/comeco/envir/Doklad_2013_v2.pdf)).

<sup>55</sup> Information letter from Sawmill 25, CJSC dated 21.11.13, Ref. № 1518.

reached 20 MAC), aluminum compounds (maximum concentration in the Maimaksa flow was 4-5 MAC), and volatile phenols was found in the water<sup>56</sup>.

### *Industrial waste*

There is no information on the amount of waste. With regard to waste management activities, some sources state that the wood waste is used at the enterprise as fuel for thermal power generation. The remaining waste is transferred to a third party for recycling, burial and neutralization<sup>57</sup>.

### *Production process modernization plans for reducing the negative impact on the environment*

The official website of the company reports that Sawmill 25, CJSC strictly complies with all applicable environmental laws of the Russian Federation. The company annually approves a program for environmental activities, which includes monitoring storm water composition, lifting sunken wood, and cleaning the watersides. In addition to waste management activities (production of fuel pellets from industrial wood residues) and measures to ensure the energy independence of the enterprise, the technology used is being constantly improved and energy efficiency is being raised<sup>58</sup>.

The goal of Sawmill 25, CJSC for 2015 is to receive 60% raw materials used at the enterprise from a forest resource certified in accordance with international standards<sup>59</sup>.

Sawmill 25, CJSC holds the 10th All-Russian forest industry award in Green Energy nomination, and has a diploma and a medal of the Russian industry and Environmental Forum in the category of "best environmentally responsible company in the Arkhangelsk region"<sup>60</sup>.

## *Arkhangelsk Geological Mining Enterprise, OJSC*

### *General Information*

Arkhangelsk Geological Mining Enterprise, OJSC is a company dealing with exploration, prospecting, extraction and processing of minerals, the owner of which is the largest (in Russia) private oil company LUKOIL, OJSC. It is the oldest company in the industry in the north of Russia. It was registered in February, 1996. The company was a successor of Arkhangelsk State Enterprise "Arkhangelskgeologiya" which dealt with prospecting, exploration, extraction and processing of minerals. 184 people are employed with the company (according to 2012).

Over 80 years, the company has opened and explored more than 400 deposits (oil and gas, diamonds, coal, oil shale, nonferrous, rare and precious metals, non-metallic minerals, cement, etc.). Today, the company is developing V.Grib diamond mine (Verkhotinsky deposit) located 130 km away from Arkhangelsk on the territory of the Mezensky municipal district of the Arkhangelsk region (population in

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<sup>56</sup> Sbornik «Sostoyanie i okhrana okruzhayushey sredy Arkhangelskoy oblasti za 2013 god» [Collection «State and Environmental Protection of the Arkhangelsk region for 2013»], Natural Resources and Ecology Agency of the Arkhangelsk region ([http://dvinaland.ru/files/power/departments/comeco/envir/Doklad\\_2013\\_v2.pdf](http://dvinaland.ru/files/power/departments/comeco/envir/Doklad_2013_v2.pdf)).

<sup>57</sup> <http://www.sawmill25.ru/ecology/effect>; Sbornik «Sostoyanie i okhrana okruzhayushey sredy Arkhangelskoy oblasti za 2013 god» [Collection «State and Environmental Protection of the Arkhangelsk region for 2013»], Natural Resources and Ecology Agency of the Arkhangelsk region ([http://dvinaland.ru/files/power/departments/comeco/envir/Doklad\\_2013\\_v2.pdf](http://dvinaland.ru/files/power/departments/comeco/envir/Doklad_2013_v2.pdf)).

<sup>58</sup> Ibid.

<sup>59</sup> Information letter from Sawmill 25, CJSC dated 21.11.13, Ref. № 1518.

<sup>60</sup> <http://www.sawmill25.ru/ecology/effect>.

Mezensky municipal district is 9 800 people, according to 2013). The company also continues geological exploration<sup>61</sup>.

The power consumption of Arkhangelsk Geological Mining Enterprise, OJSC in 2013 amounted to 229 491 89.89 kWh<sup>62</sup>.

### *Economic aspects*

At the end of 2012, the company's net profit was negative. The annual report states that in 2012 Arkhangelsk Geological Mining Enterprise, OJSC continued implementing an investment program at the expense of the funds borrowed from LUKOIL, OJSC<sup>63</sup>. In 2013, the profit before taxation became positive (388 million rubles)<sup>64</sup>.

The company is registered in Arkhangelsk. Commercial production of diamonds is planned to start in 2014. If the asset complex at V.Grib mine is registered in Arkhangelsk region, the region's budget will gain a portion of the income tax. There are certain privileges related to property tax and income tax aimed at attracting major investors provided in the Arkhangelsk region<sup>65</sup>.

### *Air emissions*

Total pollutant emissions (nitrogen oxide, carbon oxide, sulfur dioxide, volatile organic compounds, black carbon, hydrocarbons) in 2012 amounted to 14.332 tons, which is several times less than the total allowable pollutant emissions (76.849 tons). It is noted that gas cleaning facilities are not provided at emission sources.

In 2012, a 5-year permission was granted for maximum allowable emissions within the production area of Verkhotinsky mining and beneficiation plant, which (including 32 sources of air pollution) is 176.12 tons/year for construction period and 4 549.23 tons/year for operation period (taking into account 52 sources of air pollution)<sup>66</sup>.

### *Discharges into water bodies*

The volume of water discharge at the enterprise in 2012 amounted to 26 010 m<sup>3</sup>/year, while allowable water discharge is 5 520 m<sup>3</sup>/year. The total discharge of pollutants in 2012 was 16.302 tons, which exceeded the total allowable discharge of pollutants (10.562 tons). The company's annual report also stated that the plant managed to get an adjournment in relation to accomplishing the prescriptions made by the Federal Service for Supervision of Natural Resource Usage (Rosprirodnadzor), concerning normative cleaning of domestic sewage, and it was planned in the second quarter of 2013 to put the stationary sewage treatment facilities into operation. It is unknown at the moment whether the treatment facilities have been started up.

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<sup>61</sup> <http://www.agddiamond.ru>.

<sup>62</sup> Godovoy otchet OAO «Arkhangelskgeoldobycha» za 2013 god [Annual report of Arkhangelsk Geological Mining Enterprise, OJSC for 2013] ([http://www.agddiamond.ru/invest/report\\_year/2013](http://www.agddiamond.ru/invest/report_year/2013)).

<sup>63</sup> Godovoy otchet OAO «Arkhangelskgeoldobycha» za 2012 god [Annual report of Arkhangelsk Geological Mining Enterprise, OJSC for 2012] ([http://www.agddiamond.ru/invest/report\\_year/2012](http://www.agddiamond.ru/invest/report_year/2012)).

<sup>64</sup> Godovoy otchet OAO «Arkhangelskgeoldobycha» za 2013 god [Annual report of Arkhangelsk Geological Mining Enterprise, OJSC for 2013] ([http://www.agddiamond.ru/invest/report\\_year/2013](http://www.agddiamond.ru/invest/report_year/2013)).

<sup>65</sup> <http://dvinaland.ru/finance/obespechenie-dokhodov-byudzheta/27208>.

<sup>66</sup> Godovoy otchet OAO «Arkhangelskgeoldobycha» za 2012 god [Annual report of Arkhangelsk Geological Mining Enterprise, OJSC for 2012] ([http://www.agddiamond.ru/invest/report\\_year/2012](http://www.agddiamond.ru/invest/report_year/2012)).



The annual report also contains information that in 2012 the Arkhangelsk Interdistrict Environmental Prosecutor's Office filed a complaint to the Oktyabrsky District Court against Arkhangelsk Geological Mining Enterprise, OJSC in relation to wastewater discharge exceeding the established standards into a swamp. According to the court's decision, Arkhangelsk Geological Mining Enterprise, OJSC was obliged to take appropriate measures, so that discharge of pollutants into a swamp complied with the established standards<sup>67</sup>.

### *Industrial wastes*

In 2013, the company generated 7 902 058 tons of waste<sup>68</sup> (in 2012 23 121 900 tons)<sup>69</sup>, which does not exceed the specified limits for waste disposal of IV hazard class (68 344 440 tons/year) and V hazard class waste, such as soil from excavation works (38 150 000 tons/year). The IV hazard class wastes were transferred to specialized organizations.

The company plans to build a landfill. It requires a change of the land use from forest land category into industrial land category.

Based on the requirements of license No. ARKh 13267 KR providing the right for geological survey, prospecting and mining of diamonds at the Verkhotinsky area, the Department of Ecology within Arkhangelsk Geological Mining Enterprise, OJSC monitors populations of animals, plants and aquatic ecosystems with participation of Siberian affiliate of the State Educational Institution "B.M.Zhitkov All-Russian Research Institute of Hunting and Farming" and Federal State Unitary Enterprise "Knipovich Polar Research Institute of Marine Fisheries and Oceanography".<sup>70</sup>

### *Production process modernization plans for reducing the negative impact on the environment*

In 2012, the main activities for nature management and environmental protection were as follows: obtaining a positive conclusion from the state ecological expertise on project documentation for construction of the tailings pond, as well as receiving documents with established standards for permissible impact on the environment (up to 2012 only temporary permits were available), monitoring of compliance with the established limits of impact on the environment and providing the necessary reporting forms, etc. An emphasis in environmental work in 2012 was placed on protection of surface waters (85% of labor costs)<sup>71</sup>.

## *Severalmaz, OJSC*

### *General Information*

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<sup>67</sup> Ibid.

<sup>68</sup> Sbornik «Sostoyanie i okhrana okruzhayushey sredy Arkhangelskoy oblasti za 2013 god» [Collection «State and Environmental Protection of the Arkhangelsk region for 2013»], Natural Resources and Ecology Agency of the Arkhangelsk region ([http://dvinaland.ru/files/power/departments/comeco/envir/Doklad\\_2013\\_v2.pdf](http://dvinaland.ru/files/power/departments/comeco/envir/Doklad_2013_v2.pdf)).

<sup>69</sup> Sbornik «Sostoyanie i okhrana okruzhayushey sredy Arkhangelskoy oblasti za 2012 god» [Collection «State and Environmental Protection of the Arkhangelsk region for 2012»], Natural Resources and Ecology Agency of the Arkhangelsk region (<http://www.czl29.ru/upload/medialibrary/74e/74e833fa78327c42e610e74cde1b5783.pdf>).

<sup>70</sup> Godovoy otchet OAO «Arhangelskgeoldobycha» za 2012 god [Annual report of Arkhangelsk Geological Mining Enterprise, OJSC for 2012] ([http://www.agddiamond.ru/invest/report\\_year/2012](http://www.agddiamond.ru/invest/report_year/2012)).

<sup>71</sup> Ibid.

Severalmaz Joint-Stock Company is one of the youngest diamond-mining companies in Russia.

Severalmaz, OJSC was registered in Arkhangelsk on August 27, 1992, and industrial production at M.V.Lomonosov diamond mine began in 2005. In 2012, diamond production amounted to 558 600 carats, which provides only about 1.5% of the total production of diamonds in ALROSA, JSC. The main shareholder of the company. Severalmaz, OJSC plans to increase production of ore processing, and, hence, the volume of mined diamonds will be increased significantly.

The average staff at Severalmaz, OJSC departments is 1139 people (data for 2011)<sup>72</sup>. The main consumers of electricity, heat, water from Severalmaz, OJSC are Lomonosov Mining and Processing Plant (capacity - 1.0 million tons of ore per year) and the base of the Pomorsky geological survey expedition. M.V. Lomonosov deposit, where Lomonosov Mining and Processing Plant is located, is near Pomoriye village, Primorsky district, Arkhangelsk region.

During the last year, Severalmaz, OJSC has increased the production of ore processing and put into operation a second module of ore-processing plant with production capacity of 3 million tons/year<sup>73</sup>.

According to Severalmaz's plan, in 2015 diamond production should reach 2 million carats, in 2016 - 2.1 million carats, in 2017 - 2.5 million carats, in 2018 - 3.7 million carats, and by 2019 it will reach 4.3 million carats per year<sup>74</sup>.

In 2012, Severalmaz, OJSC used 21 464 910 tons of diesel fuel (for a sum of 604 705 080 rubles) and 119.96 tons of petrol (for a sum of 3 623 610 rubles). Power consumption at Lomonosov Mining and Processing Plant reached 8 906 kWh<sup>75</sup>.

### *Economic aspects*

Total revenues from all activities of the company in 2012 amounted to 1 087 900 000 rubles. The company is not profitable yet. The loss for 2012 year amounted to 342 200 000 rubles. The volume of the company's tax payments was 626 800 000 rubles<sup>76</sup>.

### *Air emissions*

The plant's air emissions in 2012 reached 597 tons (in 2011 - 311 tons), or 0.3% of total emissions in the Arkhangelsk region. Severalmaz, OJSC together with North Onega bauxite mine, OJSC (out of mining companies in the region) make a significant contribution to air pollution<sup>77</sup>.

### *Discharges into water bodies*

In 2012, water consumption by Lomonosov Mining and Processing Plant constituted 100 210 m<sup>3</sup> (2011 – 114 898 m<sup>3</sup>), and water consumption by the base of Pomorsky geological survey expedition – 2 257 m<sup>3</sup> (in 2011 – 3 268 m<sup>3</sup>)<sup>78</sup>.

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<sup>72</sup> <http://www.severalmaz.ru/investors/annual-2011.pdf>.

<sup>73</sup> <http://www.bclass.ru/ekonomika/severalmaz-zapustil-vtoruiu-fabriku-na-almaznom-mestorozhdenii>.

<sup>74</sup> Ibid.

<sup>75</sup> Godovoy otchet OAO «Severalmaz» za 2012 god [Annual report of Severalmaz, OJSC for 2012] (<http://www.e-disclosure.ru/portal/files.aspx?id=268&type=2>).

<sup>76</sup> <http://www.severalmaz.ru/investors/annual-2011.pdf>.

<sup>77</sup> Sbornik «Sostoyanie i okhrana okruzhayushey sredy Arkhangelskoy oblasti za 2012 god» [Collection «State and Environmental Protection of the Arkhangelsk region for 2012»], Natural Resources and Ecology Agency of the Arkhangelsk region (<http://www.czl29.ru/upload/medialibrary/74e/74e833fa78327c42e610e74cde1b5783.pdf>).



## *Industrial wastes*

In 2013, the company generated 7 434 300 tons<sup>79</sup> (in 2012 – 25 417 900 tons)<sup>80</sup> of waste.

## *Production process modernization plans for reducing the negative impact on the environment*

The report for 2012 states that the enterprise will continue to carry out the modernization of the manufacturing scheme for the concentrating plant (CP No. 1) in order to increase the main output and to improve performance. To provide the concentrating plant with industrial water of the required quality, it is planned to start up the tailing pumping station and to construct a new tailings pond at the tailings site (TS)<sup>81</sup>.

Among the measures for the protection and rational use of water resources in 2012-2013, such measures as drilling of water-lowering wells, construction of bailing collectors and monitoring for water bodies were highlighted, on which 98 968 200 rubles was spent in 2012 and 159 369 400 rubles in 2013<sup>82</sup>. It is also known that the company is engaged in designing water purification facilities.

The annual report also states that the company monitors environmental situation in the area of M.V.Lomonosov diamond mine: control of forest health condition, soil and vegetation cover condition, rare and specially protected species condition and atmospheric air condition is in progress. Thanks to space imagery, the forest in the area of development of the deposit is locally monitored. Monitoring results, in particular, give the evidence of satisfactory condition of populations of rare and specially protected species of animals and no impact on migration of animals on the territory adjacent to the Lomonosov Mining and Processing Plant.

The company assures that "all the observations are carried out in full in relation to quarry, drainage and storm water wastes, emissions and air condition", although more detailed information on the state of the water and the atmosphere in the vicinity of the company is unavailable.

At the same time, the report informs that in 2012 7.65 million rubles (in 2011 - 6.5 million rubles.) was spent on measures to protect the environment (without specifying the measures), and payment for the negative impact on the environment (emissions, discharges and waste disposal) in 2012 amounted to

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<sup>78</sup> Ibid.

<sup>79</sup> Sbornik «Sostoyanie i okhrana okruzhayushey sredey Arkhangel'skoy oblasti za 2013 god» [Collection «State and Environmental Protection of the Arkhangel'sk region for 2013»], Natural Resources and Ecology Agency of the Arkhangel'sk region ([http://dvinaland.ru/files/power/departments/comeco/envir/Doklad\\_2013\\_v2.pdf](http://dvinaland.ru/files/power/departments/comeco/envir/Doklad_2013_v2.pdf)).

<sup>80</sup> Sbornik «Sostoyanie i okhrana okruzhayushey sredey Arkhangel'skoy oblasti za 2012 god» [Collection «State and Environmental Protection of the Arkhangel'sk region for 2012»], Natural Resources and Ecology Agency of the Arkhangel'sk region (<http://www.czl29.ru/upload/medialibrary/74e/74e833fa78327c42e610e74cde1b5783.pdf>).

<sup>81</sup> Godovoy otchet OAO «Severalmaz» za 2012 god [Annual report of Severalmaz, OJSC for 2012] (<http://www.e-disclosure.ru/portal/files.aspx?id=268&type=2>).

<sup>82</sup> Sbornik «Sostoyanie i okhrana okruzhayushey sredey Arkhangel'skoy oblasti za 2012 god» [Collection «State and Environmental Protection of the Arkhangel'sk region for 2012»], Natural Resources and Ecology Agency of the Arkhangel'sk region (<http://www.czl29.ru/upload/medialibrary/74e/74e833fa78327c42e610e74cde1b5783.pdf>); Sbornik «Sostoyanie i okhrana okruzhayushey sredey Arkhangel'skoy oblasti za 2013 god» [Collection «State and Environmental Protection of the Arkhangel'sk region for 2013»], Natural Resources and Ecology Agency of the Arkhangel'sk region ([http://dvinaland.ru/files/power/departments/comeco/envir/Doklad\\_2013\\_v2.pdf](http://dvinaland.ru/files/power/departments/comeco/envir/Doklad_2013_v2.pdf)).

19.07 million rubles (in 2011 - 13.8 million rubles), and over 90% of the total amount was the payment for accommodation of overburden rocks in refuse dumps (V hazard class waste)<sup>83</sup>.

## *Savinsky Cement Plant, CJSC*

### *General Information*

Savinsky Cement Plant, CJSC founded in 1966 is the only cement manufacturer in the Arkhangelsk region. The plant is located in Savinsky village, Plesetsk District, Arkhangelsk region. The population of the village is about 7,500 inhabitants (according to 2011 data). The number of employees has dropped since the beginning of 2014 and now it is 344 people<sup>84</sup>.

Savinsky Cement Plant, CJSC is a part of EUROCEMENT Group holding. The products are awarded with quality management diplomas ("All-Russian Quality Mark. Quality Mark of the 21<sup>st</sup> Century", "100 best goods of Russia"). The company's products are used for monolithic and precast concrete in construction and are supplied to the Russian market in the North-West and Central regions, as well as to the Far North regions. The production capacity is more than 1.2 million tons of cement per year<sup>85</sup>.

The volume of power consumption in 2012 grew by more than 85% and reached 111.6 million kWh, which is directly related to the increase in production<sup>86</sup>.

### *Air emissions*

The emissions of Savinsky Cement Plant, CJSC in 2013 reached 2 631 tons (in 2012 2 189 tons), or 1.5% of total emissions in region, and this volume was reduced, as compared to 2011, (4 160 tons) due to the changes in production volumes<sup>87</sup>. Savinsky Cement Plant is the main air pollutant (out of all companies) dealing with production of non-metallic mineral products (construction materials) in the region.

It is reported that as a result of modernization, the plant's air emissions decreased several times and are now far below the maximum allowable indicators<sup>88</sup>, but more precise information on indicators for Savinsky Cement Plant, CJSC is unavailable, as well as the information on discharges into water bodies and the volume of industrial waste generated.

### *Production process modernization plans for reducing the negative impact on the environment*

EUROCEMENT group holding, the owner of Savinsky cement plant, adopted a voluntary environmental certification system on conformance to EcoMaterial 1.3 standard, which demonstrates the brand's environmental responsibility and ensures the quality of the material<sup>89</sup>.

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<sup>83</sup> Godovoy otchet OAO «Severalmaz» za 2012 god [Annual report of Severalmaz, OJSC for 2012] (<http://www.e-disclosure.ru/portal/files.aspx?id=268&type=2>).

<sup>84</sup> <http://www.nzgb.com/news-all/238-zao-savinskij-tsementnyj-zavod-v-pravitelstvo-oblasti-ofitsialnoj-informatsii-o-likvidatsii-predpriyatiya-ne-postupalo.html>.

<sup>85</sup> Based on website of CJSC«EUROCEMENT Group» (<http://www.eurocement.ru>).

<sup>86</sup> [http://www.arhen.ru/index.php?option=com\\_content&task=view&id=6187&Itemid=633](http://www.arhen.ru/index.php?option=com_content&task=view&id=6187&Itemid=633).

<sup>87</sup> Sbornik «Sostoyanie i okhrana okruzhayushey sredy Arkhangelskoy oblasti za 2013 god» [Collection «State and Environmental Protection of the Arkhangelsk region for 2013»], Natural Resources and Ecology Agency of the Arkhangelsk region ([http://dvinaland.ru/files/power/departments/comeco/envir/Doklad\\_2013\\_v2.pdf](http://dvinaland.ru/files/power/departments/comeco/envir/Doklad_2013_v2.pdf)).

<sup>88</sup> [http://www.eurocement.ru/cntnt/rus/ustoychivoe-razv/ekologiche2/zashita\\_ok.html](http://www.eurocement.ru/cntnt/rus/ustoychivoe-razv/ekologiche2/zashita_ok.html).

<sup>89</sup> <http://www.eurocement.ru/cntnt/rus/production3/zavody1/rossiya/arhangelsk.html>.

The holding has been actively investing in the modernization of production that implies (together with an increase in production capacity due to using modern technologies) a reduction of the impact on the environment, namely the transition to dry process of production, energy- and water-saving technologies, as well as improving the product quality control<sup>90</sup>.

This information refers to general policy of the holding. Information on specific activities carried out at Savinsky Cement Plant, CJSC is unavailable.

## *North-Onega bauxite mine, OJSC*

### *General Information*

North-Onega bauxite mine, OJSC is a bauxite mining enterprise in Severoonezhsk town, Plesetsk District, Arkhangelsk region. This is a township-forming enterprise where more than 600 people are employed (according to 2012)<sup>91</sup> - almost all the able-bodied population of the village.

The enterprise uses the Western section of Belovodskaya deposit of Iksinskiy mine where the poor-quality bauxites with low iron content are mined. The mining is open-cast. In 2012, 971 700 tons of salable ore (including losses) was produced. The mined bauxites and clays are used in alumina production as a raw material for cement and refractory industries, as well as a deoxidant in metallurgy. Ore and overburden rocks are used in the manufacture of composite materials for production of linoleum, proppants, bricks, tiles, expanded clay, silumi, etc.<sup>92</sup>

### *Economic aspects*

According to reports for 2009 and 2010, net profit of company amounted to 6 938 300 rubles in 2009 and 1 548 969 000 rubles in 2010. The company pays income tax to the budget of the Arkhangelsk region<sup>93</sup>.

### *Air emissions*

Among the mineral mining companies (except for fuel and energy one), North-Onega bauxite mine, OJSC is the second (after Severalmaz, OJSC) main pollutant in the Arkhangelsk region. In 2011 (the last year of data provided), the company produced 209 tons of emissions (in 2010 233 tons), or 0.10% of total emissions in the region<sup>94</sup>.

### *Discharges into water bodies*

Information on the volume of discharges into water bodies is unavailable. In the course of inspection by the Department of the Federal Service for Supervision of Natural Resources (Rosprirodnadzor) in the Arkhangelsk region, it was found that during the period from 18 July to 20 November, 2012 the company discharged pollutants with excess of NAD into water bodies. The relevant prescriptions were provided<sup>95</sup>.

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<sup>90</sup> <http://www.eurocement.ru/cntnt/rus/production3/modernizac1.html>.

<sup>91</sup> [http://www.pleseck.ru/kp/arh/2012/2012071128\(710\).pdf](http://www.pleseck.ru/kp/arh/2012/2012071128(710).pdf).

<sup>92</sup> <http://usscompany.ru/node/2>.

<sup>93</sup> <http://news.metalweb.ru/news/news39234.html>.

<sup>94</sup> Sbornik «Sostoyanie i okhrana okruzhayushey sredy Arkhangelskoy oblasti za 2013 god» [Collection «State and Environmental Protection of the Arkhangelsk region for 2013»], Natural Resources and Ecology Agency of the Arkhangelsk region ([http://dvincialand.ru/files/power/departments/comeco/envir/Doklad\\_2013\\_v2.pdf](http://dvincialand.ru/files/power/departments/comeco/envir/Doklad_2013_v2.pdf)).

<sup>95</sup> <http://www.rpn.atnet.ru/ind/13-02-08.html>.

## *Industrial wastes*

In 2013, North-Onega bauxite mine, OJSC generated 3 998 600 tons (in 2012 3 124 400 tons) of waste<sup>96</sup>.

## *Production process modernization plans for reducing the negative impact on the environment*

In order to reduce the negative impact on the atmosphere, in 2012-2013 the enterprise took measures to maintain emissions within normal limits by using instrumental control over vehicle emissions (2012), to control over emissions from boiler station (2013) and to obtain sanitary and epidemiological conclusion (2013).

Measures reported to protect water bodies in 2012-2013 include a chemical analysis of quarry, sewage and natural waters, waters of the industrial site and waters of the Ikxa and the Luzhma rivers for monitoring the water protection zone (according to requirements of the Water Code), replacement of the filter material in oil separators of industrial sewage to reduce oil content in waste waters of sewage system, development of draft code provisions for allowable discharges and obtaining the sanitary-epidemiological conclusion.

The plant has transferred the waste for burial and utilization to a number of specialized companies (Uyut-2, LLC, TECH-Service, LLC, ROSA-1, LLC)<sup>97</sup>. More detailed information (what part of the waste has been disposed of, etc.) is not available.

## *RN-Arkhangelsknefteprodukt, LLC*

### *General Information*

RN-Arkhangelsknefteprodukt, LLC is a subsidiary of NK Rosneft, OJSC. The company incorporates Arkhangelsk oil terminal and a number of branches. The company owns 11 oil depots and 54 oil filling stations in total.

Among the main activities of RN-Arkhangelsknefteprodukt, LLC are oil transshipment, bunkering, wholesale and retail trading, oil products storage.

Arkhangelsk terminal, located 8 km away from Arkhangelsk (in the vicinity of Talagi village, on the right bank of the Kuznechikha river), provides the receipt, storage and shipment of oil products: light (kerosene, petrol, diesel oil) and dark (heating oil, masut). Oil products are delivered to the terminal by rail and shipped by waterways and by road. The number of employees is 983 people (according to 2013)<sup>98</sup>.

### *Economic aspects*

RN-Arkhangelsknefteprodukt, LLC pays income tax to the budget of the Arkhangelsk region. The company is one of the largest taxpayers in the region. It is reported that during 2013 the company transferred to the region's budget about 330 million rubles<sup>99</sup>.

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<sup>96</sup> Sbornik «Sostoyanie i okhrana okruzhayushey sredy Arkhangelskoy oblasti za 2013 god» [Collection «State and Environmental Protection of the Arkhangelsk region for 2013»], Natural Resources and Ecology Agency of the Arkhangelsk region ([http://dvinaland.ru/files/power/departments/comeco/envir/Doklad\\_2013\\_v2.pdf](http://dvinaland.ru/files/power/departments/comeco/envir/Doklad_2013_v2.pdf)); Sbornik «Sostoyanie i okhrana okruzhayushey sredy Arkhangelskoy oblasti za 2012 god» [Collection «State and Environmental Protection of the Arkhangelsk region for 2012»], Natural Resources and Ecology Agency of the Arkhangelsk region (<http://www.czl29.ru/upload/medialibrary/74e/74e833fa78327c42e610e74cde1b5783.pdf>).

<sup>97</sup> Ibid.

<sup>98</sup> Information from RN-Arkhangelsknefteprodukt, LLC in response to request dated 18.11.13 No. 2057 made by non-state educational establishment "YeKTS".

<sup>99</sup> <http://www.dvinainform.ru/economy/2014/02/18/21766.html>.

### *Air emissions*

In 2012, among the pollutant emissions from RN-Arkhangelsknefteprodukt, LLC, methane emissions amounted to 515.107 tons, hexane emissions – to 225.957 tons.

The company has duly developed and agreed project documentation on MAD for 14 objects, including Arkhangelsk terminal, Severodvinsky branch, Nyandomsky branch, Plesetsky branch, Leshukonsky branch, Onegsky section, Kotlassky branch, Velsky branch, ZhNNK "Privodino". All fuel filling stations have permits for pollutant emissions<sup>100</sup>.

### *Discharges into water bodies*

The only source of discharges into water bodies in RN-Arkhangelsknefteprodukt, LLC is Arkhangelsk terminal. In 2012, RN-Arkhangelsknefteprodukt, LLC discharged into surface water bodies 75 990 tons of pollutants (ammonia, BOD, suspended substances, oil products, sulfate, chloride, phosphate, nitrate, nitrite, dry residue, iron).

The Arkhangelsk terminal has a permit for discharge, valid through 2016. The block of cleansing structures (design capacity is 394 200 m<sup>3</sup>/year), to which industrial storm discharges inflow, comprises the steps of buffering and separating processing, flotation and filtration purification. Surface and industrial wastewaters cleaning from oil products and suspended substances at fuel filling stations is carried out by means of oil catchers with different modifications<sup>101</sup>.

Meanwhile, earlier in 2011, in the course of audit of the enterprise's compliance with the prescriptions the Interdistrict Environmental Prosecutor's Office of the Arkhangelsk region revealed that within the prescribed time limit RN-Arkhangelsknefteprodukt, LLC has not fulfilled the requirements for providing the storm water dispersion from fuel filling stations (in accordance with applicable legislation) and has not obtained a permit for discharging the pollutants as a part of storm waters from oil depots and fuel filling stations of RN-Arkhangelsknefteprodukt into the environment<sup>102</sup>. Upon the audit new orders to eliminate violations were issued. On July 3, 2012, the Arkhangelsk Interdistrict Environmental Prosecutor's Office filed a claim to the Primorsky district court against RN-Arkhangelsknefteprodukt, LLC concerning the discharge of waste water into the Volzhivka River with excess of the established standards. RN-Arkhangelsknefteprodukt, LLC was obliged to carry out a number of measures to reduce the discharge of pollutants into water bodies (cleaning the sewage wells, replacing the steel pipes of the collector and repairing the dispersive outlet) in the amount of 1 002 230 rubles, and the company was also fined for damage in the amount of 532 780 rubles<sup>103</sup>.

In waters of the Kuznechikha channel, where Arkhangelsk terminal discharges its waste waters, in 2012-2013 maximum concentration of oxidation-prone organic substances (in terms of COD) was fixed - 6 MAC, the average (maximum) concentration of aluminum compounds - 2 (5) MAC. In 2012, maximum concentration of easily oxidable organic substances (in terms of BOD<sub>5</sub> - biochemical oxygen demand indicator to be detected for 5 days) was 2 MAC and maximum concentration of oil products was 2 MAC.

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<sup>100</sup> Information from RN-Arkhangelsknefteprodukt, LLC in response to request dated 18.11.13 No. 2057 made by non-state educational establishment "YeKTS".

<sup>101</sup> Ibid.

<sup>102</sup> <http://www.rpn.atnet.ru/ind/11-11-17.html>.

<sup>103</sup> Sbornik «Sostoyanie i okhrana okruzhayushey sredy Arkhangelskoy oblasti za 2013 god» [Collection «State and Environmental Protection of the Arkhangelsk region for 2013»], Natural Resources and Ecology Agency of the Arkhangelsk region ([http://dvincialand.ru/files/power/departments/comeco/envir/Doklad\\_2013\\_v2.pdf](http://dvincialand.ru/files/power/departments/comeco/envir/Doklad_2013_v2.pdf)).

Maximum concentration of lead and nickel compounds (2 MAC) was found at the Kuznechikha channel in 2010 and 2012<sup>104</sup>.

### *Industrial wastes*

The information on the volume of wastes is unavailable. It is known from certain sources that the company takes steps to control and prevent contamination of soil, but, other than tillage by bacteria preparation, no other details are reported.

### *Production process modernization plans for reducing the negative impact on the environment*

RN-Arkhangelsknefteprodukt, LLC performs production quality control of waste, natural and underground waters, atmospheric air, soil of the sites by using a testing laboratory within Arkhangelsk terminal with the involvement of accredited specialists from laboratories (Federal Budget Institution "Centre for Laboratory Analysis and Technical Measurements in the Arkhangelsk region ", Federal Budget Healthcare Institution "Center for Hygiene and Epidemiology in the Arkhangelsk Region"). The company has successfully passed the recertification to confirm compliance with ISO 14001: 2004 and OHSAS 18001: 2007 requirements<sup>105</sup>.

The policy of NK Rosneft, OJSC in the field of the environment (related to industrial safety and labor protection) is focused on raising the industrial and environmental safety of industrial facilities of the company to the best standards of world oil companies<sup>106</sup>.

According to several sources, the latest achievements of RN-Arkhangelsknefteprodukt, LLC in the field of environmental protection are as follows: construction of industrial and storm water sewage system in Severodvinsky branch together with cleansing structures and underwater outlet, start of the construction of industrial and storm water sewage system for fuel filling stations No. 19 and No. 24 in Plesetsky branch<sup>107</sup>.

In 2010-2012 years, RN-Arkhangelsknefteprodukt, LLC took top places as the best subsidiary of NK Rosneft, OJSC based on the results of the year in the field of environmental protection.

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<sup>104</sup> Ibid; Sbornik «Sostoyanie i okhrana okruzhayushey sredy Arkhangelskoy oblasti za 2012 god» [Collection «State and Environmental Protection of the Arkhangelsk region for 2012»], Natural Resources and Ecology Agency of the Arkhangelsk region (<http://www.czl29.ru/upload/medialibrary/74e/74e833fa78327c42e610e74cde1b5783.pdf>).

<sup>105</sup> Information from RN-Arkhangelsknefteprodukt, LLC in response to request dated 18.11.13 No. 2057 made by non-state educational establishment "YeKTs".

<sup>106</sup> [http://www.rosneft.ru/attach/0/02/68/HealthSafetyandThe environment.pdf](http://www.rosneft.ru/attach/0/02/68/HealthSafetyandThe%20environment.pdf).

<sup>107</sup> Information from RN-Arkhangelsknefteprodukt, LLC in response to request dated 18.11.13 No. 2057 made by non-state educational establishment "YeKTs".





Photo by Olga Kruglova/flickr.com



## Republic of Karelia

The Republic of Karelia is situated in the northwest of the Russian Federation and borders on Finland in the west, on the Murmansk region in the north, on the Arkhangelsk region in the east and on the Leningrad and the Vologda regions in the south. The area of Karelia is 180 500 km<sup>2</sup>, which is about 1% of the territory of Russia. The population of Karelia is 636 900 people, approximately 80% of which is urban<sup>108</sup>.

Industry comprises 30% of the structure of the gross regional product. There are significant reserves of forest and mineral resources. Iron ore, titanium, vanadium, molybdenum, precious metals, diamonds, mica, building materials (granite, diabase, marble), ceramic raw materials (pegmatite, spar), apatite and carbonate ores and alkaline amphibole asbestos<sup>109</sup> constitute the minerals of the specialized raw material industry. In 2013, the share of the mining industry reached 43%.

The processing industry, the share of which is 38%, comprises enterprises related to the pulp and paper industry, aluminum production and wood processing production. The mining complex of the Republic of Karelia is the second largest mining complex in the structure of the industry after the timber processing industry.

In areas where pulp and paper and metallurgy companies are present, the ecological condition is strained.



<sup>108</sup> <http://gov.karelia.ru/gov/Different/karelia3.html>.

<sup>109</sup> Ibid.



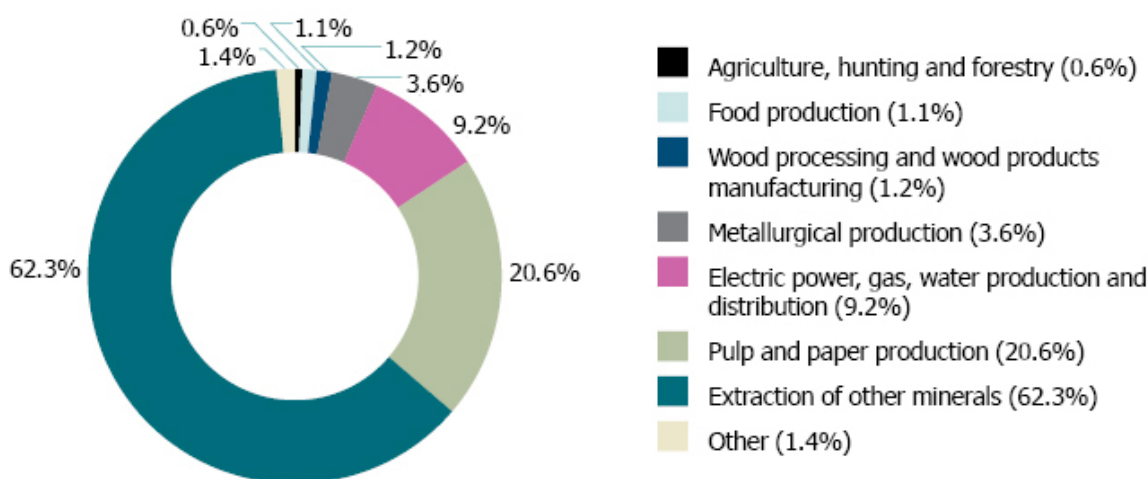
## General characteristics of the environment condition

### Atmospheric air condition

The status indicators of air condition are air pollutant emissions by industrial companies and air pollution by the end products of fuel combustion.

In recent years there has been a negative trend towards an increase in emissions of harmful substances from stationary sources into the atmosphere. In 2013, these emissions have grown by 11.2% as compared with 2012<sup>110</sup>.

In total in 2013 industries emitted 118 505 tons of pollutants into the atmosphere (in 2012 – 106 605 tons). Two major industries, making a major contribution to air pollution, are mineral mining (73 865 tons, or 62.3% of the total gross emissions in the republic), and the pulp and paper industry (24 452 tons, or 20.6 %).



**Fig. 1. Structure for air pollutant emissions in the Republic of Karelia by types of economic activity, 2013<sup>111</sup>**

As compared to 2012, there was an increase of emissions from mineral mining (by 22.1%) and pulp and paper companies (by 30.2%). The most significant decline in emissions was from metallurgical companies (51.2%) and companies involved in the production and distribution of electricity, gas and water (20.3%)<sup>112</sup>.

The majority of the emissions occur in the centers of industrial production - Kondopoga, Kostomuksha, Petrozavodsk, Pitkyaranta, Segezha, and Nadvoitsy.

<sup>110</sup> Gosudarstvenny doklad «O sostoyanii okruzhayushey sredy Respubliki Kareliya v 2013 godu» [State report "State of The Environment in the Republic of Karelia in 2013"], Ministry of Nature Management and The Environment of the Republic of Karelia ([http://www.gov.karelia.ru/Power/Committee/Forest/Docum/docl\\_2013.pdf](http://www.gov.karelia.ru/Power/Committee/Forest/Docum/docl_2013.pdf)).

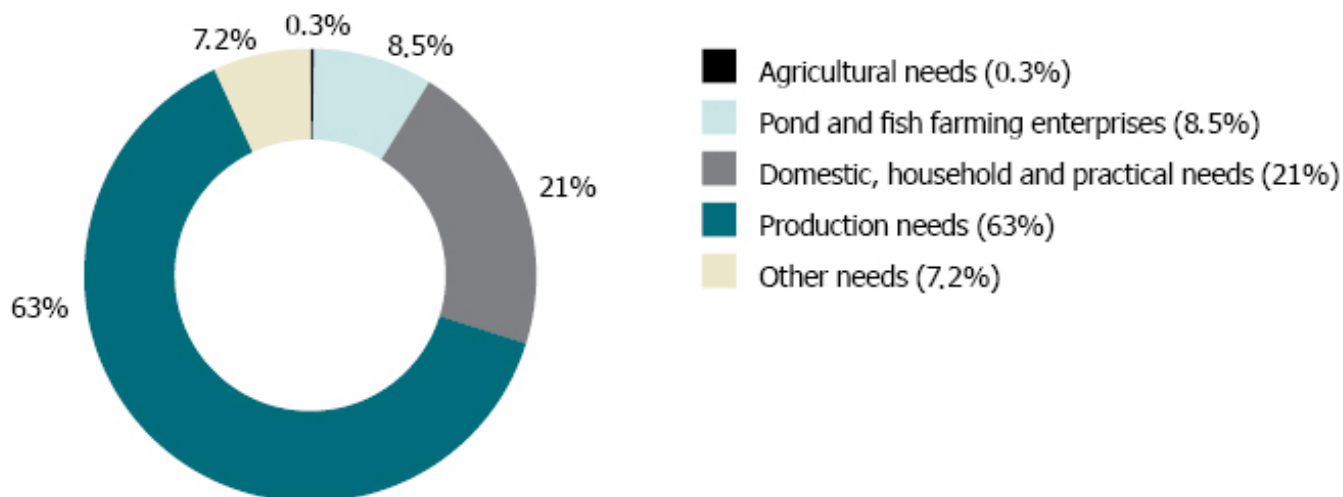
<sup>111</sup> [http://www.gov.karelia.ru/gov/Power/Committee/Forest/Docum/docl\\_2013.pdf](http://www.gov.karelia.ru/gov/Power/Committee/Forest/Docum/docl_2013.pdf).

<sup>112</sup> Ibid.

## The condition of water resources

The territory of the Republic of Karelia has a well developed water network related to the basin of the White Sea and the Baltic Sea. A quarter of the republic's territory is water surface. The total length of the water network is almost 83 000 km.

In recent years, the water intake structure has not undergone significant changes. More than 50% of the water intake goes to the industrial sector. Out of the total volume of water used in Karelia in 2013 (172.35 million m<sup>3</sup>) industry consumes the lion's share: 63% of water (109.32 million m<sup>3</sup>) was used for production needs<sup>113</sup>.



**Fig. 2. Structure for water use in the Republic of Karelia, 2013<sup>114</sup>**

Water pollution by industrial enterprises occurs due to the discharge of untreated or insufficiently treated waste waters.

89% (217.08 million m<sup>3</sup>) of wastewaters, discharged in 2013 into the surface water bodies of Karelia, were contaminated. Out of this amount, 139.2 million m<sup>3</sup> of wastewater is discharged as insufficiently treated and 77.40 million m<sup>3</sup> - entirely without purification. As compared with 2012, the volume of untreated contaminated wastewater was reduced by 15.4%, but the volume of the wastewater discharged without treatment has increased more than 6 times<sup>115</sup>.

The main polluters are the concerns; Kondopoga, OJSC; Segezha pulp-and-paper plant, OJSC; Pitkyaranta pulp mill, OJSC and Karelian pellet, OJSC. The problem of waste water treatment in the pulp and paper industry is particularly important, as about 60% of the total volume of polluted wastewater in the republic<sup>116</sup> was created by pulp and paper enterprises (Pitkyaranta pulp mill, OJSC; Segezha PPM, OJSC and Kondopoga, OJSC) in 2012, although in 2013 a reduction in water intake was observed.

<sup>113</sup> Ibid.

<sup>114</sup> Ibid.

<sup>115</sup> Ibid.

<sup>116</sup> Ibid.

The main pollutants of water bodies of the Republic are suspended substances, ammonia nitrogen, phosphates, iron, nickel, copper, nitrites, oil products and fluorine.

Because of the significant volumes of untreated water discharges, the quality of water bodies in the Republic of Karelia remains low. According to contamination characteristics, most of the monitored rivers are classified as contaminated. (More detailed information about excess of MAC for harmful substances in water bodies located close to the large polluters can be found in the appropriate chapters on polluters).

## Soil cover condition

Anthropogenic sources of soil pollution play a significant role in determining soil quality and the extent of its contamination. There is a trend in the republic towards an increase in the specific weight of soil samples not complying with hygienic standards, notably, the largest specific weight of unsatisfactory soil samples according to sanitary chemical indicators was recorded in the zones of influence of industrial plants. One of the factors of soil degradation is industrial waste.

## Industrial wastes

In 2011-2012, the intensity of environment pollution by industrial waste grew, but in 2013 the total volume of produced waste decreased slightly and amounted to 135 788 287.0 tons (in 2012 – 137 968 045.0 tons). The largest volumes of waste (96.7%) are caused by the extraction of minerals.

The ore mining company Karelian Pellet, OJSC (Kostomuksha) is a major environmental pollutant (in 2013 – 131 750 523.9 tons), through industrial wastes such as overburden rocks, non-recyclable wastes and enrichment sludge. These wastes generally are not utilized and, as a result, contaminate soil and water bodies around refuse dumps with heavy metals (iron, chromium and others). The industrial centers of Petrozavodsk and Kondopoga are also sources of pollution by heavy metals (lead, etc.)<sup>117</sup>.

In 2013, the volume of IV hazard class waste (e.g. bark waste, household solid waste, waste resulting from the mechanical, biological treatment and processing of wastewater, as well as liquid household waste, etc.) in the Republic of Karelia increased by 12.2%. Although they are classified as non-hazardous wastes, an insufficient volume of recultivation works and the increasing area of the refuse dumps have a negative impact on the environmental situation in Karelia. In the same year, there was an increase in waste generation of I and III hazard class. At the same time, a 99% increase in the share of recycling and demercurization of I hazard class waste in 2012 and the growth of III class waste volumes transferred to the disposal and use in 2013 can be noted as positive trends <sup>118</sup>.

## Main polluters

The largest industrial polluters in the Republic of Karelia are Karelian Pellet, OJSC; Nadvoitsky Aluminum Plant (branch of NAZ-SUAL, OJSC), Segezha PPM, OJSC; Kondopoga, OJSC and Pitkyaranta pulp mill, OJSC.

All the five largest industrial polluters of Karelia responsible for the load on the environment are the main township-forming enterprises in Kostomuksha, Nadvoitsy, Kondopoga, Segezha and Pitkyaranta.

The factual basis for this section consists of data taken from official sources of authorities of the Republic of Karelia: city administrations, state statistics services, as well as companies' information and reports and news articles of federal and regional news agencies. All materials are publicly available. In addition to these materials, we used data provided by environmental organizations.

## *Karelian Pellet, OJSC*

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<sup>117</sup> Ibid.

<sup>118</sup> Ibid.

## *General Information*

Karelian Pellet, OJSC is the township-forming enterprise in the Kostomuksha municipal district. The number of employees in 2012 was 3 683 people (the population of Kostomuksha is 29 259 inhabitants)<sup>119</sup>. Since 1982 the company has dealt with the extraction and processing of ferruginous quartzites into iron-ore pellets. Since 1999 it is a part of the mining division of the mining and smelting company Severstal, OJSC.

The enterprise produces iron-ore pellets with an iron content up to 64-66%. These products meet high quality world standards with a high added value (the pellets can be used directly in the blast furnace without intermediate agglomeration by sintering). The main consumer of the company's products is the metallurgical plant Severstal located in Cherepovets (Vologda region). The company also exports its products to the UK, the Netherlands, the USA and China. Karelian Pellet, OJSC constantly occupies leading positions in various rankings as the best Russian exporter and as the best mining company in Russia. Meanwhile, the company is one of the biggest polluters of Karelia in terms of emissions, discharges and industrial wastes.

The company produces about 20% of all Russian iron-ore pellets. The mineral source for the production of pellets is the Kostomukshsky iron-ore deposit, the largest one in the North-West of Russia. The development of Kostomukshsky and Korpangsky quarries are underway. The explored ore reserves amount to 1.269 billion tons; in 2012, extraction of raw materials reached 30.420 million tons (in 2011 - 29.932 million tons); 10.325 million tons of iron-ore pellets were produced (in 2011 - 10.120 million tons)<sup>120</sup>.

The production process is energy-intensive, the company consumes about 22% of all electricity in the Republic of Karelia (in 2012 - 1 553.7 million kWh) with a peak load of 213.8 MW (in 2011 - 218.7 MW)<sup>121</sup>. In 2012, the company used 68 363.0 tons of fuel oil (masut) and the costs for masut consumption reached 680 599, 900 rubles (price of fuel – 9 955.68 rubles/t)<sup>122</sup>.

## *Economic aspects*

The largest company in Karelia, Karelian Pellet has a turnover of 40 534 071 000 rubles (in 2012 – 39 721 517 000 rubles). The net profit of the company in 2013 amounted to 10 440 560 000 rubles (in 2012 – 8 276 128 000 rubles). The income tax, respectively, constituted 2 234 101 000 rubles (in 2012 – 2 407 455 000 rubles)<sup>123</sup>.

Karelian Pellet, OJSC, as a part of the group of mining and smelting company Severstal, was the largest taxpayer in Karelia; in 2013, it was included in the consolidated group of taxpayers<sup>124</sup> in the Vologda region and ceased to transfer funds regarding income tax to the budget of the Republic of Karelia. At the same

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<sup>119</sup> <http://karelskyokatysh.severstal.com/rus/about/index.phtml>.

<sup>120</sup> Ibid.

<sup>121</sup>

[http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CCIQFjAA&url=http%3A%2F%2Fwww.gov.karelia.ru%2Fgov%2FLegislation%2Fdocs%2F2013%2F06%2F410r-p\\_2.docx&ei=0\\_jsU5PbJcSm0AXc8oCoCQ&usg=AFQjCNHAXejQ\\_UxClzEgnTkCxcgO7prY6w&sig2=SPyGCTZOqFV\\_fzQ0o9e8Mw&bv m=bv.72938740,d.d2k](http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CCIQFjAA&url=http%3A%2F%2Fwww.gov.karelia.ru%2Fgov%2FLegislation%2Fdocs%2F2013%2F06%2F410r-p_2.docx&ei=0_jsU5PbJcSm0AXc8oCoCQ&usg=AFQjCNHAXejQ_UxClzEgnTkCxcgO7prY6w&sig2=SPyGCTZOqFV_fzQ0o9e8Mw&bv m=bv.72938740,d.d2k).

<sup>122</sup>

[http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CCIQFjAA&url=http%3A%2F%2Fwww.gov.karelia.ru%2Fgov%2FLegislation%2Fdocs%2F2013%2F06%2F410r-p\\_2.docx&ei=0\\_jsU5PbJcSm0AXc8oCoCQ&usg=AFQjCNHAXejQ\\_UxClzEgnTkCxcgO7prY6w&sig2=SPyGCTZOqFV\\_fzQ0o9e8Mw&bv m=bv.72938740,d.d2k](http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CCIQFjAA&url=http%3A%2F%2Fwww.gov.karelia.ru%2Fgov%2FLegislation%2Fdocs%2F2013%2F06%2F410r-p_2.docx&ei=0_jsU5PbJcSm0AXc8oCoCQ&usg=AFQjCNHAXejQ_UxClzEgnTkCxcgO7prY6w&sig2=SPyGCTZOqFV_fzQ0o9e8Mw&bv m=bv.72938740,d.d2k).

<sup>123</sup> <http://karelskyokatysh.severstal.com/files/1578/f1578.pdf>.

<sup>124</sup> <http://nw.ria.ru/society/20120917/82150732.html>.



time, the company continues to pay tax on mineral extraction, individual income tax, property tax to the budget of the Republic, while tax payments were more than halved in 2013.

### *Air emissions*

The technological process involves ore extraction (drilling, blasting and mining), enrichment (crushing, screening, grinding, magnetic separation and concentration) and production of pellets (preparation of fusion mixture, pelletizing, roasting and sorting). At each stage of production air pollutant emissions occur<sup>125</sup>. Air emissions in 2012 amounted to 60 505 tons (in 2011 - 51 484 tons), or 56.8% of the total number of objects (225 units) generating air pollutant emissions on the territory of the Republic of Karelia<sup>126</sup>. In recent years, air emissions of harmful substances from the company has increased. The emissions from Karelian Pellet, OJSC in 2013 amounted to 62.3% of the total air emissions in the republic<sup>127</sup>.

Emissions from stationary sources contain the following pollutants: sulfur dioxide, suspended substances (inorganic and other dust), carbon oxide and nitrogen oxide. CO<sub>2</sub> emissions are released into the atmosphere from the oil-fired central heating station of Karelian Pellet, OJSC, heating not only production premises, but also the entire city. No official data on the figures for CO<sub>2</sub> was found. To improve energy efficiency for production and to reduce the cost of electricity consumed, the company management has proposed, in the future, to build a biofuel mini-boiler and use waste heat for the pellet production unit. Pulp (327 000 m<sup>3</sup>) or peat (up to 50% in the mixture) is the proposed biofuel, with a projected power output of 54 MW (46.4 Gcal/h). The equipment is to be made by PRO-TEAM OY (Sweden). According to the project, it is expected that biofuel boilers will operate in normal operation mode, and the existing boiler - in peak mode<sup>128</sup>.

The main source of emissions are roasting machines for pelletizing: as a result of their work dust, nitrogen oxides (NO<sub>x</sub>), sulfur oxides (SO<sub>x</sub>), hydrogen fluoride (HF) and non-methane gaseous organic compounds are emitted. Emission limits (MAD) of Karelian Pellet, OJSC are set for the following pollutants: sulfur dioxide (37 727.7 t/year), carbon oxide (1 894.02 tons/year), nitrogen oxides (2 732.48 t/year calculated as NO<sub>2</sub>)<sup>129</sup>. There is no other data on MAD or provisionally agreed emissions (PAE).

### *Discharges into water bodies*

At the crushing and processing stage the water which is afterwards discharged into the tailings pond is used in the technological process. The volume of contaminated water of Karelian pellet in 2013 amounted to 10.83 million m<sup>3</sup> (in 2012 - 20.18 million m<sup>3</sup>). There are compounds in discharges that contain kalium, lithium, nickel, calcium, magnesium, manganese, iron, as well as nitrates and sulfates<sup>130</sup>. The increase by

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<sup>125</sup> [http://www.severstal.com/files\\_archive/files/1041/KO.pdf](http://www.severstal.com/files_archive/files/1041/KO.pdf).

<sup>126</sup> Gosudarstvennyy doklad «O sostoyanii okruzhayushey sredy Respubliki Kareliya v 2012 godu» [State report "State of The Environment in the Republic of Karelia in 2012"], Ministry of Nature Management and The Environment of the Republic of Karelia (<http://www.gov.karelia.ru/gov/Power/Committee/Forest/Docum/gd2012.pdf>)

<sup>127</sup> Gosudarstvennyy doklad «O sostoyanii okruzhayushey sredy Respubliki Kareliya v 2013 godu» [State report "State of The Environment in the Republic of Karelia in 2013"], Ministry of Nature Management and The Environment of the Republic of Karelia ([http://www.gov.karelia.ru/Power/Committee/Forest/Docum/docl\\_2013.pdf](http://www.gov.karelia.ru/Power/Committee/Forest/Docum/docl_2013.pdf)).

<sup>128</sup> <http://www.kostomuksha-city.ru/attachments/article/328/%D0%9E%D1%82%D1%87%D0%B5%D1%82%20%D0%A1%D1%85%D0%B5%D0%BC%D0%B0%20%D0%A2%D0%A1%20%D0%9A%D0%BE%D1%81%D1%82%D0%BE%D0%BC%D1%83%D0%BA%D1%88%D0%B0%20%D0%BF%D0%BE%D1%81%D0%BB%D0%B5%20%D0%B7%D0%B0%D0%BC..pdf>;  
<http://karelia.allnw.ru/news/189475>.

<sup>129</sup> According to form 2-TP (air) for 2010.

<sup>130</sup> Gosudarstvennyy doklad «O sostoyanii okruzhayushey sredy Respubliki Kareliya v 2013 godu» [State report "State of The Environment in the Republic of Karelia in 2013"], Ministry of Nature Management and The Environment of the Republic of Karelia ([http://www.gov.karelia.ru/Power/Committee/Forest/Docum/docl\\_2013.pdf](http://www.gov.karelia.ru/Power/Committee/Forest/Docum/docl_2013.pdf)).

133% in the amount of nickel compounds in total wastewaters in the republic, as compared with 2012, is connected to the increase of this indicator in the wastewater of Karelian Pellet<sup>131</sup>.

It was not possible to find official information on exceeding NAD for pollutants and discharge limits in 2012. However, for Karelian Pellet, OJSC there is information on excess of MAC for harmful substances in fishery water bodies (for fishery reservoirs) by kalium, iron, manganese, sulfate and lithium.

In 2012, the MAC (set for fishery ponds) in the wastewater of mechanical cleansing structures (MSC) was exceeded in terms of the following substances: potassium by 3.4 times, iron - 2.5, manganese - 19.0, sulfates - 3.85. The MAC for lithium was not exceeded. According to 2010 figures, the content of heavy metals in the mine (quarry) water was below the MAC, except for nickel with a concentration of 15 MAC<sup>132</sup>.

In the area of the Korpangsky deposit during research works, significant changes were observed in the waters of the Polviyarviyoki River near western quarry, pollution was assessed as "heavily contaminated". In the waters of the Livo and Tolloyoki rivers, the anthropogenic influence is less and their waters correspond to the "relatively clean" category. It is noted that the deterioration in the quality of water bodies in the area of the Korpangsky deposit is occurring faster than in the Kenti River at the initial stage of operation on the Kostomuksha deposit<sup>133</sup>.

Due to violations of the license conditions related to the use of mineral resources at the Korpangskiy deposits and the site of subsurface resources within South Korpangsky in 2011, administrative fines totalling 700 000 rubles were imposed on Karelian Pellet, OJSC. It is not reported which clauses of the license were violated<sup>134</sup>.

### *Industrial wastes*

Karelian Pellet, OJSC is among the top ten Russian companies with the largest number of generated waste in terms of production and consumption. The amount of hazardous waste generated in 2013 reached 131.8 million tons<sup>135</sup> (in 2012 - 135.2 million tons)<sup>136</sup>, most of which is V class waste<sup>137</sup>. The make up of industrial waste from Karelian Pellet, OJSC comprises mainly overburden rocks, to a lesser degree - tails<sup>138</sup> and

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<sup>131</sup> Ibid.

<sup>132</sup> Gosudarstvenny doklad «O sostoyanii okruzhayushey sredy Respubliki Kareliya v 2012 godu» [State report "State of The Environment in the Republic of Karelia in 2012"], Ministry of Nature Management and The Environment of the Republic of Karelia (<http://www.gov.karelia.ru/gov/Power/Committee/Forest/Docum/gd2012.pdf>).

<sup>133</sup> Ibid.

<sup>134</sup> <http://www.gosnadzor.info>.

<sup>135</sup> Gosudarstvenny doklad «O sostoyanii okruzhayushey sredy Respubliki Kareliya v 2013 godu» [State report "State of The Environment in the Republic of Karelia in 2013"], Ministry of Nature Management and The Environment of the Republic of Karelia ([http://www.gov.karelia.ru/Power/Committee/Forest/Docum/docl\\_2013.pdf](http://www.gov.karelia.ru/Power/Committee/Forest/Docum/docl_2013.pdf)).

<sup>136</sup> Gosudarstvenny doklad «O sostoyanii okruzhayushey sredy Respubliki Kareliya v 2012 godu» [State report "State of The Environment in the Republic of Karelia in 2012"], Ministry of Nature Management and The Environment of the Republic of Karelia (<http://www.gov.karelia.ru/gov/Power/Committee/Forest/Docum/gd2012.pdf>).

<sup>137</sup> Gosudarstvenny doklad «O sostoyanii okruzhayushey sredy Respubliki Kareliya v 2013 godu» [State report "State of The Environment in the Republic of Karelia in 2013"], Ministry of Nature Management and The Environment of the Republic of Karelia ([http://www.gov.karelia.ru/Power/Committee/Forest/Docum/docl\\_2013.pdf](http://www.gov.karelia.ru/Power/Committee/Forest/Docum/docl_2013.pdf)).

<sup>138</sup> Tails – nonutilizable domestic solid wastes.

enrichment sludge, but, according to 2007, the plant disposed of only 1.8% of the extracted overburden rocks and 13.6% of the generated tailings and sludge enrichment<sup>139</sup>.

### *Production process modernization plans for reducing the negative impact on the environment*

Karelian Pellet plans to increase production volumes and has set a goal to increase pellet production from 10.3 million tons in 2012 to 10.7 million tons in 2015, while simultaneously improving output quality<sup>140</sup>. Increasing the volume of output may result in an increase in the anthropogenic load on the environment. According to official information, in recent years the company has upgraded its production capacity with modern equipment<sup>141</sup>. The proximity to Finland (distance to state border - 30 km) encourages the company to carry out modernization and implement environmental safety measures. Finnish authorities perform monitoring and have an interest in reducing the negative impact on their territory<sup>142</sup>.

The enterprise has been actively working on the localization of sulfur dioxide (SO<sub>2</sub>) emissions; with the participation of Tampella OY (Finland), a gas treatment unit (cleaning sulfur dioxide by "Lifak" method) is being installed on roasting machine No. 1 within the pellet production unit. According to the company's calculations, this installation will reduce sulfur dioxide emissions by 30%<sup>143</sup>.

The volume and chemical composition of the waste waters in tailings pond discharged into the fluviolacustrine system of Karelia is monitored (online). In 2011, Karelian Pellet, OJSC in cooperation with the Finnish company EHP-Tekniikka Ltd completed a scheme whereby modern technologies for wastewater monitoring in the tailings pond were introduced. According to the latest news, the monitoring system should start up in December 2014<sup>144</sup>. It is unknown yet whether the monitoring data will be publicly available.

The short term plans of Karelian Pellet, OJSC include a project on the reduction of sulphate and potassium compounds in waste water - wastewater treatment using willow plantations. The project, which will cost 1 million Euros (with equal funding from Russia, Finland and the European Union) will be implemented with the participation of scientists from the Petrozavodsk State University<sup>145</sup>.

Among the measures for the successful and profitable utilization of industrial wastes, the following initiatives should be noted. The unit for production of crushed stone within Karelian Pellet already produces and sells halleflinta crushed stone of various fractions generated from quartz-feldspar rocks mined from the Kostomukshsky deposit<sup>146</sup>. According to the project on land cultivation, the Forest Research Institute of the Karelian Research Centre of the Russian Academy of Sciences has offered peat storage at the

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<sup>139</sup> According to the Scheme for territorial planning of the Republic of Karelia, approved by Government of the Republic of Karelia dated 06.07.2007 № 102-P ([http://www.gov.karelia.ru/gov/Legislation/docs/2007/07/102p\\_1.pdf](http://www.gov.karelia.ru/gov/Legislation/docs/2007/07/102p_1.pdf)).

<sup>140</sup> [http://www.severstal.com/files\\_archive/files/10378/SK02129.pdf](http://www.severstal.com/files_archive/files/10378/SK02129.pdf).

<sup>141</sup> Ibid.

<sup>142</sup> <http://expert.ru/northwest/2012/16/okatyishi-forever>.

<sup>143</sup> [http://knowledge.allbest.ru/economy/3c0b65625b3ad68b4d53a88421316c36\\_1.html](http://knowledge.allbest.ru/economy/3c0b65625b3ad68b4d53a88421316c36_1.html).

<sup>144</sup> [http://reports.severstal.com/2011/rus/sustainability/the\\_environment/index.phtml](http://reports.severstal.com/2011/rus/sustainability/the_environment/index.phtml).

<sup>145</sup> [http://www.kostomuksha.ru/rus/press\\_center/news/document1212.phtml](http://www.kostomuksha.ru/rus/press_center/news/document1212.phtml).

<sup>146</sup> <http://karelskyokatysh.severstal.com/rus/customers/products/document403.pdf>;  
<http://www.kostomuksha.ru/rus/customers/products/document403.phtml>.

Kostomukshsky plant near the explosive material landfill for the further possible use of peat-morainisch mixtures in agricultural production<sup>147</sup>.

The company, together with Finnish partners, has been preparing to implement a project on the recultivation of the landfill of household solid wastes, consequently there is a plan to install observation and inspection wells<sup>148</sup>.

Karelian Pellet is also constructing an automatic monitoring station for waste waters - the project is planned to be completed by the end of 2014<sup>149</sup>.

32 385 thousand rubles was spent<sup>150</sup> on environmental protection in 2012 at Karelian Pellet, OJSC, which amounted to 0.4% of the company's net profit in 2012.

An integrated management system operates at the enterprise, certified according to the international standards ISO 9001, ISO 14001, OHSAS 18001, which confirms the company's intention to abide by international principles of environmental management<sup>151</sup>.

### *Affiliate of Nadvoitsky Aluminium Plant of Siberian-Urals Aluminium Smelter, OJSC (NAZ-SUAL)* *General information*

The company is located in Nadvoitsy town, Segezhsy municipal district. Nadvoitsy is a single-industry town with a population of 8 166 inhabitants (according to 2013 figures)<sup>152</sup>. In recent years, the number of workers has been significantly reduced. At the beginning of 2014, the number of employees at Nadvoitsky aluminum plant (NAZ) constituted 584 people<sup>153</sup>. The owner of the company is United Company RUSAL Plc. NAZ-SUAL, a township-forming enterprise.

NAZ-SUAL's activities are involved with the non-ferrous metals industry (aluminum production). Until recently, the company was in a crisis situation due to the unprofitability of its production. Before the crisis, the company had mainly produced primary aluminum in ingots, silumin, aluminum dust and powders, as well as implementing projects for increasing the production volumes of marketable products, such as aluminum-silicon and aluminum-magnesium alloys in small ingots. The main product consumers in Russia are the automotive industry and the packaging industry. More than 90% of primary aluminum produced is exported. The fall in prices in the international market caused a crisis throughout the industry, and, therefore, aluminum producers have been looking for state support, including preferential rates on electricity for unprofitable enterprises<sup>154</sup>. Nadvoitsky aluminum plant has been under threat of closure or reprofiling for two years. However, according to the orders of President V.V.Putin, financial assistance from the state budget totalling 430 million rubles will be allocated to save the plant. These funds will also be used for investing in a new project on the production of aluminum foil, which will enable the creation of new jobs<sup>155</sup>.

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<sup>147</sup> [http://knowledge.allbest.ru/economy/3c0b65625b3ad68b4d53a88421316c36\\_0.html](http://knowledge.allbest.ru/economy/3c0b65625b3ad68b4d53a88421316c36_0.html).

<sup>148</sup> [http://www.gov.karelia.ru/gov/News/2011/07/0712\\_09.html](http://www.gov.karelia.ru/gov/News/2011/07/0712_09.html).

<sup>149</sup> <http://www.severstal.com/files/10115/APA00121-Clean.pdf>.

<sup>150</sup> <http://karelskyokatysh.severstal.com/rus/about/index.phtml>.

<sup>151</sup> [http://karelskyokatysh.severstal.com/rus/products\\_and\\_services/index.phtml](http://karelskyokatysh.severstal.com/rus/products_and_services/index.phtml).

<sup>152</sup> <http://www.karjalan.ru/kareliya/item/3035-naselenie-karelii.html>.

<sup>153</sup> <http://iv-g.livejournal.com/1002605.html>.

<sup>154</sup> [http://karelinform.ru/article/business/40197/naz\\_mogyt\\_zakrit](http://karelinform.ru/article/business/40197/naz_mogyt_zakrit).

<sup>155</sup> <http://rk.karelia.ru/ekonomika/vladimir-putin-dal-porucheniya-po-razvitiyu-nadvoickogo-alyuminievogo-zavoda>.



Power consumption in 2012 was 1 049.1 million kWh (in 2011 - 1 317.6 kWh), or 15.2% of total energy consumption in the republic. The maximum load was 120 MW (in 2011 - 151 MW)<sup>156</sup>. Consumption has been reduced due to conservation of part of the electrolyzers<sup>157</sup>. The raw material for aluminum production is alumina, produced by RUSAL companies. About 2 tons of alumina is needed to produce 1 ton of aluminum. In total, the company is able to produce up to 81 thousand tons of aluminum per year<sup>158</sup>.

### *Economic aspects*

Information about the company's financial results is not available<sup>159</sup>. The United Company RUSAL did not disclose any financial indicators of certain plants. A decline in prices for primary aluminum to \$ 1,800 per ton has recently been observed in the world market (London Metal Exchange - LME). The production cost of a ton of primary aluminum produced at NAZ-SUAL is more than \$ 2,500. Accordingly, currently any profit from production at Nadvoitsky is out of the question<sup>160</sup>. The company was registered on 17 October, 2002 in the Inspectorate of the Federal Tax Service of the Russian Federation, Kamensk-Ural, Sverdlovsk Region<sup>161</sup>.

### *Air emissions*

In 2012, emissions reached 8 459 tons (in 2011 – 9 063 t), or 7.9% of the total emissions of air pollutants on the territory of the Republic of Karelia. In 2011, the company was granted a permit for emissions within the established limits<sup>162</sup>.

The main pollutant emissions are as follows: hydrogen fluoride, fluoride and benz(a)pyren. Fluorine compounds have been entering the air in the form of gaseous hydrogen fluoride, silicon tetrafluoride, dustlike particles of sodium fluoride, calcium fluoride and other fluorides. NAZ-SUAL is the main source of environmental pollution in the region.

According to official data on particularly hazardous substances, the average concentration of hydrogen fluoride (for 2012 year) was 0.8 MAC, and the maximum single concentration in March reached 1.4 MAC. The average annual concentration of benz(a)pyrene exceeded the MAC by 1.3 times, and maximum

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<sup>156</sup>

[http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CCIQFjAA&url=http%3A%2F%2Fwww.gov.karelia.ru%2Fgov%2FLegislation%2Fdocs%2F2013%2F06%2F410r-p\\_2.docx&ei=0\\_jsU5PbJcSm0AXc8oCoCQ&usg=AFQjCNHAXejQ\\_UxckzEgnTkcXcgO7prY6w&sig2=SPyGCTZOqFV\\_fZQ0o9e8Mw&bv m=bv.72938740,d.d2k](http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CCIQFjAA&url=http%3A%2F%2Fwww.gov.karelia.ru%2Fgov%2FLegislation%2Fdocs%2F2013%2F06%2F410r-p_2.docx&ei=0_jsU5PbJcSm0AXc8oCoCQ&usg=AFQjCNHAXejQ_UxckzEgnTkcXcgO7prY6w&sig2=SPyGCTZOqFV_fZQ0o9e8Mw&bv m=bv.72938740,d.d2k)

<sup>157</sup>

[http://karelinform.ru/news/society/43170/na\\_nadvoitskom\\_alyuminievom\\_zavode\\_nachali\\_konservatsiyu\\_poslednih\\_rabotayuschih\\_moschnostey](http://karelinform.ru/news/society/43170/na_nadvoitskom_alyuminievom_zavode_nachali_konservatsiyu_poslednih_rabotayuschih_moschnostey).

<sup>158</sup>

<http://www.rusal.ru/about/45.aspx>.

<sup>159</sup>

Consolidated financial reportings of the United Company "RUSAL" can be found at <http://www.rusal.ru>, as well as its main indicators at <http://rusal.ru/investors/kpi.aspx>.

<sup>160</sup>

<http://rusplt.ru/policy/vse-po-pikalevskoy-sheme.html>.

<sup>161</sup>

<http://comready.ru/company/5245331>.

<sup>162</sup>

Gosudarstvenny doklad «O sostoyanii okruzhayushey sredy Respubliki Kareliya v 2012 godu» [State report "State of The Environment in the Republic of Karelia in 2012"], Ministry of Nature Management and The Environment of the Republic of Karelia (<http://www.gov.karelia.ru/gov/Power/Committee/Forest/Docum/gd2012.pdf>).

average monthly concentrations in January reached 3.2 MAC. Nevertheless, over the last five years, air quality has improved due to a reduction in the content of benz(a)pyrene and hydrogen fluoride<sup>163</sup>. The official data on air pollutant emissions shows air pollution at Nadvoitsy town to be exceptionally stable. However, the results of independent studies indicate the possibility of dangerous situations related to fluoride emissions. The data for 2005-2012 provided by the Karelian Meteorological Office (Karelgidromet) details increased concentrations of hydrogen fluoride in the air in Nadvoitsy town. The maximum concentration of hydrogen fluoride in 2012 was 0.026 mg/m<sup>3</sup>.<sup>164</sup> However, in 2005, the Chemical and Analytical Center "Arbitrage" within the Federal State Unitary Enterprise "D.I. Mendeleyev All-Russian Scientific and Research Institute for Metrology" measured the average daily values for gaseous fluoride concentrations in the atmosphere, which exceeded the MAC by 46 times (sampling dates: 28-29 September, 2005) and by 4.2 times (sampling dates: 01-02 October, 2005)<sup>165</sup>. Data for CO<sub>2</sub> emissions is not available.

### *Discharges into water bodies*

In 1995, the Nadvoitsy Aluminum Plant introduced a closed water utilization scheme that, according to official data, allowed the company not to discharge the wastewater into natural water bodies<sup>166</sup>. According to the Department of Rosprirodnadzor in the Republic of Karelia dated March 22, 2013, "discharge of industrial and household wastewater was completely suspended at Nadvoitsy Aluminum Plant ..." <sup>167</sup>.

### *Industrial wastes*

In 2013, NAZ-SUAL, OJSC generated 7 007.7 tons (in 2012 - 6 566.6 tons) of industrial waste, most of which is IV class waste - 4 443.8 t and V hazard class waste - 2 147.3 t. The United Company has stated that RUSAL is seeking to minimize the volume of waste generated and to transfer the major part to recycling<sup>168</sup>. The projected waste from this would be scrap and waste metal.

Due to a breach in the waterproofing layer of the industrial waste dump site, which, during the period from 1978 to 1988 contained NAZ's fluorine-containing waste products, contamination of both surface waters, and subsurfaces may have occurred<sup>169</sup>. According to laboratory studies of surface water samples it was found that they did not comply with SanPiN 2.1.5.980-00 "Hygienic requirements for protection of surface water", as the MAC for fluoride was exceeded by 1.2-1.4 times. In addition, it is reported that in the past two years the fluorine content at sampling sites has increased more than 400 times<sup>170</sup>. According to the ruling made by the Segezhsy City Court dated 06.04.2011, the defendant Eco-Resurcy, LLC was obliged to restore the waterproofing layer of industrial waste dump site damaged due to earthworks. The ruling has come into force and an enforcement order has been issued on the case<sup>171</sup>.

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<sup>163</sup> Ibid.

<sup>164</sup> Analysis for data pollution monitoring based on <http://www.kareliameteo.ru/monitoring.html>.

<sup>165</sup> Protocols for quantitative chemical analysis of atmospheric air No. 440/05 dated 17.10.2005 and No. 501/05 dated 15.11.2005 provided by Karelian Regional Charitable Foundation of Youth and Childhood «Ariston» ([http://www.yabloko.ru/books/eco\\_reg/book\\_Kareliya.pdf](http://www.yabloko.ru/books/eco_reg/book_Kareliya.pdf)).

<sup>166</sup> [http://www.yabloko.ru/books/eco\\_reg/book\\_Kareliya.pdf](http://www.yabloko.ru/books/eco_reg/book_Kareliya.pdf).

<sup>167</sup> <http://sampo.ru/~ecolog/water.html>.

<sup>168</sup> <http://www.rusal.ru/development/ecology>.

<sup>169</sup> [http://segezhsy.kar.sudrf.ru/modules.php?name=press\\_dep&op=1&did=86](http://segezhsy.kar.sudrf.ru/modules.php?name=press_dep&op=1&did=86).

<sup>170</sup> Data provided by environmental organizations of the Republic of Karelia.

<sup>171</sup> [http://segezhsy.kar.sudrf.ru/modules.php?name=press\\_dep&op=1&did=86](http://segezhsy.kar.sudrf.ru/modules.php?name=press_dep&op=1&did=86).

## *Production process modernization plans for reducing the negative impact on the environment*

The Nadvoitsy Aluminium Smelter (NAS) currently uses Soderberg technology with self-baking anodes of lateral current lead with 60-70 kA current strength.

This is an obsolete technology, characterized by poor efficiency and significant power consumption (and consequently, a high level of emissions)<sup>172</sup>. Works are being carried out at the plant aimed at the reconstruction and transfer of electrolysis lines to the state of the art technology of baked anodes, the use of which allows the conservation of energy and other resources. 30 percent of aluminium manufactured by the plant is produced according to this technology<sup>173</sup>.

The plant, as a structural subdivision of the RUSAL Company, is certified in accordance with the international standards of ISO 14001:2004 Environmental Management System and ISO 9001:2008 Quality Management System. An integrated management system is implemented.

The dry gas treatment of exhaust gases, intended to minimize hazardous emissions, has not been carried out at Nadvoitsy Aluminium Smelter for a period of several decades. According to information provided by the Department of Federal Supervisory Natural Resources Management Service for the Republic of Karelia, dated 15.10.2013, the "In August-September 2013, the Department reviewed and registered datasheets for gas treatment and gas and dust removal units (GTU) for the following entities: 1. SUAL OJSC, NAS-SUAL branch - 1 GTU datasheet."<sup>174</sup>. It is necessary to follow up on whether the gas treatment unit will be included in the proposed NAS modernization plan.

Subsequent to the decision to continue production at the plant and the granting of subsidies from the state, it is now essential to understand, to what extent environmental protection measures and reducing the negative impact on the environment will be a priority for the plant.

### *Segezha PPM, OJSC*

#### *General information*

The plant is located in Segezha, Segezha municipal district. The city's population is 28 555 inhabitants (according to 2013 figures). Segezha, like Nadvoitsy, is a single-industry town; 1977 people are employed at the plant. In April 2014, it became known that LesInvest, LLC, as a part of Sistema, Joint Stock Financial Corporation (JSFC) (the largest in Russia and the CIS, public diversified holding company), has signed a legally binding agreement with the Bank of Moscow who acquired 100% shares in Segezha PPM, OJSC<sup>175</sup>.

The activities of the company are related to the pulp and paper industry. The company produces kraft paper, sack standard and microcrepe sack, kraft liner (cardboard) for flat layers and products of forest chemistry (tall oil, tall oil rosin, crude turpentine, fatty acids, pitch and oil sulfate). Due to unprofitability, it was decided to stop the production of cardboard. The products are sold not only in the domestic market, but also in the external one. Up to 60% of paper produced is exported through intermediaries (to the markets of Egypt, Vietnam, China, and Greece)<sup>176</sup>.

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<sup>172</sup> <http://ko.ru/articles/24299>.

<sup>173</sup> <http://www.allmetals.ru/industry/index.php?idpl=3379>.

<sup>174</sup> <http://sampo.ru/~ecolog/ecocontrol.htm>.

<sup>175</sup> <http://news.unipack.ru/49559>; [http://www.lesprom.com/en/news/Bank\\_Moskvi\\_polnostyu\\_konsolidiroval\\_aktsii\\_OAO\\_Segezhskiy\\_TSBK\\_57797](http://www.lesprom.com/en/news/Bank_Moskvi_polnostyu_konsolidiroval_aktsii_OAO_Segezhskiy_TSBK_57797).

<sup>176</sup> <http://www.scbk.ru/portal/content/view/8/28>.

In 2012, power consumption reached 493.3 million kWh (in 2011 - 469.6 million kWh), or 7.1% of the total electricity consumed in Karelia in 2012 (6.9 billion kWh), maximum load - 63 MW<sup>177</sup>. In 2012, fuel consumption by boiler stations reached 291 700 TFOE<sup>178</sup>. Since 2000, the company has been using biofuel (woodfuel, low-grade chips) in equal measure with oil fuel. Boiler stations serve the plant's production operation and provide heat for the town<sup>179</sup>.

### *Economic aspects*

The company's turnover in 2011 amounted to 6 616 877 000 rubles (in 2010 – 6 137 788 thousand rubles)<sup>180</sup>. Segezha PPM is experiencing economic problems. For example, in January 2012, production of the plant had to stop due to lack of timber and funds<sup>181</sup>. The amount of losses in 2011 reached 770 785 thousand rubles (in 2010 - 429 058 000 rubles)<sup>182</sup>. In 2012, the company was the third largest debtor because of failure to pay for lease of forests in the republic (22.6 million rubles)<sup>183</sup>. Segezha PPM was registered as a taxpayer at the Interdistrict Inspectorate of the Federal Tax Service of the Republic of Karelia.

### *Air emissions*

The state report on the environmental condition in the Republic of Karelia in 2013 indicated that the contribution of the companies involved in production of pulp, paper and paperboard, as well as associated products (Segezha PPM, OJSC; Kondopoga, OJSC and Pitkyaranta pulp mill, OJSC), to the total emissions in the republic was 20.6%, or 24 412 tons<sup>184</sup>. In 2012, these total emissions reached 18 787 tons (in 2011 – 20 193 t), or 17.6% of total air pollutant emissions on the territory of the Republic of Karelia<sup>185</sup>.

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[http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CCIQFjAA&url=http%3A%2F%2Fwww.gov.karelia.ru%2Fgov%2FLegislation%2Fdocs%2F2013%2F06%2F410r-p\\_2.docx&ei=0\\_jsU5PbJcSm0AXc8oCoCQ&usg=AFQjCNHAXejQ\\_UxCkzEgnTkcXcgO7prY6w&sig2=SPyGCTZOqFV\\_fZQ0o9e8Mw&bv m=bv.72938740,d.d2k](http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CCIQFjAA&url=http%3A%2F%2Fwww.gov.karelia.ru%2Fgov%2FLegislation%2Fdocs%2F2013%2F06%2F410r-p_2.docx&ei=0_jsU5PbJcSm0AXc8oCoCQ&usg=AFQjCNHAXejQ_UxCkzEgnTkcXcgO7prY6w&sig2=SPyGCTZOqFV_fZQ0o9e8Mw&bv m=bv.72938740,d.d2k)

<sup>178</sup> TFOE – tons of fuel oil equivalent.

<sup>179</sup> "Utilization of biomass at Segezha PPM, OJSC in 2010 (project, pursuant to the principles of Article 6 of the Kyoto Protocol and the UN Framework Convention on Climate Change, and in this status it was included in the federal list) (<http://www.scbk.ru/portal/content/view/30/52>).

<sup>180</sup> According to Form 4 "Report on cash flows" of OJSC "Segezha PPM" for 2011 based on indicator "Cash flows related to current activities" in line "Income - Total" (code 4110).

<sup>181</sup> <http://forest-karelia.ru/?id=219>.

<sup>182</sup> According to Form 2 "Report on profits and losses" of "Segezha PPM" for 2011 based on indicator "Net income (loss) for the reporting period" (code 2400).

<sup>183</sup> <http://forest-karelia.ru/?id=281>.

<sup>184</sup> Gosudarstvenny doklad «O sostoyanii okruzhayushey sredy Respubliki Kareliya v 2013 godu» [State report "State of The Environment in the Republic of Karelia in 2013"], Ministry of Nature Management and The Environment of the Republic of Karelia ([http://www.gov.karelia.ru/Power/Committee/Forest/Docum/docl\\_2013.pdf](http://www.gov.karelia.ru/Power/Committee/Forest/Docum/docl_2013.pdf)).

<sup>185</sup> Gosudarstvenny doklad «O sostoyanii okruzhayushey sredy Respubliki Kareliya v 2012 godu» [State report "State of The environment in the Republic of Karelia in 2012"], Ministry of Nature Management and The environment of the Republic of Karelia (<http://www.gov.karelia.ru/gov/Power/Committee/Forest/Docum/gd2012.pdf>).

The main pollutant emissions are as follows: solid substances, sulfur dioxide, carbon monoxide, nitrogen oxides and hydrogen sulfide. An excess in MAC for sulfur dioxide and nitrogen has not been recorded and the maximum concentration for hydrogen sulfide in the air within the Segezha area in January 2012 reached 0.042 mg/m<sup>3</sup>, exceeding the MAC by 5.3 times. A tendency to increase the concentration of hydrogen sulfide in the past five years should be noted<sup>186</sup>.

### *Discharges into water bodies*

In 2013, the plant discharged 35.628 million m<sup>3</sup> of polluted waste water that corresponds to 65% of the total volume of wastewater discharged into surface water bodies of the White Sea by the companies located within the territory of the Republic of Karelia (54.47 million m<sup>3</sup>). The largest volume of wastewater discharged without treatment (4.348 million m<sup>3</sup>) was created by Segezha PPM, OJSC<sup>187</sup>.

The main pollutants in the discharges were: suspended substances, oil products, ammonia nitrogen, phenols, organic sulfur compounds, hydrogen sulfide, methanol, turpentine, sulfate lignin and others. The company has a permit for discharge of pollutants into water bodies within the NAD. The multiple cases of MAC excess in 2012 were as follows: outlet No. 2 MCS in terms of BOD<sub>full</sub> – 5 times, suspended substances - 4.4 times, oil products - 12.2 times, ammonia nitrogen - 3.8 times, phenols – 3 times; outlet No. 6 BTP in terms of BOD<sub>full</sub> - 1.2 times, lignin - 14.5 times<sup>188</sup>.

Segezha PPM, OJSC plans to implement an EnMonCon project to increase the degree of recycled water utilization and to install automatic on-line station monitoring of wastewater quality. The partner for this project is EHP-Tekniikka Ltd (Oulu, Finland). The implementation period is scheduled for December 2014<sup>189</sup>.

### *Industrial wastes*

In 2013, Segezha PPM, OJSC generated 245 725.2 tons (in 2012 - 282 327.8 t) of hazardous waste, most of which is IV class waste - 176 853.5 tons. The composition of the company's waste includes liquid sludge, ash, pulp and dust<sup>190</sup>.

On May 30<sup>th</sup>, 2011, the Segezhsy City Court obliged the administration of Nadvoitsky municipal settlement and Segezha PPM, OJSC (forest area tenant) to eliminate the illegal dump site generated in the Nadvoitsky district forestry area and Kuleminsky forestry area (based on forestry management documents), and sought payment of duty. On July 8, 2011, the Supreme Court of the Republic of Karelia brought the decision into force<sup>191</sup>.

It is known that bark and wood waste generated by Segezha PPM, OJSC is burned instead of fuel oil<sup>192</sup>. Information on the waste management system at the plant is not available. On the whole, there is no

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<sup>186</sup> Ibid.

<sup>187</sup> Gosudarstvenny doklad «O sostoyanii okruzhayushey sredy Respubliki Kareliya v 2013 godu» [State report "State of The environment in the Republic of Karelia in 2013"], Ministry of Nature Management and The environment of the Republic of Karelia ([http://www.gov.karelia.ru/Power/Committee/Forest/Docum/docl\\_2013.pdf](http://www.gov.karelia.ru/Power/Committee/Forest/Docum/docl_2013.pdf)).

<sup>188</sup> Data provided by environmental organizations of the Republic of Karelia.

<sup>189</sup> <http://www.scbk.ru/portal/content/view/746/2>.

<sup>190</sup> Gosudarstvenny doklad «O sostoyanii okruzhayushey sredy Respubliki Kareliya v 2013 godu» [State report "State of The environment in the Republic of Karelia in 2013"], Ministry of Nature Management and The environment of the Republic of Karelia ([http://www.gov.karelia.ru/Power/Committee/Forest/Docum/docl\\_2013.pdf](http://www.gov.karelia.ru/Power/Committee/Forest/Docum/docl_2013.pdf)).

<sup>191</sup> <http://actoscope.com/szfo/kareliya/segezhsy-kar/gr/1/reshenie-o-likvidacii-nesankci07092011-3834120>.

<sup>192</sup> <http://www.gov.karelia.ru/Karelia/695/38.html>.



system of collecting recyclable waste components for production and consumption on the territory of the Segezhsy municipal district.

### *Production process modernization plans for reducing the negative impact on the environment*

On the territory of Segezha PPM, OJSC for six years, a project for reconstruction and development of Segezha PPM ("Bely Medved" (White Bear)) has been planned. The project involves the construction of a new pulp mill and usage of old capacities for the production of bleached pulp, as well as adoption of the most advanced environmentally friendly technologies in the pulp and paper industry<sup>193</sup>. The project also includes almost waste-free production, reconstruction of a biological treatment station and installation of a system for capturing and burning gas, which would reduce overall environmental impact to a minimum level. The total investment for the project was supposed to be about 1 billion Euros. In April 2011, the White Bear project was approved by the Main Administration of State Environmental Review (Glavgosexpertisa), but since then no actions under the plan have been taken, and the project was frozen. It is reported that the new owner, Sistema, AFK, is ready to revive the project<sup>194</sup>, but it is very problematic in the current economic situation<sup>195</sup>. The need to modernize one of the oldest companies in the pulp and paper industry remains a serious problem.

Among the measures implemented to modernize production, commissioning of an upgrade of soda recovery boiler SRB-2 (one of the sources of emissions and odors) should be noted. This has reduced the level of harmful emissions into the atmosphere by ten times: concentrators enable maximum elimination of odors from the strong smelling methyl mercaptan, and new powerful electrofilters capture up to 98-99% of the dust<sup>196</sup>.

An upgrade of two production units is planned: paper-making machine No. 10, with the aim of more efficient processing of wood raw material and high-quality pulping, and boiling plant No. 4 with the aim of achieving greater uniformity of chip penetration, which will allow energy saving and reduce the use of chemicals<sup>197</sup>.

The plant has implemented an energy efficient boiling process. Tall oil rosin and wood rosin is produced from by-products. Black liquor is used for reboiling<sup>198</sup>.

Segezha PPM, OJSC was in possession of a license from the Forest Stewardship Council (FSC) which states that the forestry actions undertaken by the plant have no negative economic and social consequences<sup>199</sup>. However in practice, there are violations in both forestry and environmental legislation. In 2012, due to numerous violations of forest and environmental laws at forest areas leased by Segezha PPM, the FSC certificate was suspended<sup>200</sup>.

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<sup>193</sup> <http://www.scbk.ru/portal/content/view/595/102>.

<sup>194</sup> <http://www.interfax.ru/business/352936>.

<sup>195</sup> <http://forest-karelia.ru/?id=1132>.

<sup>196</sup> <http://www.scbk.ru/portal/content/view/28/50>.

<sup>197</sup> Ibid.

<sup>198</sup> <http://www.scbk.ru/equip.html>.

<sup>199</sup> <http://www.scbk.ru/portal/content/view/30/52>.

<sup>200</sup> <http://forest-karelia.ru/?id=534>.

## *Kondopoga, OJSC*

### *General information*

The company is located in Kondopoga, Kondopozhsky municipal district. The population of the city is 31 962 people (according to 2013 figures). This is a township-forming enterprise. The number of employees is 6 328 people (according to 2011 figures). By the end of 2012, the number of employees decreased by 138 people<sup>201</sup>.

The plant belongs to a branch of the pulp and paper industry and is a jointly owned property of the subject of the Russian Federation (Republic of Karelia - 10%) and foreign ownership (20% owned by Conrad Jacobson)<sup>202</sup>.

95% of the company's products are newsprint paper used in printing and publishing houses. Spruce, supplied mainly by the timber industry enterprises of Karelia, is used as a raw material. The supply and consumption of raw materials at Kondopoga, OJSC are extremely erratic, because the company has substantial wood delivery debts<sup>203</sup>. 80% of production is exported to the UK, Germany, Greece, Turkey, Finland, India, Bulgaria and to the countries of the CIS, Africa, Latin America and Asia<sup>204</sup>.

In 2012, power consumption constituted 1 358.5 million kWh (in 2011 - 1 712.3 million kWh), or 6.2% of the total energy consumed in the republic. The maximum load reached 54 MW (in 2011 - 57 MW)<sup>205</sup>. The decline in power consumption occurred due to economic problems affecting production.

In 2007, pipeline construction was completed. In 2011 a full change-over of steam boilers to natural gas was effected<sup>206</sup>. Fuel consumption by the company's boilers reached 481.2 thousand tons of fuel oil equivalent (mainly natural gas) in 2012. Kondopoga, OJSC is one of the largest debtors for natural gas supply.

### *Economic aspects*

In 2012, Kondopoga, OJSC produced 680 thousand tons of paper. The company's turnover in 2012 decreased by 14.6%, as compared to 2011, and amounted to 12.22 billion rubles. Revenues also fell in the first quarter of 2013 and reached 961.26 million rubles (in the first quarter of 2012 - 3.23 billion rubles). A reduction in production capacity from 91.8% in the first quarter of 2012 to 25.5% in the first quarter of 2013 occurred due to a lack of raw materials. The revenue decrease was also influenced by lower prices for newsprint paper in the export market. Thus, the company suffered losses: at the end of 2012, losses amounted to 1.57 billion rubles. In the first quarter of 2013 the losses of Kondopoga, OJSC constituted 841.64 million rubles, as compared with net profit of 322.41 million rubles in the first quarter of 2012<sup>207</sup>. In

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<sup>201</sup> <http://newskar.ru/?p=1300>.

<sup>202</sup> <http://lesvesti.ru/news/capital/6761>.

<sup>203</sup> <http://www.forest-karelia.ru/?id=553>.

<sup>204</sup> <http://www.oakondopoga.ru>.

<sup>205</sup> [http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CCIQFjAA&url=http%3A%2F%2Fwww.gov.karelia.ru%2Fgov%2Flegislation%2Fdocs%2F2013%2F06%2F410r-p\\_2.docx&ei=0\\_jsU5PbJcSm0AXc8oCoCQ&usg=AFQjCNHAXejQ\\_UxckzEgnTkcXcgO7prY6w&sig2=SPyGCTZOqFV\\_fZQ0o9e8Mw&bv m=bv.72938740,d.d2k](http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CCIQFjAA&url=http%3A%2F%2Fwww.gov.karelia.ru%2Fgov%2Flegislation%2Fdocs%2F2013%2F06%2F410r-p_2.docx&ei=0_jsU5PbJcSm0AXc8oCoCQ&usg=AFQjCNHAXejQ_UxckzEgnTkcXcgO7prY6w&sig2=SPyGCTZOqFV_fZQ0o9e8Mw&bv m=bv.72938740,d.d2k).

<sup>206</sup> <http://oakondopoga.ru/eco.html>.

<sup>207</sup> [http://www.lesprom.com/en/news/V\\_1\\_kv\\_\\_2013\\_g\\_\\_ubitok\\_OAO\\_Kondopoga\\_sostavil\\_84164 mln\\_rub\\_\\_56185](http://www.lesprom.com/en/news/V_1_kv__2013_g__ubitok_OAO_Kondopoga_sostavil_84164 mln_rub__56185).

2013, because of huge debt, the company was under threat of suspension of all production. A court decision ruled that the company be placed under credit watch<sup>208</sup>. One of the reasons for the economic problems of the enterprise is the lack of its own logging base. The company has to buy wood for the production process. To ensure the stability of the company's production, the plant must have its own raw material base that would fill about 50-60% of its needs<sup>209</sup>.

### *Air emissions*

The state report on the environmental condition in the Republic of Karelia in 2013 indicated that the contribution of the companies involved in production of pulp, paper and paperboard, as well as associated products (Segezha PPM, OJSC, Kondopoga, OJSC, and Pitkyaranta pulp mill, OJSC) to total emissions in the republic was 20.6%, or 24 412 tons<sup>210</sup>. In 2012, these total emissions reached 18 787 tons (in 2011 – 20 193 tons), or 17.6% of total air pollutant emissions by stationary sources on the territory of the Republic of Karelia.

In 2011, the share of emissions from Kondopoga, OJSC amounted to 34.9% of the total emissions for the companies in this industry. The main pollutant emissions are as follows: solid substances, sulfur dioxide, carbon monoxide, nitrogen oxides and hydrogen sulfide. The plant's air pollutant emissions amounted to 7 056 tons in 2011 (in 2010 - 14 839.53 tons). Meanwhile, emissions in 2011, as compared to 2010, were reduced by 55% (in particular, sulfur dioxide emissions were reduced by 70%)<sup>211</sup>.

In 2012, sulfur dioxide and nitrogen dioxide concentration in the air of Kondopoga did not exceed the MAC. The maximum single concentration of hydrogen sulfide in August amounted to 0.5 MAC. Multiple cases of excess of the Allowable Discharge Rates in 2012 were as follows: core operations, outlet No. 2 PCWT, phenols – no excess detected, nitrate ion - 1.2 times; core operations, outlet No. 3 after BTP and BTIW, lignosulfonates – 2 times, suspended substances – 6 times, AS - 2.5, chlorides – 8 times, resinous substances - no exceedance detected, phenols - 8.3 times, iron - 1.7 times. Precise data related to CO2 emissions reduction is not available<sup>212</sup>.

### *Discharges into water bodies*

In 2013, the company discharged 41.316 million m<sup>3</sup> of contaminated waste waters (2012 – 55.604 million m<sup>3</sup>). The main pollutants in discharges are as follows: organic substances (by BOD<sub>full</sub>), lignosulfonates, suspended substances, dry residue, total nitrogen, phenols, anionic surfactants, chlorides, sulfates, methanol, formaldehyde, iron, etc.<sup>213</sup> The company (core production) has a permit for discharge of pollutants into water bodies within the Allowable Discharge Rates. Multiple cases of excess of the MAC for hazardous substances found in water bodies used as fisheries (for fishery ponds) in 2012 were as follows: BTP at household plot (Tivdiya village): phosphate - 7.6 times, ammonium ion - 17.9 times, phenols – 25

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<sup>208</sup> <http://lesvesti.ru/news/capital/6761>.

<sup>209</sup> Ibid.

<sup>210</sup> Gosudarstvenny doklad «O sostoyanii okruzhayushey sredy Respubliki Kareliya v 2013 godu» [State report "State of The Environment in the Republic of Karelia in 2013"], Ministry of Nature Management and The Environment of the Republic of Karelia ([http://www.gov.karelia.ru/Power/Committee/Forest/Docum/docl\\_2013.pdf](http://www.gov.karelia.ru/Power/Committee/Forest/Docum/docl_2013.pdf)).

<sup>211</sup> Gosudarstvenny doklad «O sostoyanii okruzhayushey sredy Respubliki Kareliya v 2012 godu» [State report "State of The Environment in the Republic of Karelia in 2012"], Ministry of Nature Management and The Environment of the Republic of Karelia (<http://www.gov.karelia.ru/gov/Power/Committee/Forest/Docum/gd2012.pdf>).

<sup>212</sup> Ibid.

<sup>213</sup> Gosudarstvenny doklad «O sostoyanii okruzhayushey sredy Respubliki Kareliya v 2013 godu» [State report "State of The Environment in the Republic of Karelia in 2013"], Ministry of Nature Management and The Environment of the Republic of Karelia ([http://www.gov.karelia.ru/Power/Committee/Forest/Docum/docl\\_2013.pdf](http://www.gov.karelia.ru/Power/Committee/Forest/Docum/docl_2013.pdf)).

times, oil products - 1.6 times. Moreover, the company failed to comply with the planned parameters for BOD and suspended substances<sup>214</sup>.

### *Industrial wastes*

In 2013, Kondopoga, OJSC generated 203 262.5 tons (in 2012 - 198 668.0 tons) of hazardous waste, including IV class - 181 987.1 tons<sup>215</sup>. All wood waste generated during technological process in Kondopoga, OJSC is burned in a waste burning boiler station<sup>216</sup>.

### *Production process modernization plans for reducing the negative impact on the environment*

Currently, due to the growing losses of the company it is hard to plan further modernization for the reduction of negative impact on the environment.

The company has been certified in relation to ecological forest management and environmental management: FSC chain of supply certificate with FSC-controlled wood code (CoC/CW certificate) and certificate of international standard for environmental management ISO 14001: 2004 (GOST R ISO 14001: 2007).

According to the website, the company has three laboratories accredited to the ISO/IEC 17025:2005 international standard, carrying out regular monitoring of air quality in the residential areas of Kondopoga.

The company adopted a wastewater treatment system using Matrix mobile fittings (together with Swedish company Anox), thanks to which, as reported, the main pollutant discharge constituents (BOD and suspended substances) have fallen by more than 2.5 times. In addition, the company reports that every year due to improvements in circulating water systems, the specific indicators of water consumption are being reduced<sup>217</sup>.

As mentioned above, Kondopoga, OJSC produces newsprint paper. Russian producers occupy only 2% of the world market for this product. Spruce wood, which is quite an expensive raw material, is used for production of newsprint paper at the Kondopoga plant. The main forest species in Karelia are pines. They cover 60% of the forest area on average. To make effective decisions on modernization of the company, the available resource base and the state of the world market for pulp and paper production should be taken into account. Experts advise considering the possibility of using new raw materials (pine) with a further shift to the production of sulphite and viscose pulp<sup>218</sup>.

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<sup>214</sup> Gosudarstvenny doklad «O sostoyanii okruzhayushey sredy Respubliki Kareliya v 2012 godu» [State report "State of The Environment in the Republic of Karelia in 2012"], Ministry of Nature Management and The Environment of the Republic of Karelia (<http://www.gov.karelia.ru/gov/Power/Committee/Forest/Docum/gd2012.pdf>).

<sup>215</sup> Gosudarstvenny doklad «O sostoyanii okruzhayushey sredy Respubliki Kareliya v 2013 godu» [State report "State of The Environment in the Republic of Karelia in 2013"], Ministry of Nature Management and The Environment of the Republic of Karelia ([http://www.gov.karelia.ru/Power/Committee/Forest/Docum/docl\\_2013.pdf](http://www.gov.karelia.ru/Power/Committee/Forest/Docum/docl_2013.pdf)).

<sup>216</sup> [http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0CCKQFjAB&url=http%3A%2F%2Frpn.gov.ru%2Fsites%2Fall%2Ffiles%2Fusers%2Frpnglavred%2Ffilebrowser%2Fdocs%2Fspravka\\_po\\_oao\\_kondopoga.rtf&ei=PEDtU43YF8mq0QW66IGQAg&usq=AFQjCNG9VqYk4YiWRhnZ\\_wdb7vBJC6ZI3w&sig2=Fuq4\\_p0Kg1GO1e-YIBILsA&bvm=bv.73231344,d.d2k](http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0CCKQFjAB&url=http%3A%2F%2Frpn.gov.ru%2Fsites%2Fall%2Ffiles%2Fusers%2Frpnglavred%2Ffilebrowser%2Fdocs%2Fspravka_po_oao_kondopoga.rtf&ei=PEDtU43YF8mq0QW66IGQAg&usq=AFQjCNG9VqYk4YiWRhnZ_wdb7vBJC6ZI3w&sig2=Fuq4_p0Kg1GO1e-YIBILsA&bvm=bv.73231344,d.d2k).

<sup>217</sup> <http://oaokondopoga.ru/eco.html>.

<sup>218</sup> <http://www.kondopoga.ru/2416-perspektivy-otchestvennoy-cellyulozno-bumazhnoy-promyshlennosti-i-kondopozhskogo-cbk.html>.

## *Pitkyaranta pulp mill, OJSC*

### *General information*

Pitkyaranta pulp mill is located in Pitkyaranta, Pitkarantsky municipal district. The city's population is 11 089 people (according to 2013).

The company belongs to the pulp and paper industry sector and is jointly owned by subjects of the Russian Federation and foreign owners. In spring 2013, the Arbitration Court of the Republic of Karelia recognized Pitkyaranta pulp mill, OJSC as bankrupt and the company went into receivership (the final stage of bankruptcy). Pitkyaranta pulp mill, OJSC rented out its property to Pitkyaranta Pulp, LLC, which has, according to some reports, a nominal capital of 12 000 rubles<sup>219</sup>.

The company's staff figures had been gradually reduced, and in 2013 numbered 850 people<sup>220</sup>.

The company produces turpentine, tall oil and various types of cellulose (unbleached cellulose sulfate, cellulose for cable paper and electrocardboard and sulfate unbleached wrapping cellulose). More than 90% of the total of output goes to export operations. The main consumer countries are as follows: China, Germany, Ukraine, India, Korea, Finland, Belgium, and Brazil<sup>221</sup>.

Power consumption in 2012 reached 69.1 million kWh (in 2011 - 85.0 million kWh), or only 1% of all power consumed in the republic. The peak load was 12.5 MW (in 2011 - 10.6 MW). Fuel consumption by the TPP of Pitkyaranta PM, OJSC in 2012 amounted to 46 800 tons of fuel oil equivalent, including oil fuel. Wood substances in the form of pine roundwood and wood (pine) chips are used as raw material.<sup>222</sup>

### *Economic aspects*

The total amount of the plant's debt has reached 800 million rubles with a turnover totalling 1.5 billion rubles<sup>223</sup>. 2012 turnover reached 1 189 950 000 rubles (in 2011 - 1 773 900 000 rubles). 2012 losses amounted to 295 765 000 rubles (in 2011 - 61 046 000 rubles)<sup>224</sup>.

### *Air emissions*

The state report on the environmental condition in the Republic of Karelia in 2013 provides only data on the sum contribution of the companies involved in the pulp and paper industry in the Republic of Karelia (Pitkyaranta pulp mill, OJSC, Kondopoga, OJSC, and Segezha PPM, OJSC) to total emissions in the republic. In 2013, pulp and paper companies emitted 24 412 tons of harmful substances into the atmosphere, which amounted to 20.6% of the total pollutant emissions by economic entities in the Republic of Karelia. The main pollutant emissions are as follows: solid substances, sulfur dioxide, carbon monoxide, nitrogen oxides, and other substances. Multiple cases of ADR excesses in emissions from the BTP in the Pitkyaranta pulp mill, OJSC in 2012 were as follows: dimethyl sulphide - 500 times, suspended substances - 1.6 times, lignin - no excess detected. No data on CO<sub>2</sub> emissions was found.

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<sup>219</sup> <http://www.forest-karelia.ru/?id=868>.

<sup>220</sup> <http://rk-press.ru/a/5597>.

<sup>221</sup> <http://expert.ru/northwest/2013/28/sibirskij-investor-dlya-karelskoj-tsellyulozyi>.

<sup>222</sup> [http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CCIQFjAA&url=http%3A%2F%2Fwww.gov.karelia.ru%2Fgov%2FLegislation%2Fdocs%2F2013%2F06%2F410r-p\\_2.docx&ei=0\\_jsU5PbJcSm0AXc8oCoCQ&usg=AFQjCNHAXejQ\\_UxckzEgnTkcXcgO7prY6w&sig2=SPyGCTZOqFV\\_fZQ0o9e8Mw&bv m=bv.72938740,d.d2k](http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CCIQFjAA&url=http%3A%2F%2Fwww.gov.karelia.ru%2Fgov%2FLegislation%2Fdocs%2F2013%2F06%2F410r-p_2.docx&ei=0_jsU5PbJcSm0AXc8oCoCQ&usg=AFQjCNHAXejQ_UxckzEgnTkcXcgO7prY6w&sig2=SPyGCTZOqFV_fZQ0o9e8Mw&bv m=bv.72938740,d.d2k).

<sup>223</sup> <http://expert.ru/northwest/2013/28/sibirskij-investor-dlya-karelskoj-tsellyulozyi>.

<sup>224</sup> <http://www.list-org.com/company/3873>.



### *Discharges into water bodies*

In 2013, the company's total wastewater discharge was 15 521 million m<sup>3</sup> (in 2012 – 13.803 million m<sup>3</sup>). The volume of wastewater discharged without treatment reached 0.084 m<sup>3</sup> <sup>225</sup>. The main pollutants in discharges are as follows: phenols, organic sulfur compounds, turpentine, lignin sulfate, formaldehyde and methanol. The company has a permit for the discharge of pollutants into water bodies within the ADR.

In May 2013, an inspection at Pitkyaranta pulp mill, OJSC<sup>226</sup>, revealed an accidental oil spill from the territory of the oil fired units within the TPP, which had been concealed by the company. The company's executive officers were administratively fined in accordance with part 1 of Article 8.42 of the Administrative Offences Code of the Russian Federation (violation of the special regime for economic and other activities in the coastal buffer zone of a water body, and water protection zone of a water body). According to the inspection results of September 2013, Pitkyaranta pulp mill, OJSC was subjected to administrative liability in accordance with Article 7.6 of the Administrative Offences Code of the Russian Federation (violation of contract terms for water use).

### *Industrial wastes*

In 2013, the Pitkyaranta pulp mill, OJSC generated 19 265.9 tons (in 2012 - 21 194.3 tons) of hazardous waste, including IV class waste - 15 175.4 tons (in 2012 - 16 289.0 tons)<sup>227</sup>. More detailed information on waste management is not available.

### *Production process modernization plans for reducing the negative impact on the environment*

It was reported that the CTS Invest Russian group of companies had a plan to help the plant overcome the crisis by means of a large-scale program for the modernization of production and development of sales funded by a total amount of future investments, given over the period of the next three years, of about 2 billion rubles<sup>228</sup>. It is planned to "establish a cost-effective, environmentally friendly company operating to European standards ..." <sup>229</sup>.

It is planned to upgrade a bark wood boiler to burn the waste. The dump site of the paper and pulp plant has already exceeded an area of 2 hectares, and over the past seven years about 100 thousand m<sup>3</sup> of bark, wood chips and wood chunks have accumulated there. Replacing the boiler will enable all the waste to be burned, so the company will need much less expensive fuel oil for production, which means that the

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<sup>225</sup> Gosudarstvenny doklad «O sostoyanii okruzhayushey sredy Respubliki Kareliya v 2013 godu» [State report "State of The Environment in the Republic of Karelia in 2013"], Ministry of Nature Management and The Environment of the Republic of Karelia ([http://www.gov.karelia.ru/Power/Committee/Forest/Docum/docl\\_2013.pdf](http://www.gov.karelia.ru/Power/Committee/Forest/Docum/docl_2013.pdf)).

<sup>226</sup> The on-site audit was carried out by Pitkyarantsky District Prosecutor's Office with participation of the Department of Rosprirodnadzor in the Republic of Karelia and accredited expert organization, branch of the FBI "TsLATI in the Northwestern Federal District" - "Center for laboratory analysis and technical measurements in the Republic of Karelia".

<sup>227</sup> Gosudarstvenny doklad «O sostoyanii okruzhayushey sredy Respubliki Kareliya v 2013 godu» [State report "State of The Environment in the Republic of Karelia in 2013"], Ministry of Nature Management and The Environment of the Republic of Karelia ([http://www.gov.karelia.ru/Power/Committee/Forest/Docum/docl\\_2013.pdf](http://www.gov.karelia.ru/Power/Committee/Forest/Docum/docl_2013.pdf)).

<sup>228</sup> <http://expert.ru/northwest/2013/28/sibirskij-investor-dlya-karelskoj-tsellyulozyi>.

<sup>229</sup> <http://lesprominform.ru/jarchive/articles/itemprint/3224>.

plant will be energy independent. In addition, there is a plan to create a circulating water supply system allowing the re-use of all the water used in the process of wood preparation<sup>230</sup>. In 2014-2015, in Pitkyaranta the delivery of natural gas is expected<sup>231</sup>.

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<sup>230</sup> <http://mir.karelia.ru/index.php?tag=682>.

<sup>231</sup> <http://www.gov.karelia.ru/Karelia/2403/2.html>.





Photo by United Nations Development Programme in Europe and CIS/flickr.com



## Komi Republic

The Komi Republic is located in the north-east of the European part of Russia and borders on a number of regions: the Nenets Autonomous District to the north and to the north-west, the Arkhangelsk region to the west, the Yamal-Nenets and Khanty-Mansi Autonomous Districts to the east, Sverdlovsk region to the south-east, Perm Krai to the south and Kirov region to the south-west. The area of the Komi Republic is 416.8 thousand km<sup>2</sup>, or 2.4% of the territory of Russia. The Komi Republic is underpopulated, its average density of population is 2.1 persons/km<sup>2</sup>. The population is 880 600 inhabitants, 77% of which (681 100 people) live in urban areas<sup>232</sup>.

The mineral resources of the Komi Republic include the most important types of fuel, metal and non-metallic minerals. The core of the Komi economy is made of industries involved in the mining and processing of fossil fuels; oil, gas, coal and wood. The Usinsky region is a major center of oil production of the Komi Republic.

Despite the fact that the official data (published annually in the state report on the state of the environment of the Komi Republic) reports a decrease in negative impact, in many areas this does not correspond with the true picture. Activities related to oil and gas production, storage and transportation are of great environmental danger and pollute the environment by production and consumption waste. The most dangerous situation concerns oil spills. Official statistics have only been recording spills exceeding 8 tons<sup>233</sup>.

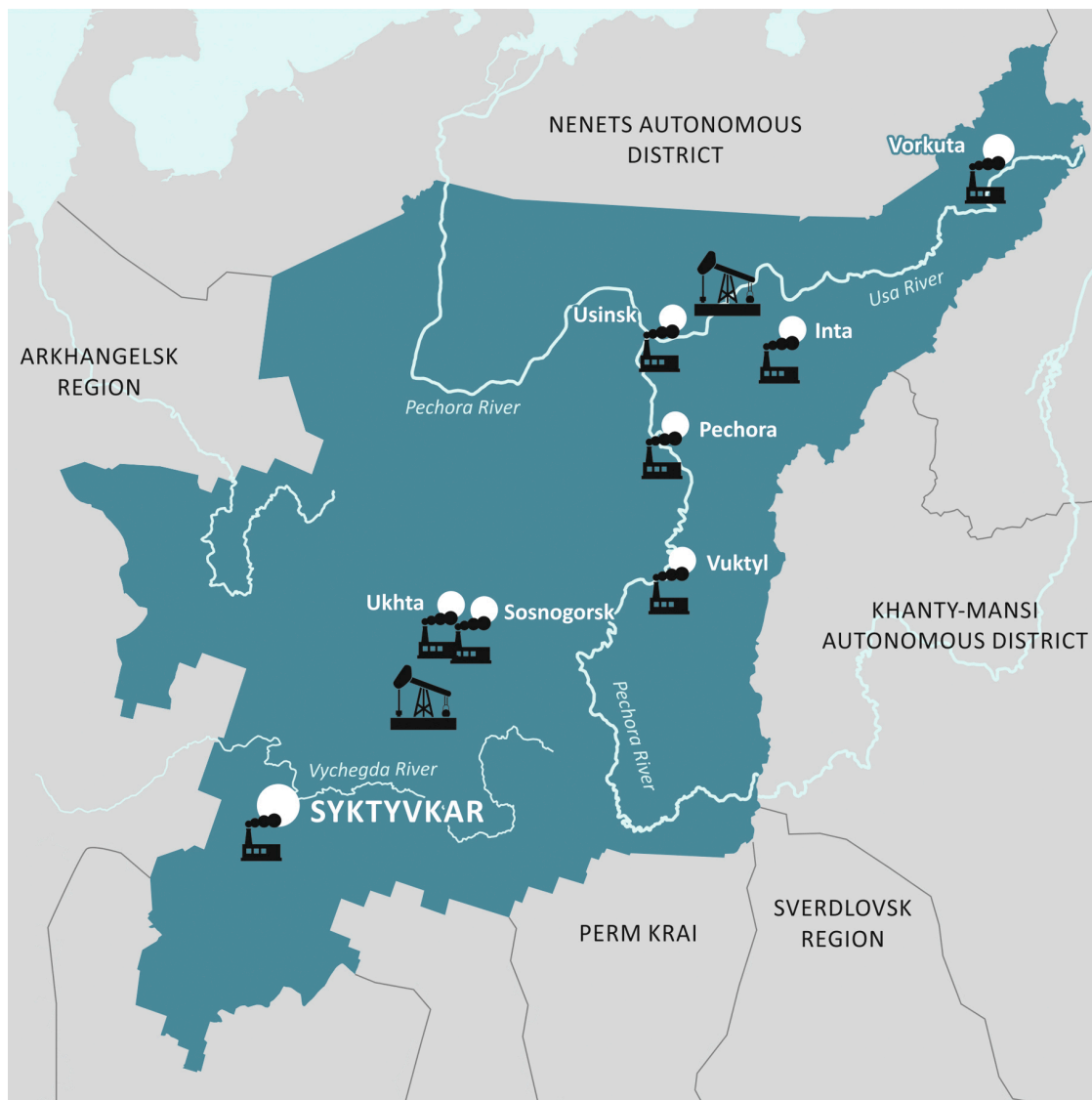
Local adverse impact on environmental components is observed mainly in the major industrial centers of the Komi Republic (Vorkuta, Usinsk, Sosnogorsk, Pechora, Ukhta, Inta, Syktyvkar and Vuktyl), where major industrial polluters, mining and processing industries are situated. The impact of the oil and gas industry on main components of the environment (air, water, soil, flora and fauna and human beings) is caused by the toxicity of natural hydrocarbons, a wide variety of chemicals used in industrial processes, as well as the ever-increasing volume of oil and gas production, including preparation, transportation, storage, processing, etc<sup>234</sup>.

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<sup>232</sup> Gosudarstvenny doklad «O sostoyanii okruzhayushey sredy Respubliki Komi v 2013 godu» [State report "State of The environment in the Komi Republic in 2013"], Ministry of Nature Management and The environment of the Komi Republic (<http://www.agiks.ru/data/gd2013.pdf>).

<sup>233</sup> <http://www.ecolife.ru/zhurnal/articles/27583>.

<sup>234</sup> Based on websites: <http://pp.rkomi.ru/page/7896>; [http://komi.gks.ru/wps/wcm/connect/rosstat\\_ts/komi/ru/statistics/population](http://komi.gks.ru/wps/wcm/connect/rosstat_ts/komi/ru/statistics/population).



## General description of the environmental condition

### Atmospheric air condition

As compared with 2012, the total pollutant emissions from stationary sources in the Komi Republic in 2013 increased by 12.5% and totalled 774 300 tons (in 2012 – 688 200 tons), out of which 474.8 thousand tons of emissions are from mining minerals, and 49 200 tons from processing.

In 2013, there was a significant increase in emissions, as compared to 2012: hydrocarbons by 27.73%, nitrogen oxides by 10.5%, sulfur dioxide by 9.43%, carbon monoxide by 4.85%. In the same period there was a decrease in pollutant emission, namely in volatile organic compounds - 17% and solid substances - 4.96%<sup>235</sup>.

<sup>235</sup> Gosudarstvenny doklad «O sostoyanii okruzhayushey sredy Respubliki Komi v 2013 godu» [State report "State of The environment in the Komi Republic in 2013"], Ministry of Nature Management and The environment of the Komi Republic (<http://www.agiks.ru/data/gd2013.pdf>).



The Komi oil companies alone emit more than 100 thousand tons of pollutants containing 5.9% of solid substances, 12.5% - sulfur dioxide, 31.6% - carbon dioxide, 5.7% - nitrogen dioxide, and 6% - hydrocarbons into the atmosphere<sup>236</sup>.

Atmospheric pollution in the Republic has an uneven spread - in some cities the number of air emissions in 2013, as compared with 2012, significantly decreased (Vorkuta, Sosnogorsk), but in Inta, Usinsk, Pechora, Ukhta and Syktyvkar there was a significant increase in the amount of air emissions, mainly due to an increase in the emission of hydrocarbons, carbon monoxide and sulfur dioxide<sup>237</sup>.

The most polluted cities are Syktyvkar and Vorkuta<sup>238</sup>.

## The condition of water resources

Due to significant reserves of fresh water and a developed hydrographic network, the Komi Republic has no shortage of water resources. Two major rivers have their sources in and flow through the Republic, namely the Pechora River (1 570 km long within the Komi territory) and the Vychegda River (920 km long within the Komi territory) belonging to the Barents and the White Sea basins. Other major rivers on the territory of the Republic are the Luza, the Mezen (the White Sea basin), the Kara (the Kara Sea basin) and the Letka, the Kobra and the Berezovka (the Caspian Sea basin).

Water use in the Komi Republic, as well as in Russia as a whole, faces the problem of irrational use of water resources and water quality deterioration due to untreated waste discharge. The heaviest pollution of surface water in the Republic is observed in industrially developed districts, such as the Vorkuta district, the Inta district, the Pechora district, the Sosnogorsk district, the Ukhta district and the Syktyvkar district.

Over the past 20 years, the total water consumption in the Republic has decreased by more than 36% (a decrease by 293.69 million m<sup>3</sup>), which has had a positive impact on the quality of surface waters<sup>239</sup>. 377.39 million m<sup>3</sup>, or about 80% of the total volume of water used in the Komi Republic in 2013 (475.59 million m<sup>3</sup>) was used for industrial needs.

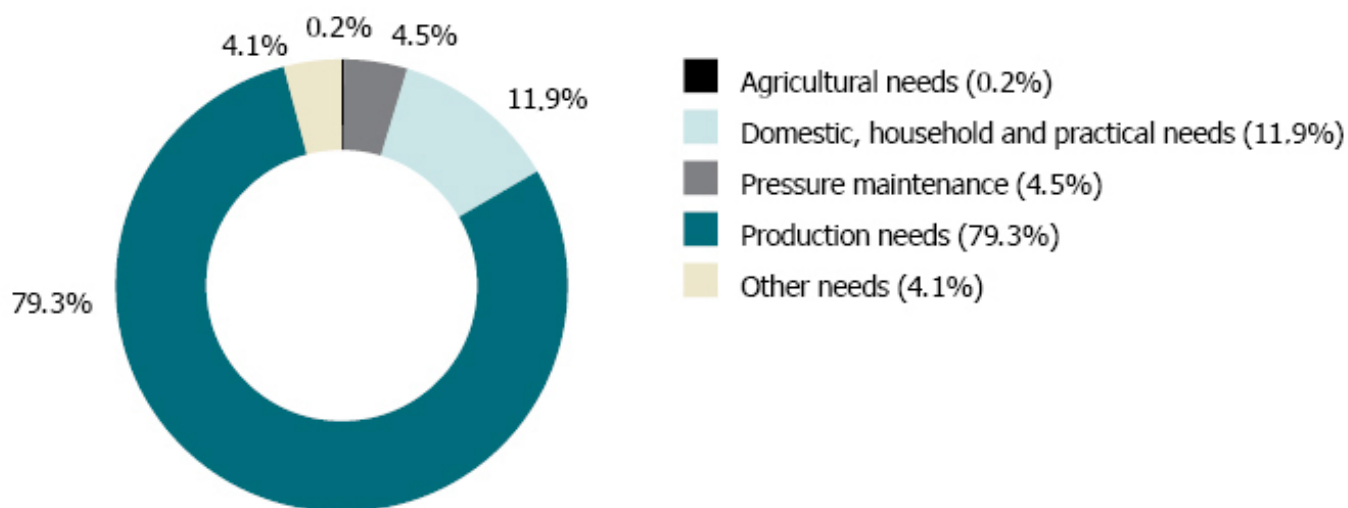
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<sup>236</sup> [http://www.fcgsen.ru/12/documents/070504\\_Vliyanie\\_NGP\\_Arctic\\_region.html](http://www.fcgsen.ru/12/documents/070504_Vliyanie_NGP_Arctic_region.html).

<sup>237</sup> Gosudarstvenny doklad «O sostoyanii okruzhayushey sredy Respubliki Komi v 2013 godu» [State report "State of The environment in the Komi Republic in 2013"], Ministry of Nature Management and The environment of the Komi Republic (<http://www.agiks.ru/data/gd2013.pdf>).

<sup>238</sup> Overview for environmental pollution on the territory of activities of Federal State Budget Institution "Northern Department of Hydrometeorology and Environmental Monitoring" for 2013 ([http://www.sevmeteo.ru/monitoring/reviews/i/monitoring\\_review-2013.pdf](http://www.sevmeteo.ru/monitoring/reviews/i/monitoring_review-2013.pdf)).

<sup>239</sup> Gosudarstvenny doklad «O sostoyanii okruzhayushey sredy Respubliki Komi v 2012 godu» [State report "State of The environment in the Komi Republic in 2012"], Ministry of Nature Management and The Environment of the Komi Republic ([http://www.agiks.ru/data/gosdoklad/gd2012/html/h10\\_1.html](http://www.agiks.ru/data/gosdoklad/gd2012/html/h10_1.html)).



**Fig. 1. Structure of water use in the Komi Republic, 2013<sup>240</sup>**

25% of wastewater discharged into surface water bodies of the Komi Republic in 2013, or 109.39 million m<sup>3</sup> out of 437.08 million m<sup>3</sup>, is contaminated: 101.14 million m<sup>3</sup> out of the discharged volume is inadequately treated, and 8.25 million m<sup>3</sup> is released without purification. The volume of inadequately treated water in 2013 continued to be reduced, and, as compared with 2012, decreased by almost 9%, which is mainly connected to the general decrease in the total volume of wastewaters at the plants involved in the wood processing and pulp industry. The volume of wastewater discharge (without treatment), as compared with 2012, has also decreased by 6%, due to the reduction of discharges at a number of companies (Mondi Syktyvkar forest industry complex, OJSC and Vorkutaugol, OJSC).

Officially, 14 cases (in 2012 - 7 cases) related to accidental oil and oil products spills totaling 79.1 m<sup>3</sup> and 3 465 m<sup>2</sup> of contaminated area were recorded in the Komi Republic in 2013<sup>241</sup>. But according to non-governmental organizations and local residents, there were many more spills than those reported; they are marked as "incidents", "depressurization of the pipeline" and not included in official statistics. In August 2014, in the course of Greenpeace oil spill patrol's actions in the Komi Republic and the Nenets Autonomous District, 204 oil-contaminated sections of land of a total area of about 130 hectares, including more than 20 fresh oil spills, were detected<sup>242</sup>.

The Pechora River basin in the Usinsk, the Ukhta and the Pechora districts (major oil deposits) is highly endangered. The majority of the oil produced also travels through the basin of the Kolva River. The river systems annually exposed to oil spills are as follows: downstream of the Kolva River, a part of the downstream of the Usa River, the Pechora River from the mouth of the Usa river till the estuary (the Pechora Sea).

<sup>240</sup> Gosudarstvenny doklad «O sostoyanii okruzhayushey sredy Respubliki Komi v 2013 godu» [State report "State of The Environment in the Komi Republic in 2013"], Ministry of Nature Management and The Environment of the Komi Republic (<http://www.agiks.ru/data/gd2013.pdf>).

<sup>241</sup> Ibid.

<sup>242</sup> [http://www.greenpeace.org/russia/Global/russia/report/Arctic-oil/complaint\\_Komi\\_patrol.pdf](http://www.greenpeace.org/russia/Global/russia/report/Arctic-oil/complaint_Komi_patrol.pdf).

In 2013, the water quality in most rivers of the Komi Republic is classified as 3 "a" (polluted), the water quality over a large area of the Pechora River belongs to the same category. Water quality in the Kolva and the Usa rivers (downstream - Ust-Usa village) is classified as 3 "b" (very polluted)<sup>243</sup>.

In 2013, technogenic pollution of underground waters was detected at 19 public water supply intakes. The core indicators of groundwater contamination are elevated concentrations of iron, manganese, boron, ammonium, hydrogen sulfide, as well as elevated values of turbidity, colority, oxidizability. The intensity of contamination is mostly defined as moderately dangerous: predominantly less than 10 MAC, rarer is 10 MAC and more<sup>244</sup>. The results of groundwater monitoring in areas of rapidly developed oil deposits show evidence of nearly all-round contamination of groundwater of the first and main underlying aquifers with oil products. As a result, water quality does not meet the regulatory standards for iron, manganese, ammonium, chlorides, oxidability values, organoleptic properties, and on rare occasions for mineralization<sup>245</sup>.

## Surface soil condition

Industrial emissions, irrational waste management policy concerning industrial waste and technogenic accidents (oil spills) have a great influence on the condition of the surface soil in the Komi Republic. The official statistics indicate that, in 2013, 11 986.6 hectares of land was contaminated in the Republic, 6 228.9 hectares of which was reclaimed. The contaminated land area in 2013 grew by 98.6602 hectares, as compared with 2012<sup>246</sup>.

## Industrial waste

The main contribution to waste generation is made by companies involved in mining minerals (71.03%) and processing (23.28%) and basic industries producing and accumulating waste, such as coal mining and wood processing, namely Vorkutaugol, OJSC and Mondi Syktyvkar forest industry complex, OJSC. Most waste belongs to V hazard class, and the percentage of waste utilization in the Komi Republic is very low (24.4%)<sup>247</sup>.

The colliers are responsible for the lion's share of all industrial wastes generated annually in the Komi Republic. In 2010, the waste from the coal industry amounted to 5 million tons (76% of the total), of which Vorkutaugol, OJSC generated 4.3 million tons of waste<sup>248</sup>. In 2012, the total amount of production and consumption wastes in the Republic reached 23.98 million tons (in 2011 - 6.34 million tons). Such an increase in waste in 2012, as compared to 2011, was connected to the activities of Vorkutaugol, OJSC, the waste of which in 2012 was 21.57 million tons (in 2011 - 4.67 million tons).

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<sup>243</sup> Gosudarstvenny doklad «O sostoyanii okruzhayushey sredy Respubliki Komi v 2013 godu» [State report "State of The Environment in the Komi Republic in 2013"], Ministry of Nature Management and The Environment of the Komi Republic (<http://www.agiks.ru/data/gd2013.pdf>).

<sup>244</sup> Ibid.

<sup>245</sup> <http://www.agiks.ru/data/gd2013.pdf>.

<sup>246</sup> Gosudarstvenny doklad «O sostoyanii okruzhayushey sredy Respubliki Komi v 2013 godu» [State report "State of The Environment in the Komi Republic in 2013"], Ministry of Nature Management and The Environment of the Komi Republic (<http://www.agiks.ru/data/gd2013.pdf>).

<sup>247</sup> Ibid.

<sup>248</sup> [http://www.barentsinfo.fi/beac/docs/The\\_environment\\_Ministers\\_Meeting\\_4\\_5\\_Nov\\_2013\\_Inari\\_HotSpots\\_Assessment\\_Report\\_RUS.pdf](http://www.barentsinfo.fi/beac/docs/The_environment_Ministers_Meeting_4_5_Nov_2013_Inari_HotSpots_Assessment_Report_RUS.pdf).

In 2013, the opposite situation arose in the Republic: total amount of waste production and consumption was 6.78 million tons, which is related to the production of Vorkutaugol, OJSC. This is a decrease in the amount of waste by 17 million tons<sup>249</sup>.

## Main polluters

Due to the fact that most of the large mining polluters conduct their production activities in several areas, the core areas with the greatest load were identified. These include such settlements, as Syktyvkar (Mondi Syktyvkar forest industry complex, OJSC), Usinsk and its suburbs (LUKOIL-Komi, LLC and RN-Severnaya Neft, LLC), Vorkuta (Vorkutaugol, OJSC) and Ukhta (Gazprom Transgaz Ukhta, LLC). It should be noted that the effects of LUKOIL-Komi, LLC and RN-Severnaya Neft, LLC activities also spread to the Ukhta urban district and the municipal districts of Pechora, Sosnogorsk, Izhemsky and Ust-Tsilemsky.

The actual basis for this section consists of data taken from official sources of authorities of the Komi Republic, the companies' reports and information. Furthermore, appropriate formal requests were sent to the polluters. However, in most cases we have been redirected to the publicly available information, and some companies ignored our requests completely. In response to our requests, the state authorities (Rosprirodnadzor and the Statistics Committee) replied that they did not have the right to provide information in connection with the fact that it is "source information and can not be publicly disclosed". Some of the materials were obtained from unofficial sources at the companies and in the relevant government entities.

### *Mondi Syktyvkar Forest Industry Complex, OJSC*

#### *General information*

Mondi Syktyvkar Forest Industry Complex Pulp and Paper Mill (Mondi Syktyvkar forest industry complex, OJSC) is a major logging company of the Republic, i.e. about 43.9% of total wood processing is carried out at this mill.

Mondi Syktyvkar forest industry complex, OJSC is located on the left bank of the Vychegda River 18 km away from the Syktyvkar center (population - 300 thousand inhabitants, in 2013), in the Ezhvinsky industrial district of the city, the population of which is about 60 thousand people. The residential buildings in the Ezhvinsky district are separated from the plant by woodland. The main shareholder of the plant is Austrian company Neusiedler Holdings BV. The average number of staff is 4170 people (according to 2013 figures).

The company occupies a territory of 1 086.9 hectares, 292.5 ha of which is the industrial site of the company, 500.2 ha contain objects of environmental conservation, including mechanical and biological wastewater treatment stations, ponds, landfills, sludge collectors, drainage channels and sewage networks.

While manufacturing pulp and paper products, low-grade raw wood is mainly used, this allows the company to sell high-grade wood to external customers and to get additional revenues.

The volume of forest harvested in 2012 amounted to 2.8 million m<sup>3</sup>. The plant has two wood preparation units (WPU), sulphate pulp and paperboard production facilities and two units for sheet paper production. In addition to the plant, Mondi Syktyvkar forest industry complex, OJSC has seven branches using more than 2 million hectares of the leased forest lands. The company specializes in the production of office and offset paper (with a share of 37% and 43%, respectively, in the Russian market), and also produces newspaper paper and cardboard. Paper and cardboard are also export products. The share of exports of the total production of paper products is 29.8%. The main products of Mondi Syktyvkar forest industry complex, OJSC, providing 89% of income in 2012, were paper and cardboard.

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<sup>249</sup> Gosudarstvenny doklad «O sostoyanii okruzhayushey sredy Respubliki Komi v 2012 godu» [State report "State of The Environment in the Komi Republic in 2012"], Ministry of Nature Management and The Environment of the Komi Republic ([http://www.agiks.ru/data/gosdoklad/gd2012/html/h10\\_1.html](http://www.agiks.ru/data/gosdoklad/gd2012/html/h10_1.html)).

The company receives power from its own thermal power plant (TPP). In 2012, the TPP generated 2 746 246 thousand KWh of electricity (2 698 416 thousand rubles), 1 535 848 000 KWh of which was taken by domestic consumption. Heat production amounted to 4 180 560 Gcal (2 226 858 000 rubles), 3 407 355 Gcal of which was taken by internal consumption.

Mondi Syktyvkar forest industry complex, OJSC is among the seven largest manufacturers of paper products in Russia.

Forest management at the company's leased forest lands is certified according to the standards of the Forest Stewardship Council (FSC). A subsidiary of Mondi Syktyvkar forest industry complex, OJSC, the New Forest Company, cultivates seedlings with closed root systems for reforestation works in areas of felling<sup>250</sup>.

### *Economic aspects*

Mondi Syktyvkar forest industry complex, OJSC is the largest taxpayer in the Komi Republic forming more than 20% of the republic budget. In 2013, the company's turnover amounted to 31 818 132 000 rubles. The net profit reached 2 318 772 000 rubles (in 2012 – 2 643 767 000 rubles). The income tax amounted to 793 796 000 rubles (in 2012 - 671 258 000 rubles)<sup>251</sup>.

### *Air emissions*

The enterprise has more than 200 air pollutant sources, emission standards are provided for all the sources. A maximum admissible discharge is set (MAD)<sup>252</sup>.

51 pollutants are emitted into the air from the company's sources (32 liquid and gaseous, 19 solid substances).

However, fixed monitoring stations of the Center for Hydrometeorology and Environmental Monitoring of the Komi Republic have been observing only 12 out of 51 components of the emissions declared. Thus, there is no confidence about excesses for other components.

Comparative analysis of air emissions for the period 2011-2012 indicates a significant increase in emissions of hydrogen sulfide (3.8 times) and sulfur dioxide (2 times). The total volume of air emissions for five pollutants (dust, sulfur dioxide, hydrogen sulfide, mercaptans and chlorine) in 2012 amounted to 294 tons, which is 2% more than in 2011 (about 236 tons). The total emissions of nitrogen dioxide and carbon monoxide in 2012 did not exceed the MAD and together with greenhouse gas emissions amounted to about 8.7 thousand tons.

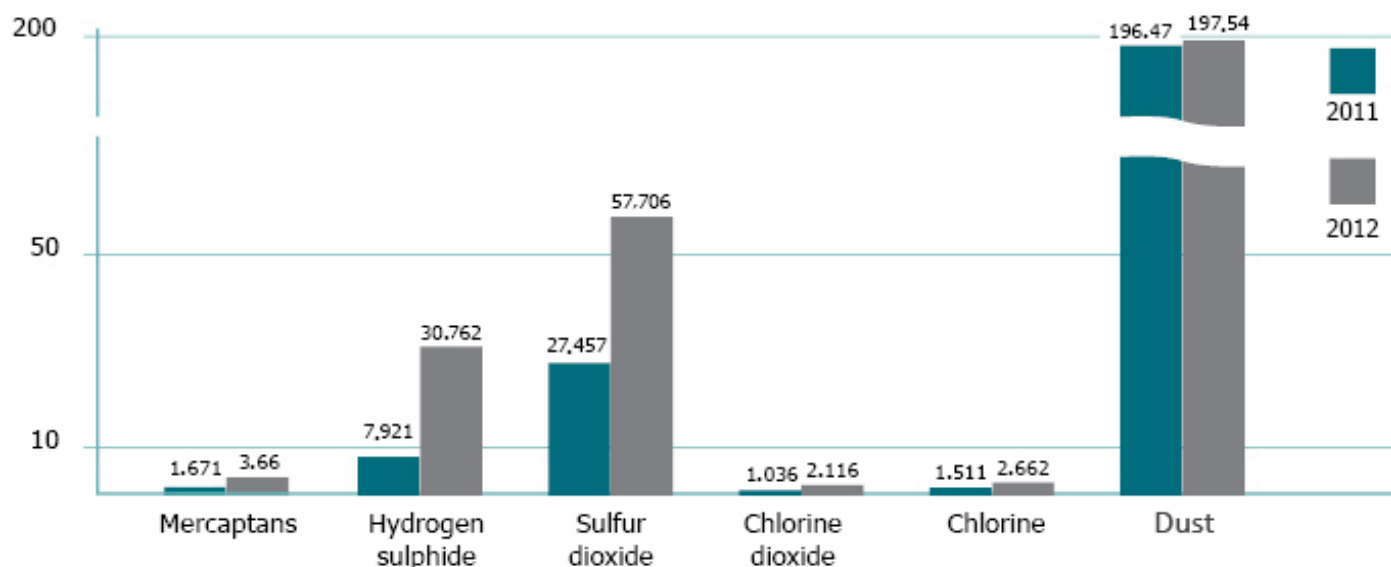
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<sup>250</sup> Based on website at <http://www.mondigroup.com/ru/desktopdefault.aspx/tabid-351>.

<sup>251</sup> Godovaya bukhgalterskaya otchetnost OAO «Mondi SLPK» za 2013 god [Annual financial reporting of Mondi Syktyvkar Forest Industry Complex, OJSC for 2013] (<http://www.e-disclosure.ru/portal/files.aspx?id=643&type=3>).

<sup>252</sup> <http://narfu.ru/university/library/books/0596.pdf>.





**Fig. 2. Comparative analysis of air emissions from Mondi Syktyvkar forest industry complex, OJSC for 2011-2012<sup>253</sup>**

The greatest contribution to air pollution in terms of methanethiol (methyl mercaptan) and hydrogen sulfide are made by emissions generated during the manufacturing process, and exhaust ventilation in the production units: boiling-bleaching room, soda recovery boilers (SRB) with dissolving tanks, treatment facilities. For example, the contribution of source No. 206 (dissolving tank 4U) to the overall level of pollution in terms of methanethiol (methyl mercaptan) is 18% and source No. 108 (exhaust ventilation in the cooking-bleaching room) is 9%. It should be noted that in an effort to implement an environmental protection plan, the soda recovery boiler units and dissolving tanks SRB 3U, SRB 4U and SRB 6U were taken out of operation. Nevertheless actual total emissions have increased by certain parameters (nitrogen oxides, sulfur dioxide and hydrogen sulphide).

The Department of Rosprirodnadzor in the Komi Republic inspected production apparatus, such as WPU No. 1, the bleaching unit, the causticizing and lime regeneration unit, SRB 7U, boiler-and-turbine unit No. 2, as well as the gas treatment equipment where the air-gas mixture is cleaned of the following substances: wood dust, chlorine, chlorine dioxide, calcium oxide (quick-lime), sodium sulfate and suspended substances.

Together with specialists from the Centre for Laboratory Analysis and Technical Measurement, emission sources at Mondi Syktyvkar, OJSC forest industry complex were sampled during operation (the power boiler, bark boiler No. 5U, SRB-7U and lime burning furnaces No. 1 and No. 2) to determine the pollutants emitted according to the accreditation scope of the Centre for Laboratory Analysis and Technical Measurement in the Komi Republic. According to the protocol on measuring the concentrations of pollutants, an excess of the established norms was not found.

This inspection did not reveal "other stationary sources of harmful air emissions, not part of the MAD project, as well as contaminants not listed in permits for discharge". No violations of the requirements of the legislation of the Russian Federation in the field of air protection were found.

The remoteness of the plant from Syktyvkar (about 20 km) makes it almost invulnerable in case of inspections, a prompt response is almost impossible. Control and measuring station located in the vicinity of industrial facilities has been purchased by the company itself. The lack of state monitoring makes it impossible to confirm the objectivity of measurement data provided by the company.

<sup>253</sup> Godovoy otchet OAO «Mondi SLPK» za 2012 god [Annual report of OJSC "Mondi Syktyvkar Forest Industry Complex" for 2012] (<http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&ved=0CC8QFjAC&url=http%3A%2F%2Fwww.e-disclosure.ru%2Fportal%2FFileLoad.ashx%3FFileid%3D635155&ei=e33rU6zjO8am0QXc34CoAQ&usg=AFQjCNGQsiMdJUnbUigitrbwvcElFc1Svg&sig2=1DcWUe6C-Lt5HjNQmJnu6A&bvm=bv.72938740,d.ZGU>).

The level of air pollution in Syktyvkar in 2013 was characterized as high<sup>254</sup>. Average annual and single concentrations of suspended substances, sulfur dioxide, nitrogen dioxide and carbon monoxide in 2012-2013 were low and average annual concentrations did not exceed the MAC<sup>255</sup>. Specific impurities formed the main part of air pollution: formaldehyde, which exceeded the MAC two fold (although for the period 2009-2013 its concentration decreased by 22%), benz(a)pyrene, whose average annual concentration reached 1.7 MAC<sup>256</sup>. According to data for 2003-2012, the air pollution tendency in Syktyvkar was caused by an increase in the average concentrations of suspended substances, nitrogen dioxide and formaldehyde, while annual average concentrations of benz(a)pyrene and carbon monoxide were reduced<sup>257</sup>.

### *Discharges into water bodies*

The water discharge into the Vychegda River is performed by means of five outlets. The total volume of wastewater discharges in 2012 amounted to 129 014 thousand m<sup>3</sup> that is by 6 172.43 thousand m<sup>3</sup> less than the total discharge in 2011 (given the established limit for water discharge is 139 582.7 thousand m<sup>3</sup>/year). The company discharges 27.5% of its total waste discharge into water bodies of the Republic (including the "Basic" outlet which discharges insufficiently treated (18%) waste water after processing by biological treatment station). In 2013, the company reduced the amount of water intake and discharge volume of polluted waters<sup>258</sup>.

The source of wastewaters flowing into the biological treatment plant is from the enterprise's production activity (72%) and wash-offs from the Ezhvinsky District, the Northern industrial hub and Syktyvkar (28%). According to the results of production and state monitoring, the Syktyvkar Forest Industry Complex discharges insufficiently treated wastewater (in excess of the established norms for pollutants) into the Vychegda River (a fishery of the highest category). The biological treatment facilities has a projected capacity of 420 thousand m<sup>3</sup>/day (its actual load is 220-260 thousand m<sup>3</sup>/day) is not technically capable of cleaning the wastewater to the established standards for pollutants<sup>259</sup>.

According to production supervision, in 2012 there were regular excesses of the established allowable concentrations of pollutants: for the "Basic" outlet (the main substances were BOD, sulfates, nitrates and aluminum) and for the Slobodskoy reid outlet (the main substance was BOD). As for the remaining three outlets, the quality of discharged water is, in most cases, within the approved Allowable Discharge rates.

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<sup>254</sup> Overview of environmental pollution on the territory of activities of Federal State Budget Institution "Northern Department of Hydrometeorology and Environmental Monitoring" for 2013 ([http://www.sevmeteo.ru/monitoring/reviews/i/monitoring\\_review-2013.pdf](http://www.sevmeteo.ru/monitoring/reviews/i/monitoring_review-2013.pdf)).

<sup>255</sup> Gosudarstvenny doklad «O sostoyanii okruzhayushey sredy Respubliki Komi v 2012 godu» [State report "State of The Environment in the Komi Republic in 2012"], Ministry of Nature Management and The environment of the Komi Republic ([http://www.agiks.ru/data/gosdoklad/gd2012/html/h10\\_1.html](http://www.agiks.ru/data/gosdoklad/gd2012/html/h10_1.html)); Gosudarstvenny doklad «O sostoyanii okruzhayushey sredy Respubliki Komi v 2013 godu» [State report "State of The Environment in the Komi Republic in 2013"], Ministry of Nature Management and The environment of the Komi Republic (<http://www.agiks.ru/data/gd2013.pdf>).

<sup>256</sup> Overview for environmental pollution on the territory of activities of Federal State Budget Institution "Northern Department of Hydrometeorology and Environmental Monitoring" for 2013 ([http://www.sevmeteo.ru/monitoring/reviews/i/monitoring\\_review-2013.pdf](http://www.sevmeteo.ru/monitoring/reviews/i/monitoring_review-2013.pdf)).

<sup>257</sup> Overview for environmental pollution on the territory of activities of Federal State Budget Institution "Northern Department of Hydrometeorology and Environmental Monitoring" for 2012 ([http://www.sevmeteo.ru/monitoring/reviews/i/monitoring\\_review-2012.pdf](http://www.sevmeteo.ru/monitoring/reviews/i/monitoring_review-2012.pdf)).

<sup>258</sup> Gosudarstvenny doklad «O sostoyanii okruzhayushey sredy Respubliki Komi v 2013 godu» [State report "State of The Environment in the Komi Republic in 2013"], Ministry of Nature Management and The environment of the Komi Republic (<http://www.agiks.ru/data/gd2013.pdf>).

<sup>259</sup> Data is provided by environmental organizations of the Komi Republic.

**Table 1. Analysis for quality of waste water discharges<sup>260</sup>**

Name of pollutant	Standard	Actual pollutant discharge, 2012	
	mg/l	mg/l	t
Suspended substances	23.2	11.89	667.13
BOD <sub>5</sub>	10.1	11.4	1 251.39
Cl	300	92.58	7 427.72
SO <sub>4</sub>	199.6	246.25	19 480.81
NH <sub>4</sub>	4.06	4.12	344.779
NO <sub>2</sub> (nitrites)	0.2	0.416	33.858
NO <sub>3</sub> (nitrates)	40	1.35	60.92712
P	0.7	0.62	49.231
AS	0.5	0.108	8.72824
Phenols	0.006	0.006	0.409
Formaldehyde	0.05	0.046	2.82315
Methanol	0.29	0.229	14.2517
Oil products	0.5	0.173	10.153
Sulphide anions	0.005	0.002	0.11731
Al	0.07	0.066	3.149
Dry residue	1000	912.42	6 5462.48
Total pollutants, t		94 817.957	
Sewage flow rate, thousand/m <sup>3</sup>		83 994.64	

In 2012, the following pollutant excesses were found in the MAC for discharged waste water for the "Basic" outlet: BOD - 1.25 times, sulphates - 1.4, ammonium ion - 1.3, nitrites - 2.5, formaldehyde - 1.4, phenols - 1.6, aluminum - 1.5.

The department of the Rospirodnadzor in the Komi Republic performed administrative investigations of the company:

1. Based on violation of water legislation related to infringement of rules for the protection of water bodies of the Russian Federation during bottom dredging in the Vychegda River in the scatter zone of the main outlet of waste water. Administrative sanctions were imposed on the company, namely a fine to the amount of 20 thousand rubles (on March 11<sup>th</sup>, 2012) in accordance with part 3 of Article 8.13 of the Administrative Offences Code of the Russian Federation (violation of the established procedure for purification of water bodies from sediments). According to the materials of the administrative case, it was found that the use of a surface water body (Vychegda River) for dredging in the waters of the scattering outlet (in order to clean the water body from sand and sediments, as well as dumping of the sand and sediments on the river bank (land area of a protected water zone) was carried out without any approval for bottom dredging. Also without consent from the territorial authority of the Federal Fisheries Agency, production apparatus and other objects

<sup>260</sup> Ibid.

(sand storage) which affect aquatic biological resources and their habitats was put in place. No industrial ecological monitoring at the place of operations was conducted.

2. As a result of the patrol inspection along the territory of water protection zones and adjacent water areas (the Vychegda River, 349 - 426 km from the estuary and the Sysola River, 10 km from the estuary and the Vylty Lake), conducted by the Department during the period from 19.06.2012 to 20.06.2012, two administrative proceedings against Mondi Syktyvkar forest industry complex, OJSC were instituted. According to part 1 of Article 8.13 of the Administrative Offences Code of the Russian Federation (violation of the water protection regime in watersheds of water bodies) and according to Article 8.41 of the Administrative Offences Code of the Russian Federation (failure to pay for the negative impact on the environment by the payment due date).

3. At the request of the Verkhne-Vychegodsky division of the Federal State Budget Institution Komirybvod concerning the placement within the water protection zone of the Prupt River and its coastline, pontoon sections of a decommissioned old pontoon bridge, legal proceedings against Forest Company of Mondi Syktyvkar Forest Industry Complex, LLC were initiated under part 4 of Article 8.13 of the Administrative Offences Code of the Russian Federation (infringement of the requirements for protection of water bodies which may lead to their pollution, littering (and/or exhaustion) <sup>261</sup>.

### *Industrial wastes*

Mondi Syktyvkar forest industry complex, OJSC is one of the main sources of generated industrial waste. At five waste disposal sites of the company (bark storage of Forest Industry Company Syktyvkar Forest Industry Complex, OJSC, slurry reservoir No.1, landfill of Mondi Syktyvkar forest industry complex, OJSC, bark refuse dump of Mondi Syktyvkar forest industry complex, OJSC, slurry reservoir No.2 - sludge beds of treatment facilities), non-compliance with environmental requirements was revealed. Furthermore, state ecological expertise and sanitary-epidemiological conclusions were absent. At the same time, all the objects were in possession of documents on land allocation and implementation of environmental monitoring.

**Table 2. Analysis for condition of waste disposal facilities<sup>262</sup>**

<b>Name of waste disposal facility</b>	<b>Document on land allocation</b>	<b>State ecological expertise</b>	<b>Sanitary-epidemiological conclusions</b>	<b>Environmental monitoring</b>	<b>Compliance with environmental requirements</b>
<b>Bark storage of Forest Industry Company Syktyvkar Forest Industry Complex, OJSC</b>	+	-	-	+	-
<b>Slurry reservoir No.1</b>	+	-	-	+	-
<b>Industrial waste landfill of Mondi Syktyvkar forest industry complex, OJSC</b>	+	-	-	+	-
<b>Bark refuse dump of Mondi Syktyvkar forest industry complex, OJSC</b>	+	-	-	+	-
<b>Slurry reservoir No.2 - sludge beds of treatment facilities</b>	+	-	-	+	-

### *Production process modernization plans for reducing the negative impact on the environment*

In 2012, Mondi Syktyvkar forest industry complex, OJSC implemented a number of projects to modernize production facilities. The most important actions among them are as follows:

<sup>261</sup> Ibid.

<sup>262</sup> Ibid.

- Modernization of the Do stage for coniferous flow of bleaching the pulp and change-over to a medium concentration;
- Installation of a storage tank for bleached softwood pulp with capacity of 5000 m<sup>3</sup>;
- Installation of a new node for hardwood pulp unreeling;
- Modernization of paper-making equipment;
- Modernization of control system of turbine generator, st. No. 2E;
- Reconstruction of a SRB-3U soda recovery boiler and change-over to bark waste burning in a fluidized bed<sup>263</sup>.

The reconstruction of a SRB-3U soda recovery boiler allowed almost complete disposal of the bark waste accumulated at the plant, as well as offering the service to other wood processing companies not having such capabilities.

Bark waste is used for power generation.

Today Mondi Syktyvkar forest industry complex, OJSC is the only enterprise in the Komi Republic which has introduced separate waste collection. The company installed collecting points for galvanic elements and mercury lamps; wastepaper collection is also provided.

The measures (planned in 2013 by Mondi Syktyvkar forest industry complex, OJSC) to protect the environment are focused on the technological workings of sewage treatment. However, there are not any specific actions in the plans to reduce the content of phenol, aluminum and sulfates in discharged waters.

Among the measures for protection of the atmosphere, planned for 2013, the following steps should be noted: the installation of carbon filters (to ensure absorption of sulfur-containing substances in noxious gases), the modernization of the boiler at the Noshulsky branch in Cheksha village (change-over of boiler station to electricity to eliminate pollutant emissions produced by burning). As for the measures to protect water bodies, it is planned to reconstruct the K-18 discharge pipeline (reducing the risk of accidental waste water spillage), to develop a project to install a cooling system of recycling water at compressor station No. 2 (increasing the recirculating water supply) and a number of measures to modernize sewage treatment plants (first stage) amounting to 240 million rubles<sup>264</sup>.

Despite the considerable amount of environmental investments and modernization of production, the company remains one of the major industrial polluters of Syktyvkar, Ezhvinsky district and Zelenets, Koytybozh and Parcheg villages.

## *LUKOIL-Komi, LLC*

### *General information*

LUKOIL-Komi, LLC is a subsidiary of LUKOIL, OJSC specializing in the exploration, preparation and development of hydrocarbon deposits (oil and burnable dissolved gas) of the Timan-Pechora oil- and gas-bearing province in the Komi Republic and the Nenets Autonomous District. In the Komi Republic LUKOIL-

<sup>263</sup> Godovoy otchet OAO «Mondi SLPK» za 2012 god [Annual report of OJSC "Mondi Syktyvkar Forest Industry Complex" for 2012] (<http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&ved=0CC8QFjAC&url=http%3A%2F%2Fwww.e-disclosure.ru%2Fportal%2FFileLoad.ashx%3FFileid%3D635155&ei=e33rU6zjO8am0QXc34CoAQ&usg=AFQjCNGQSiMdJUnbUigitrbwvcElFc1Svg&sig2=1DcWUe6C-Lt5HjNQmJnu6A&bvm=bv.72938740,d.ZGU>).

<sup>264</sup> OJSC "Mondi Syktyvkar Forest Industry Complex". Environmental protection measures in 2012. Action plan for 2013. ([http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&cad=rja&uact=8&ved=0CCoQFjAB&url=http%3A%2F%2Fxn--80adxb5abi4ec.xn--p1ai%2Fattachments%2Farticle%2F14842%2Fmondi%2520present.PPT&ei=WoXrU\\_MJjansBoj2gOgF&usg=AFQjCNGT\\_GYvhzX3wu\\_3cc0potA3q-uZUw&sig2=nGxiX21fzTUSG1gzRNfVDQ&bvm=bv.72938740,d.d2k](http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&cad=rja&uact=8&ved=0CCoQFjAB&url=http%3A%2F%2Fxn--80adxb5abi4ec.xn--p1ai%2Fattachments%2Farticle%2F14842%2Fmondi%2520present.PPT&ei=WoXrU_MJjansBoj2gOgF&usg=AFQjCNGT_GYvhzX3wu_3cc0potA3q-uZUw&sig2=nGxiX21fzTUSG1gzRNfVDQ&bvm=bv.72938740,d.d2k)).



Komi, LLC carries out its activities within the municipalities of Ukhta and Usinsk urban districts, Pechora, Sosnogorsk", Izhemsky and Ust-Tsilemsky municipal districts.

### *Structure of LUKOIL-Komi, LLC*<sup>265</sup>:

LUKOIL-Usinskneftegaz, Territorial Production Enterprise (TPE) operates on the territory of the Komi Republic and the Nenets Autonomous District. It develops the northern group of deposits, such as Usinskoye, Vozeyskoye, Kharyaginskoye, Verhnevozeyskoye, Vostochno-Masterelskoye, Lekkerskoye, Yuzho-Shapkinskoye, Pashshorskoye, Yuzho-Yuryakhinskoye, Suborskoye, Osvanyurskoye, Pyzhelskoye, Verhnegrubeshorskoye, Vostochno-Kharyaginskoye, Bayandyskoye, Vostochno-Lambeysorskoye and Oshskoye.

LUKOIL-Ukhtaneftegaz, TPE operates on the territory of the Komi Republic and develops the southern group of deposits: Zapadno-Tebukskoye, Dzherskoye, Rasyuskoye, Turchaninovskoye, Severnyi-Gebol, Severo-Savinoborskoye, Vostochno-Savinoborskoye, Michayuskoye, Bezymyanoye, Pashninskoye, Beregovoye, Kyртаelskoye, Yuzhno-Kyртаelskoye, Yuzhno-Nizevoye, Nizevoye, Makarelskoye, Schelyayurskoye, Verkhne-Volminskoye, Demaelskoye, Yuzhno-Sedmesskoye, Areskikh group, Severo-Kozhvinskoye, Yuzhno-Lyzhskoye and Yuzhno-Terekheveyskoye.

Yareganefit, Oil Mining Management (OMM) develops the Yaregskoye deposit (thermal mining method) in the Yaregskaya area and the deposit in the Lyaelskaya area within Yaregsky oil titanium deposit (SAGD method). Industrial development by mining method began in 1939. In accordance with the program for the development of oil production on Yaregskoye deposit, while exploiting the mines on Yaregskaya area and surface wells on Lyaelskaya area, it is planned to increase the volume of oil production from 527 thousand tons in 2012 to 3.5 million tons by 2025.

The administration for production and technical procurement (AFTP) carries out a range of services related to the provision of material and technical resources to all production facilities of LUKOIL-Komi, LLC.

The Usinsky gas processing plant (UGPP) deals with the collection of the oil-dissolved gas from the oil-and-gas production enterprises of LUKOIL-Komi, LLC on Kharyaginskoye, Vozeyskoye, Usinskoye and Kyртаelskoye oil deposits. The company's products are liquefied petroleum gas (technical propane-butane mixture, technical butane) and stable natural gasoline.

The total number of employees at LUKOIL-Komi, LLC is more than 7000 people, the overwhelming majority of them are locals<sup>266</sup>.

Most of the company production is located on the territory of the municipal formation of the Usinsk urban district. Usinsk city, Usador town, Michael town, Pripolyarnyy, Vozey, Verkhnekolvinsk, Kolva, Ust-Usa, Ust-Lyzha are located in close proximity to 22 licensed sites of LUKOIL-Komi, LLC. There is also the Usinsk gas processing plant (UGPP) in Usinsk.

The fund for subsurface raw hydrocarbon deposits of LUKOIL-Komi, LLC in the municipal formation of Usinsk urban district includes the following deposits: Usinskoye (Permo-Carboniferous and Devonian sediments), Vozeyskoye (Kostyukskaya zone), Yuzhno-Yuryakhinskoye, Pashshorskoye, Verkhne-Grubeshorskoye, Vozeyskoye (northern Middle Devonian reservoir), Michaelskoye, Vozeyskoye (Central Famennian, kamenougolnaya, Ufimskaya and Asselskaya reservoirs), Suborskoye, Denisovskaya dimple, Naydinsky-II, Lekkerskoye, Verhnevozeyskoye, Usinskoye (permian-carboniferous reservoir), Vozeyskoye (southern periclinal), Usinskoye (Famennian reservoir), Osvanyurskoye, Vostochno-Masteryelsky, Yuzhno-Khoreyverskiy, Sigaveyskoye, Yuzhno-Vozeyskoe (Famennian reservoir) and Block 15 of Timan-Pechora oil and gas-bearing province.

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<sup>265</sup> <http://lukoil-komi.lukoil.com/main/default.asp>.

<sup>266</sup> [http://lukoil-komi.lukoil.com/main/static.asp?art\\_id=942](http://lukoil-komi.lukoil.com/main/static.asp?art_id=942).

### *Economic aspects*

The turnover of LUKOIL-Komi, LLC in 2012 amounted to 279.88 billion rubles. In 2012, production of LUKOIL-Komi, LLC reached 14 million 714 tons of base fuel. The net income in 2011 was 43 billion 500 million rubles. There is no data concerning net profit for 2012<sup>267</sup>.

### *Air emissions*

Information about sources of emissions and related figures are not provided in the official sources.

### *Discharges into water bodies*

LUKOIL-Komi, LLC carries out water intake at 8 locations, and discharges are made at 13 locations. The discharge of insufficiently treated wastewater in the Usinsky district reached approximately 6.552 thousand m<sup>3</sup>. The treatment plants of Vodokanal-Service, LLC took on 13.550 thousand m<sup>3</sup> (based on data for the 1<sup>st</sup> quarter of 2012, other data not provided).

In 2012, 7 oil and oil product spills were officially recorded, 6 of them occurred in the vicinity of LUKOIL-Komi objects, including two in the Usinsky district.

According to reports by LUKOIL-Usinskneftegaz, TPE, 26 cases of depressurization at the sections of the company's oil pipeline system were recorded, occurring outside the water protection zones of the water bodies. As a result of noncategory failure of pipelines, the total effusive floating oil (FO) reached 102.6 m<sup>3</sup>, the area of contamination was 2 920 m<sup>2</sup> (based on data for the first quarter of 2012, other data is not provided)<sup>268</sup>.

Due to the lack of treatment facilities, the discharge of untreated wastewater is carried out from the territory of the "Oil depot of Usinsk, Komi Republic". There are no metering instruments for waste water discharge at this location. According to the results of sampling the waste and natural water of the Bolbanel River, LUKOIL-Severo-Zapadnefteprodukt, LLC found an excess of pollutants in wastewater and in the waters of the Bolbanel River as a result of oil pollution. During the state expertise for the project "Reconstruction of the second phase of the oil depot in Usinsk, the Komi Republic", there was no reliable information regarding the availability of the water body, Bolbanel River, on the territory of the given object to be reconstructed. Due to violation of the water legislation in terms of wastewater discharge with an excess of the MAC for pollutants, the Department of Rosprirodnadzor in the Komi Republic instituted administrative proceedings against LUKOIL-Severo-Zapadnefteprodukt, LLC and issued a fine. The fine was paid voluntarily. According to the decision of the Smolninskiy District Court of St. Petersburg dated 11.10.2012 in case No. 2-2895/2012, the plaintiff's claims were met on suspending the activities of LUKOIL-Severo-Zapadnefteprodukt, LLC related to utilizing the objects for capital construction on the territory of the Usinsk district until there was full implementation of the measures (stipulated by the project documentation) to protect the environment<sup>269</sup>.

The monitoring results of groundwater quality on the territory of the developed oil deposits in the Usinsky district indicate almost all-round oil contamination of groundwater at the first and major underlying aquifers, used for utility and drinking water supply in the areas of production activity of the company. It is reported that, to the fullest extent, groundwater is not protected from surface water pollution and is exposed to contamination. In 2012, the maximum intensity of oil pollution of groundwater in Usinsk oil deposit amounted to 0.1-2 MAC (in 2011 – 1.7-6.1 MAC)<sup>270</sup>.

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<sup>267</sup> [http://lukoil-komi.lukoil.com/main/static.asp?art\\_id=5196](http://lukoil-komi.lukoil.com/main/static.asp?art_id=5196).

<sup>268</sup> Data is provided by environmental organizations of the Komi Republic.

<sup>269</sup> [http://rpn11.rkomi.ru/index.php?option=com\\_content&view=article&id=194%3A-----|-&catid=1%3Anewsflash&Itemid=86](http://rpn11.rkomi.ru/index.php?option=com_content&view=article&id=194%3A-----|-&catid=1%3Anewsflash&Itemid=86).

<sup>270</sup> [http://www.agiks.ru/data/gosdoklad/gd2012/html/h3\\_2.html](http://www.agiks.ru/data/gosdoklad/gd2012/html/h3_2.html).

It is also reported that "based on the results of long-term observations at the site of the DNS-13 slurry reservoir at Usinsky oil deposit there has been a steady growth of chloride ions from 4 MAC in 2004 to 19 MAC in chloride waters formed under oil slurry reservoir (extremely dangerous pollution) in 2009 and iron from 18 MAC to 70 MAC, respectively. The maximum iron content was observed in 2007 - 669 MAC (extremely dangerous pollution)".<sup>271</sup>

### *Industrial wastes*

The amount of waste generated as a result of industrial activity in 2012, and construction waste taken out to the landfill constituted 3500 m<sup>3</sup>. 1354 m<sup>3</sup> of waste was sent to landfill for household solid wastes. Hazardous wastes are transferred for neutralization.

In 2014, LUKOIL-Komi, LLC initiated the second installation for recycling solid oil waste at Usinsk oil deposit, the first one is operating successfully at the Vozeyskoye deposit. In this regard, the volume of processing is expected to double and the balance of accumulated slurries is expected to be eliminated<sup>272</sup>.

### *Production process modernization plans for reducing the negative impact on the environment*

Among the activities of LUKOIL-Komi, LLC regarding the modernization of production (in order to reduce the negative impact on the environment), it is necessary to introduce sewage treatment plants and construct of new pipelines, as well as modernize of blocks for ODG treatment:

- Reconstruction of the Usinsky gas processing plant (GPP), construction of sulfur removal facility with compressor station with a capacity of 100 million m<sup>3</sup>/year. Construction of a compressor station with a capacity of 250 million m<sup>3</sup>/year<sup>273</sup>.

- Installation of a unit for gas treatment of hydrogen sulfide on the Bayandyskoye oil deposit.

- Construction of a gas compressor station in the system of utilization at Severnaya Kozhva (North Kozhva) unified oil processing unit.

- Gas utilization system from South group of deposits (cleaning gas from hydrogen sulphide).

- Pipeline looping<sup>274</sup> for oil treatment unit (OTP) "Kyrtael" - Pechorskaya SDPP;

- Construction of a booster pipeline for the pumping station, South Kyrtael - OTP "Kyrtael";

- Construction of a land storage facility for the recycling of solid and liquid oil slurries, as well as installation of equipment for processing oil slurries and washing of production tubing on the Kyrtelskoye deposit.

- Reconstruction of infield pipelines.

- Reconstruction of the interfield pipeline section of Severny Savinobor (North Savinobor) preliminary water removal unit, an insert in the Pashnya-Tebuk pipeline.

LUKOIL-Severneftegas, TPE is implementing a program for associated gas utilization, involving the large-scale reconstruction of Usinsky GPP. As a result, GPP will be able to reach a 95% utilization level for oil-dissolved gas generated from the main gas deposits (Bayandyskoye and Vostochno-Lambeyshorskoye) by 2015.

LUKOIL-Komi, LLC has been improving waste management works and intends to reclaim more than 680 hectares of damaged and oil contaminated lands (executor - LUKOIL-Usinskneftegaz, TPE)<sup>275</sup>.

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<sup>271</sup> Ibid.

<sup>272</sup> [http://lukoil-komi.lukoil.com/main/static.asp?art\\_id=952](http://lukoil-komi.lukoil.com/main/static.asp?art_id=952).

<sup>273</sup> [http://www.lukoil.ru/materials/images/Gas\\_processing/2013/LUK\\_rus\\_FB\\_81-82.pdf](http://www.lukoil.ru/materials/images/Gas_processing/2013/LUK_rus_FB_81-82.pdf).

<sup>274</sup> Looping – pipeline section laid in parallel to main gas pipe line. It is structurally and technologically connected to lineal part of pipelines. It is installed to increase the capacity of the latter or to reduce the gas pressure loss in the gas pipe line (<http://www.gazprominfo.ru/terms/looping>).

Despite the above improvements in the manufacturing process, in 2012, due to the activities of LUKOIL-Komi, LLC the environment of the Komi Republic suffered serious damage. The total amount of plaintiff's claims to identify contaminated water bodies and soil covers reached more than 13 million rubles. For example, in 2012 the Department of Rospirodnadzor in the Komi Republic repeatedly served LUKOIL-Komi, OJSC with lawsuits. The number of court cases instituted in 2012 dealt with infringements of conditions (stipulated in the license for use of mineral resources) related to FO pollution of Bezemyanny streams 1, 2, 3, feeding FO into the Kolva River, because of the unsealing of the oil-gathering collector on the territory of the complex unit for oil-and-gas recovery No.7 (CUOGR-7) within the Kharyaginskoye oil deposit, etc.<sup>276</sup>

The problem of oil spills in the Republic regularly arises and poses a threat to the environment and human health<sup>277</sup>.

## *Vorkutaugol, OJSC*

### *General information*

Vorkutaugol, as a part of Severstal mining and smelting company, is the largest company in Vorkuta (population is 64 353 inhabitants, according to 2013) and one of the largest coal companies in Russia (the company's share in the total balance of coal, produced in the Russian Federation, is 6%, close-burning coal - 22%).

The main activities of Vorkutaugol, OJSC are mining and processing of coal into high-quality and world standard coke, one of the main resources for cast-iron production in the smelting industry. The produced coal is also used in heat-power engineering, construction, and housing and public utilities.

The main market for Vorkutaugol, OJSC is the Russian market. The largest consumers of steam coal in the Northwestern Federal District of the Russian Federation are Vorkutinskaya TPP-1, 2 (OJSC "TGK-9"), TPP of Arkhangelsk PPM, OJSC, Severodvinskaya TPP (OJSC "TGK-2"). The number of company employees is 7 587 people (according to 2013 figures).

Vorkutaugol, OJSC incorporates 9 mines with a total capacity of 12.3 million tons per year, including 7 - with coking coal (10.96 million tons). The annual volume of coal production in 2013 amounted to 12.16 million tons (in 2012 - 13.03 million tons); production of commodity output - 7.95 million tons (in 2012 - 8.4 million tons); production of coking coal concentrate - 5.6 million tons (in 2012 - 5.3 million tons). The shared resources are more than 2.2 billion tons, prospected resources - 1.145 billion tons<sup>278</sup>.

In 2013, Vorkutaugol, OJSC used the following resources in its production activity: heat energy – 146 288 Gcal, electric energy – 580 242 877 kWh, petrol – 293 995 kg, diesel fuel – 18 520 600 kg, kerosene - 9815 kg.

### *Economic aspects*

The revenues of Vorkutaugol, OJSC in 2012 amounted to 29 557 156 000 rubles, net profit – 1 330 148 thousand rubles (in 2012 – 1 292 413 000 rubles). Vorkutaugol (as well as Severstal holding) was

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<sup>275</sup> [http://lukoil-komi.lukoil.com/main/static.asp?art\\_id=952](http://lukoil-komi.lukoil.com/main/static.asp?art_id=952).

<sup>276</sup> Data is provided by environmental organizations of the Komi Republic.

<sup>277</sup> Round table resolution (<http://mpr.rkomi.ru/content/image-news/23491/%D0%9F%D1%80%D0%BE%D0%B5%D0%BA%D1%82%20%D1%80%D0%B5%D0%B7%D0%BE%D0%BB%D1%8E%D1%86%D0%B8%D0%B8%20%D0%9C%D0%B8%D0%BD%D0%BF%D1%80%D0%B8%D1%80%D0%BE%D0%B4%D1%8B%20%D0%B8%20%D0%93%D1%80%D0%B8%D0%BD%D0%BF%D0%B8%D1%81.pdf>).

<sup>278</sup> <http://vorkutaugol.severstal.com/rus/about/index.phtml>.

incorporated in to the consolidated group of taxpayers in the Vologda region, and this has reduced the budget revenues of the Republic of Komi, as no more income tax is transferred<sup>279</sup>.

### *Air emissions*

The main sources of air pollution from Vorkutaugol, OJSC production are the dust-exhaust systems of the technical objects of the enriching factory, the ventilation units of mine shafts, receiving pits, the emergency store coal, slurry reservoirs, burning and dust-forming terricone, as well as the drilling rig and conveyer transport operations. The composition of emissions include the following components: inorganic dust ( $\text{SiO}_2 < 20\%$ ,  $F = 2.5$ ;  $\text{SiO}_2 < 20\%$ ,  $F=3$ ), sulfur dioxide, nitrogen dioxide, carbon monoxide, methane, hydrocarbons, oxides of manganese, ammonia and others. Contamination by methane is caused because of ventilation and mine degasification through vacuum-pumping stations. The mines, such as Severnaya, Vorkutinskaya and Vorgashorskaya within Vorkutaugol, OJSC are the main air pollutants in terms of methane<sup>280</sup>.

Methane is partially disposed in boiler stations, used as fuel for heat generation at (Shakhta Vorkutinskaya (Vorkutinskaya Mine) Joint Venture, Komsomolskaya Shakhta (Komsomolskaya Mine) Joint Venture, and Shakhta Zapolarnaya (Transpolar Mine) Joint Venture), and at Shakhta Severnaya (Northern Mine) Joint Venture, for heating the air feed into the mine in the gas-fired unit heater and drying unit for the enrichment factory<sup>281</sup>.

Despite the fact that official sources state that there has been a reduction of negative impact on the environment, local residents have repeatedly complained about the burning of waste dumps on the territory of the Northern Mine and other mines of the company.

The air pollution level in Vorkuta in 2013 was high ( $\text{ASI}_5 - 6.5$ )<sup>282</sup>. In general, the average annual concentrations are within normal limits, as well as in the capital, Syktyvkar, and did not exceed the MAC for all major pollutants: sulfur dioxide, carbon dioxide and nitrogen oxide and carbon monoxide (with the exception of the MAC for suspended substances by 1.2 times). In addition to suspended substances, an excess of the sanitary norms was also observed in the annual average concentrations of benz(a)pyrene and formaldehyde (1.2 MAC and 2.1 MAC, respectively). Over the past four years (2009-2013), there was a decrease in dust levels in the city and annual average concentrations of carbon monoxide and benz(a)pyrene. At the same time, the level of pollution by nitrogen dioxide and formaldehyde showed an increasing trend<sup>283</sup>.

### *Discharges into water bodies*

Wastewater (household, industrial, mine drainage and rainfall) from Vorkutaugol, OJSC contains suspended solids, oil products, chloride, calcium, magnesium, sulfates, ammonite nitrogen, nitrate nitrogen, total ferrum, phenols, copper, residual chlorine, zinc and nitrite nitrogen in different concentrations. Before

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<sup>279</sup> Ezhekvartalnyy otchet OAO «Vorkutaugol» za 1 kvartal 2013 goda [Quarterly Report of OJSC "Vorkutaugol" for the 1st quarter 2013] (<http://vorkutaugol.severstal.com/files/2046/f2046.pdf>).

<sup>280</sup> Development of coal deposits at "Severnaya" ("Northern") mine of OJSC "Vorkutaugol" ([http://otherreferats.allbest.ru/manufacture/00131048\\_0.html](http://otherreferats.allbest.ru/manufacture/00131048_0.html)).

<sup>281</sup> [http://www.barentsinfo.fi/beac/docs/The\\_environment\\_Ministers\\_Meeting\\_4\\_5\\_Nov\\_2013\\_Inari\\_HotSpots\\_Assessment\\_Report\\_RUS.pdf](http://www.barentsinfo.fi/beac/docs/The_environment_Ministers_Meeting_4_5_Nov_2013_Inari_HotSpots_Assessment_Report_RUS.pdf).

<sup>282</sup> Overview for environmental pollution on the territory of activities of Federal State Budget Institution "Northern Department of Hydrometeorology and Environmental Monitoring" for 2013 ([http://www.sevmeteo.ru/monitoring/reviews/i/monitoring\\_review-2013.pdf](http://www.sevmeteo.ru/monitoring/reviews/i/monitoring_review-2013.pdf)).

<sup>283</sup> Gosudarstvennyy doklad «O sostoyanii okruzhayushey sredy Respubliki Komi v 2013 godu» [State report "State of The Environment in the Komi Republic in 2013"], Ministry of Nature Management and The Environment of the Komi Republic (<http://www.agiks.ru/data/gd2013.pdf>).



discharging into the Vorkuta River, the household wastewater flows to the treatment plants, while rainfall and melting waters from industrial sites of mines along open ditches are discharged without any treatment. The mine waters are pumped over to the unit for mine water treatment. The industrial waste water flows into a slurry tank for treating<sup>284</sup>.

According to government monitoring, in 2012 wastewater discharge with an excess of permissible concentrations was recorded from Vorkutaugol, OJSC. The company has developed a plan to reduce pollution and, in future, implementation of the planned actions should be monitored.

### *Soil contamination*

The technogenic contamination of air with coal dust and combustion products from terricones, as well as the use of coal waste in urban development (slags, dump substrates), has caused a significant increase in the content of heavy metals and benz(a)pyrene, and alkalization of soils in Vorkuta, as compared with baseline soils. According to environmental indicators of overall pollution, the upper levels of urban soils are characterized as hazardous and extremely hazardous<sup>285</sup>.

### *Industrial wastes*

In 2012, Vorkutaugol, OJSC was an absolute leader in terms of amount of waste - 21.57 million tons out of 24 million tons of waste generated in the Komi Republic (in 2011 - 4.67 million tons). The state report on the state of the environment in the Komi Republic explains this situation by an increase in production capacity<sup>286</sup>. The general reduction in waste generation in the Republic in 2013 was associated with the activities of Vorkutaugol, OJSC which reduced waste generation by 17 million tons<sup>287</sup>.

### *Production process modernization plans for reducing the negative impact on the environment*

The problem of greenhouse gas emission from the companies of Vorkutaugol, OJSC was entered into the environmental "hot spots" list of the Komi Republic based on the results of NEFCO studies in 2003<sup>288</sup>. During the period 2003-2013, instructed to eliminate "hot spots", Vorkutaugol, OJSC made improvements in the reduction of methane emissions through its utilization in the boiler stations at mines, and due to the construction and commissioning of a gas engine heat generator plant. However, the percentage of methane utilization, according to 2012, ranged from 28% to 60%. In 2011, Vorkutaugol, OJSC emitted up to 199 million m<sup>3</sup>/year of methane<sup>289</sup>. In order to achieve better results in methane utilization, the company planned the construction of several gas engine heat generator plants. Vorkutaugol, OJSC proceeded with implementation of the investment project "Degaseous methane utilization at the Northern mine (Severnaya shakhta)" to reduce the negative impact on the atmosphere. The project envisages

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<sup>284</sup> Development of coal deposits at "Severnaya" ("Northern") mine of OJSC "Vorkutaugol" ([http://otherreferats.allbest.ru/manufacture/00131048\\_0.html](http://otherreferats.allbest.ru/manufacture/00131048_0.html)).

<sup>285</sup> Kaverin D. A., Dymov A. A. i dr. Zagryazneniye pochv gorodov Respubliki Komi tyazhelymi metallami [Pollution of soil with heavy metals in cities of the Komi Republic]. Institut biologii Komi NTs UrO RAN, Syktyvkar (<http://ib.komisc.ru/add/conf/humic2014/file/sbornik.pdf>).

<sup>286</sup> Gosudarstvenny doklad «O sostoyanii okruzhayushey sredy Respubliki Komi v 2012 godu» [State report "State of The Environment in the Komi Republic in 2012"], Ministry of Nature Management and The Environment of the Komi Republic ([http://www.agiks.ru/data/gosdoklad/gd2012/html/h10\\_1.html](http://www.agiks.ru/data/gosdoklad/gd2012/html/h10_1.html)).

<sup>287</sup> Gosudarstvenny doklad «O sostoyanii okruzhayushey sredy Respubliki Komi v 2013 godu» [State report "State of The Environment in the Komi Republic in 2013"], Ministry of Nature Management and The Environment of the Komi Republic (<http://www.agiks.ru/data/gd2013.pdf>).

<sup>288</sup> [http://www.barentsinfo.fi/beac/docs/The\\_environment\\_Ministers\\_Meeting\\_4\\_5\\_Nov\\_2013\\_Inari\\_HotSpots\\_Assessment\\_Report\\_RUS.pdf](http://www.barentsinfo.fi/beac/docs/The_environment_Ministers_Meeting_4_5_Nov_2013_Inari_HotSpots_Assessment_Report_RUS.pdf).

<sup>289</sup> Ibid.

degaseous methane utilization with simultaneous production of about 90 thousand Gcal of heat power and up to 110 million kilowatt-hours of electricity per year for the needs of the mine. In total per year it is planned to utilize up to 20 thousand tons of methane which, before the project implementation, was just emitted in to the atmosphere. However, given that the methane released is more than 5 m<sup>3</sup> per ton of coal produced, and the annual coal production in 2013 amounted to 12.16 million tons, the indicator for methane utilization is accordingly very modest. Commissioning of the gas engine heat generator plant was scheduled for mid-2013.

Besides methane, the project aims to reduce air emissions of other greenhouse gases - carbon dioxide and sulfur oxides, nitrogen oxides and other pollutants<sup>290</sup>. Based on the results of the effectiveness of gas engine heat generator plant, the possibility for implementation of similar plants at other mines will be considered<sup>291</sup>.

According to official information, Vorkutaugol, OJSC pays great attention to the condition of the environment. In 2012, the company invested about 22 million rubles in environmental measures. The largest programs involve modernization of treatment facilities at the Vorgashorskaya mine (5 million rubles), reconstruction of the heat supply system of the Central Concentrating Mill (CCM) Pechorskaya and the Zapolarnaya mine, monitoring the environmental condition in the zone of influence of waste dumps (including thermal control of mountain rocks, air quality measuring). The company has built a gas engine heat power generator plant operating on coalmine methane. Moreover, in order to reduce the discharge of purified effluents into water bodies of Vorkuta, the recycling of mine waters for technological needs was implemented, in order to enable the production processes at the concentrating mills of the company, including CCM Pechorskaya<sup>292</sup>.

On the whole, despite the positive shifts related to the reduction in methane emissions into atmosphere and decrease in industrial wastes, the negative impact from Vorkutaugol on the environment and human health is a serious problem.

## *Gazprom Transgaz Ukhta, LLC*

### *General information*

Gazprom Transgaz Ukhta, LLC is a subsidiary of OJSC Gazprom dealing with gas transmission through the gas pipeline system and gas supply to industrial and household consumers throughout the territory of nine subjects of the Russian Federation: the Komi Republic, the Arkhangelsk region, the Vologda region, the Yaroslavl region, the Vladimir region, the Ivanovo region, the Tver region, the Kostroma region, and the Tyumen region. The information concerning Gazprom Transgaz Ukhta, LLC refers to the enterprise as a whole, and, unfortunately, detailed information about its activity in the territory of Komi is not available.

The average staff number, as a whole, in Gazprom Transgaz Ukhta (all branches) is 11 974 people (according to 2012 figures).

The total length of gas pipelines is 14 500 km, including 2280 km of gas pipeline branches. The gas supply is provided to consumers through 166 gas distribution stations. In 2012, 136,689 m<sup>3</sup> of natural gas was transported.

The total consumption of natural gas for the company's needs (Gazprom Transgaz Ukhta, LLC) in 2012 amounted to 4 132.0 million m<sup>3</sup> (including 3 597.0 million m<sup>3</sup> of fuel gas) and for electricity – 574.234 million kWh, heat energy - 0,404 million Gcal (including own production - 0.345 million Gcal). The electricity is partly

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<sup>290</sup> <http://ccgs.ru/projects/projects/vorkuta>.

<sup>291</sup> [http://www.barentsinfo.fi/beac/docs/The\\_environment\\_Ministers\\_Meeting\\_4\\_5\\_Nov\\_2013\\_Inari\\_HotSpots\\_Assessment\\_Report\\_RUS.pdf](http://www.barentsinfo.fi/beac/docs/The_environment_Ministers_Meeting_4_5_Nov_2013_Inari_HotSpots_Assessment_Report_RUS.pdf).

<sup>292</sup> <http://www.vorkutaugol.ru/rus/about/index.phtml>.

produced at the company's power stations, and heat is forwarded to boiler stations and waste heat exchangers along the exhaust lines of gas-compressor units<sup>293</sup>.

### *Economic aspects*

No information on economic activity is available.

### *Air emissions*

Air pollution by methane, nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO) has significant impact on the atmosphere. The gross air emissions for 2012 reached 186 418 tons. Carbon dioxide emissions amounted to 19 953 tons, nitrogen oxide emissions – 10 782 tons, hydrocarbons (methane) emissions - 155 630 tons. In 2012, air pollutant emissions generally decreased by 15.68% (34 670 tons, including carbon monoxide by 319.3 tons, the oxides of nitrogen by 6812 tons, methane by 33 547 tons).<sup>294</sup> The reduction in methane emissions was accomplished by reducing the volume of the bleed gas during repair work. Gross emissions from mobile sources of the company amounted to 3933 tons<sup>295</sup>.

### *Discharges into water bodies*

The wastewaters from the plant contain: dry residue, suspended substances, ammonium nitrogen, copper, nitrates, nitrites, oil products, phosphorus, and iron. The total discharge of pollutants in 2012 amounted to 204.18 tons.

Reports state that the use of water resources of Gazprom Transgaz Ukhta, LLC in 2012 and the negative impact on them was significantly reduced, due to lowering the water consumption for drinking and industrial needs, as well as a decrease in wastewater discharge.

In 2012, the water intake reached 612 170m<sup>3</sup>, 211 390 m<sup>3</sup> of which was used for production needs. The volumes of generated drainage and storm waters were constant. At existing objects related to the main gas pipeline, treatment facilities were not provided by the projects, thus while reducing the total volume of wastewater discharge (mainly due to the effluent treated to standard quality), the amount of contaminated (inadequately treated) wastewater increased. Less than half of the total wastewater (680 610 m<sup>3</sup>) belongs to the category 'treated to standard quality' (232 410 m<sup>3</sup>) or 'regulatory clean' (43 400 m<sup>3</sup>), and the remaining volume is either insufficiently treated (369 580 m<sup>3</sup>) or not treated (35 220 m<sup>3</sup>)<sup>296</sup>.

In 2012, incidences of non-compliance with the standards for pollutant discharges into surface water bodies were detected at seven water outlets near companies of the Komi Republic, Gazprom Transgaz Ukhta, LLC is among them. It is reported that the company has taken remedial measures, and their implementation is being monitored by inspectors<sup>297</sup>.

### *Industrial wastes*

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<sup>293</sup> Otchet o sotsialno-ekologicheskoy otvetstvennosti OOO «Gazprom transgaz Uhta» za 2012 god [Report on social and environmental responsibility of "Gazprom Transgaz Ukhta" LLC for 2012] (<http://gazprom-ukhta.ru/ecology/reports/report-eko-2012.pdf>).

<sup>294</sup> Ibid.

<sup>295</sup> Ibid.

<sup>296</sup> Ibid.

<sup>297</sup> Gosudarstvenny doklad «O sostoyanii okruzhayushey sredy Respubliki Komi v 2012 godu» [State report "State of The Environment in the Komi Republic in 2012"], Ministry of Nature Management and The Environment of the Komi Republic ([http://www.agiks.ru/data/gosdoklad/gd2012/html/h10\\_1.html](http://www.agiks.ru/data/gosdoklad/gd2012/html/h10_1.html)).

7 404.055 tons of production and consumption waste (mainly IV and V hazard class waste) was generated at the production activity objects of Gazprom Transgaz Ukhta, LLC in 2012, which is an increase of 106 tons, as compared to 2011, due to the installation of new facilities. In 2012, the volume of III and II hazard class waste also increased<sup>298</sup>.

The percentage of waste utilization remains low. In 2012, only 3.6% of waste was neutralized. The majority, 95% of the waste, was transferred to specialized companies for utilization, reuse or disposal; 1.4% was buried at the landfill for household solid wastes at the Griazovetsky main pipeline production department and 0.1% was left in temporary storage at industrial sites for further utilization.

### *Production process modernization plans for reducing the negative impact on the environment*

The Environmental report of Gazprom, OJSC for 2013 detailed investment projects aimed at improving the environmental impact of Gazprom Transgaz Ukhta, LLC: air protection - modernization of combustion chambers of gas-compressor units (GCU) with type 10 and 16 of GTK; water protection - reconstruction of treatment facilities and utility networks will be provided by a program, which Gazprom, OJSC will invest in<sup>299</sup>.

It is reported that due to repeated faults in the installed equipment, the volume of gas bleeding, upon starting up and turning off the GCU, exceeded the indicators provided by the design organization of established MAD norms. Because of an excess of natural gas emissions, 2 million 936 thousand rubles were paid in fines. In 2012, payment for the negative impact on the environment broke down as follows: for air emissions - 95.49%, for discharges into water bodies - 1.16%, and for placement of waste production and consumption - 3.35%. In 2012, 1 accident and 3 incidents related to a gas pipeline breach involving a fire outbreak of steam-and-gas mixture took place at the facilities of the main gas pipeline<sup>300</sup>.

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<sup>298</sup> Otchet o sotsialno-ekologicheskoy otvetstvennosti OOO «Gazprom transgaz Uhta» za 2012 god [Report on social and environmental responsibility of "Gazprom Transgaz Ukhta" LLC for 2012] (<http://gazprom-ukhta.ru/ecology/reports/report-eko-2012.pdf>).

<sup>299</sup> Ekologicheskii otchet OAO «Gazprom» za 2013 god [Environmental Report of OJSC "Gazprom" for 2013] (<http://www.gazprom.ru/f/posts/13/830510/gazprom-environmental-report-2013-ru.pdf>).

<sup>300</sup> Otchet o sotsialno-ekologicheskoy otvetstvennosti OOO "Gazprom transgaz Uhta" za 2012 god [Report on social and environmental responsibility of "Gazprom Transgaz Ukhta" LLC for 2012] (<http://gazprom-ukhta.ru/ecology/reports/report-eko-2012.pdf>).





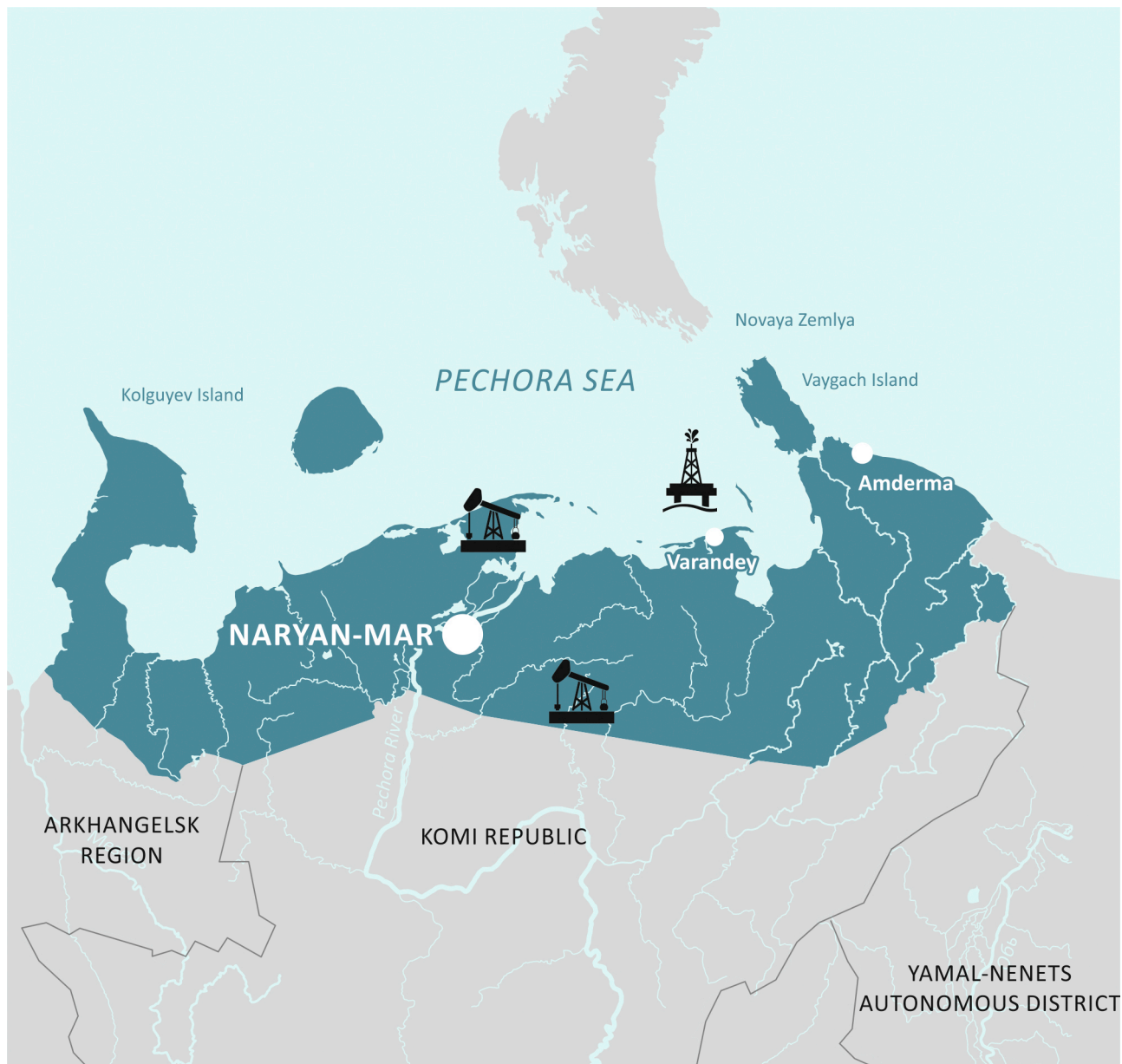
Photo by ezioman/flickr.com



## Nenets Autonomous District

The Nenets Autonomous District (NAD) is located in the northeast of the European part of the Russian Federation. The NAD is a subject of the Russian Federation and a part of the Arkhangelsk region. The territory of the district is 176 700 km<sup>2</sup>, which is about 1% of the territory of Russia and is located entirely within the Polar Circle. The NAD is one of the most sparsely populated subjects of the Russian Federation; the population of Naryan-Mar is 23 000 inhabitants, the total population of the NAD is 41 900 people<sup>301</sup>.

The Nenets Autonomous District is one of the top five subjects of the Russian Federation in terms of oil and gas production. The Timan-Pechora oil- and gas-bearing province is located within the district. The main industry in the NAD is oil production. With new industries starting up, the oil producing sector has increased its share in the economic potential of the region to 98%<sup>302</sup>. Oil and gas industry facilities have a high anthropogenic load on the natural systems of the NAD.



## General characteristics of the environmental condition

<sup>301</sup> [http://www.gks.ru/wps/wcm/connect/rosstat\\_main/rosstat/ru/statistics/population/demography/#](http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/population/demography/#).

<sup>302</sup> <http://novostienergetiki.ru/gubernator-neftedobycha-obespechivaet-98-ekonomicheskogo-potenciala-nao>.

## Atmospheric air condition

The main air pollutant source are oil and gas production companies. Thus, air pollution is a serious problem primarily due to the burning of natural and oil-dissolved gas, and to a lesser degree other fossil fuels. The combustion of oil-dissolved gas (ODG) in flare devices leads to the formation of soot, nitrogen oxides, carbon monoxide, 3,4-benzopyrene, slipped hydrocarbons, benzene, phosgene, toluene, heavy metals (mercury, arsenic, chromium), sulfur dioxide, greenhouse gases - carbon dioxide, methane and ozone. At a rough estimate, 250 million m<sup>3</sup> of oil-dissolved gas was burned off in flares on the territory of the NAD in 2012.<sup>303</sup>

Flaring of associated gas containing sulfur leads to the acidification of soils and water, and has a devastating effect on all ecosystems.

**Table 1. Air emissions from stationary sources in the Nenets Autonomous District for 2012<sup>304</sup>**

Name of indicator	Total in 2012, thousand tons	Pollutant inflow into treatment facilities
TOTAL	69.309	0
Including:		
solid substances	3.581	0
liquid and gaseous substances	65.728	0
Out of which:		
sulphur dioxide	8.494	0
carbon oxide	35.824	0
nitrogen oxide	5.525	0
hydrocarbons, including volatile organic compounds	8.29	0
other gaseous and liquid substances	7.595	0

## Water resource condition

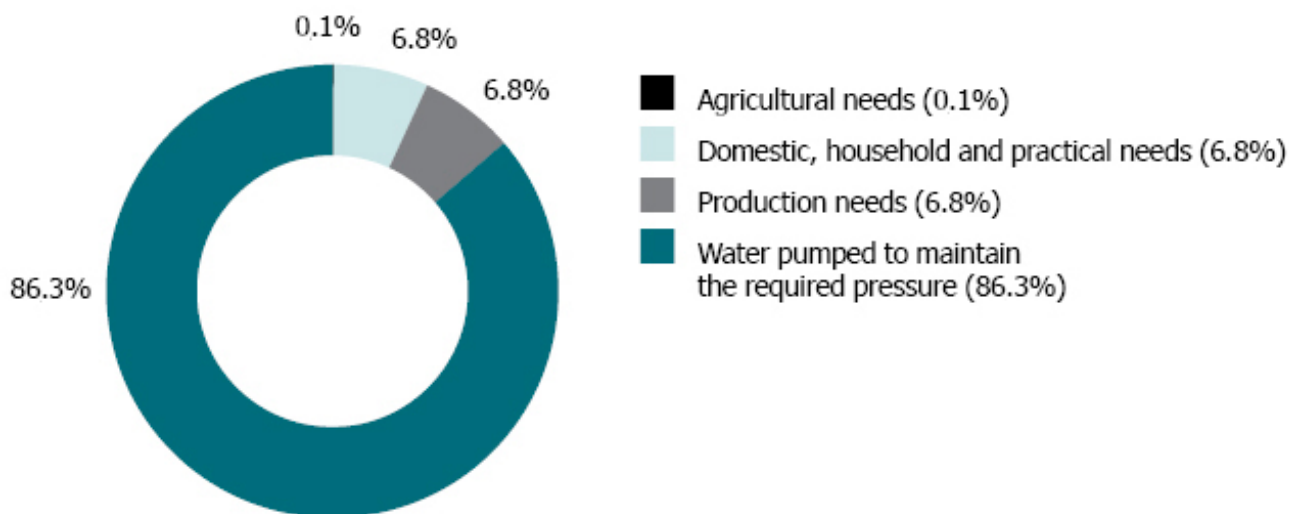
The NAD is characterized by a dense river network. All the rivers belong to the basins of the seas of the Arctic Ocean. In the north, the NAD is washed by the White, the Barents and the Kara Seas. The Pechora River plays a major role in the life of the district. The lower reach of the Pechora River with a broad delta is situated within the territory of the district.

Water resources are used for production, household and agricultural water supply. The total water intake in 2012 in the Nenets Autonomous District was 32.90 million m<sup>3</sup> (an increase of 2.83 million m<sup>3</sup>, as compared

<sup>303</sup> Kiryushin P. A., Knizhnikov A. Yu., Kochi K. V., Puzanova T. A., Uvarov S. A. Poputny nefyanoy gaz v Rossii: Szhigat nelzya, pererabatyvat! Analitichesky doklad ob ekonomicheskikh i ekologicheskikh izderzhkakh szhiganiya poputnogo nefyanogo gaza v Rossii [Oil-dissolved gas in Russia: No burning, only processing! Analytical report on economic and environmental costs related to the burning of the oil-dissolved gas in Russia]. M.: Vsemirny fond dikoy prirody (WWF), 2013 (WWF), 2013 (<http://www.wwf.ru/resources/publ/book/837>).

<sup>304</sup> <http://invest.adm-nao.ru/nao/ecology>.

with 2011). The bulk (28.36 million m<sup>3</sup>) was related to water pumped to reservoirs to maintain the required pressure<sup>305</sup>.



**Fig. 1. Structure of water use in the Nenets Autonomous District in 2012<sup>306</sup>**

However, water bodies are not only a source of technical water supply to industrial enterprises, but also the main receiver of waste waters.

According to official data for 2012, the water disposal of waste, transit and other waters reached 2.99 million m<sup>3</sup>, almost half (48% or 1.43 million m<sup>3</sup>) of this amount consisted in wastewater requiring treatment. It is reported that 0.68 million m<sup>3</sup> of wastewater was discharged into underground aquifers<sup>307</sup>.

Water pollution occurs during exploration and production of hydrocarbons and accidental oil spills. The water system of the Pechora River experiences a special anthropogenic stress. The industrial pollution of the Pechora River and its tributaries began in the 1950's. The current situation in the Pechora River basin has worsened due to the fact that a lot of oil pipelines are laid through its tributaries, where accidents often occur. The most serious accident took place on Kharyaga-Usinsk pipeline in 1994 on the Kharyaga River. As a result of the accident, a huge amount of crude oil was spilt into the river (at various estimates, from 100 000 to 375 000 tons)<sup>308</sup> and later reached the estuary of the Pechora River.

The water quality in the Pechora River, where the bulk of waste water is discharged, is estimated as follows: the estuary area of the river in the alignment of 1 km below Naryan-Mar - 3 class, category "b" ("very polluted"), in the alignment of 38 km above Naryan-Mar - 4 class, category "a" ("polluted"). The annual average content of iron, copper, zinc compounds is 2-6 times more than the established MAC. The maximum iron content reached 16 MAC, copper - 8 MAC, zinc - 10 MAC, meanwhile, the annual average concentration of organic substances (easily oxidized - BOD<sub>5</sub> and oxidation-prone – in terms of COD), and the oil products content is only slightly higher than the established standards - 1,1-2 MAC. The average for

<sup>305</sup> Ibid.

<sup>306</sup> <http://ecology.adm-nao.ru/informaciya-o-sostoyanii-okruzhayushej-sredy>.

<sup>307</sup> <http://invest.adm-nao.ru/nao/ecology>.

<sup>308</sup> Ibid.

the year (maximum) oil content varied in the range of 1-2 MAC (11 MAC), the content of manganese and aluminum compounds, monitored in the alignment of 38 km above Naryan-Mar, reached 4 (16) MAC and 1 (2) MAC, respectively<sup>309</sup>.

It should be noted that within the Nenets Autonomous District the drawing of technical groundwater is performed to maintain the pressure of reservoirs. The assessment of the resource potential for technical groundwater in the NAD is unavailable. The monitoring of groundwater quality at water intakes is not carried out at an adequate level; only 10-12 indicators out of the total number of indicators, specified by SanPin 2.1.4.1074-01, are determined. There is no information on such important indicators as oil products, phenols or SSAS. As for inorganic microelements, as a rule, only the total iron is determined<sup>310</sup>.

## Surface soil condition

Oil spills cause great damage to surface soil. Soil contamination due to oil spills in the NAD takes place on a regular basis. Because of damage to vegetation and the mechanical impact on soil, while developing deposits, changes in the soil characteristic have arisen. Monitoring has revealed that in the technogenically damaged areas, secondary cultures have been appearing and there has been a change in the dominant vegetation types. After reclamation works, the shrub vegetation will recover in 9 years, and lichens in 14 years<sup>311</sup>.

## Industrial waste

Most of the industrial waste in the District is waste from drilling on the deposits and sludge<sup>312</sup>. In 2012, the volume of the generated production and consumption waste amounted to 132 thousand tons, out of which the number of used and neutralized waste was only 16% (22 thousand tons). By the end of 2013, among the main suppliers of waste in the NAD are the following enterprises: SK Rusvietpetro, LLC (29 thousand tons), The total exploration and development Russia, JSC (16 000 tons), Arcticneft, CJSC (5 thousand tons), LUKOIL-Komi, LLC (12 300 tons), Pechoraneft, OJSC (6 500 tons), Naryanmarneftegas, LLC (1 000 tons), Polar Lights Company, LLC (1 000 tons) and RN-Severnaya Neft, LLC (4 100 tons)<sup>313</sup>.

## Main polluters

The main industrial polluters in the Nenets Autonomous District are oil and gas companies and energy industries. Their activities have an anthropogenic impact on all ecosystems. The air pollution is mainly caused by burning natural and oil-dissolved gas, water pollution by the process of hydrocarbon exploration and production and accidental oil spills. The degradation of landscapes and soil is associated with oil spills, the placement of oil and gas facilities, as well as the formation and storage of production wastes.

The main polluters within the NAD are as follows: LUKOIL-Komi, LLC, Naryanmarneftegas, LLC (belonging to the group of companies LUKOIL-Komi, LLC), LUKOIL-Severneftegas, TPE, Polar Lights Company, LLC, Total exploration and development Russia, JSC, Pechoraneft, OJSC, Oil Company "Rosneft, OJSC, Northern

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<sup>309</sup> <http://www.adm-nao.ru/?show=statics&id=376>.

<sup>310</sup> <http://invest.adm-nao.ru/nao/ecology>.

<sup>311</sup> Sergienko V. G. Problemy rekultivatsii zagryaznennykh zemel v svyazi s prirodopolzovaniyem v NAO. Trudy Sankt-Peterburgskogo nauchno-issledovatel'skogo instituta lesnogo hozyaystva 1-2, 2012 [Problems relating to remediation of contaminated land in connection with environmental management in the NAO. Works of the St. Petersburg Forestry Research Institute, 1-2, 2012] ([http://www.spb-niilh.ru/pdf/2012\\_1-2/problemy-rekultivatsyi.pdf](http://www.spb-niilh.ru/pdf/2012_1-2/problemy-rekultivatsyi.pdf)).

<sup>312</sup> <http://www.adm-nao.ru/?show=statics&id=376>.

<sup>313</sup> <http://ecology.adm-nao.ru/ekologicheskij-pasport-territorii-neneckogo-avtonomnogo-okruga> (See information about education, use, deactivation and disposal of production wastes and consumption of oil and gas companies for 2012-2013).

Lights Oil Company, LLC, Gazprom Neft, OJSC, SK Rusvietpetro, LLC, Nenets Oil Company, OJSC and Bashneft Pole, LLC<sup>314</sup>.

An overview of the oil companies' (main polluters of the District) activities, aimed at reducing the load on the environment, is given below. This approach of a general overview of industrial pollution and measures on its abatement in the NAD was dictated by the unavailability of information from individual companies on air emissions and water discharges of pollutants, as well as poor information on specific measures taken by the above mentioned companies, located in the NAD. The factual basis for this section consists in data taken from official sources of state authorities, as well as companies' information and reports, environmental organizations, news articles from the federal and regional news web portals. All materials are publicly available.

## Measures for reducing atmospheric air pollution

One of the most pressing environmental problems in the NAD is the burning of oil-dissolved gas resulting in air pollution by nitrogen oxides, carbon monoxide and sulfur dioxide. If there is an ODG infrastructure, a rational application can be found i.e. to provide gas to the towns or, through processing, to obtain gas-oil product chemicals (polyethylene, polypropylene, polystyrene, rubber, etc).

At official estimates for 2012, 70% of ODG was utilized on NAD deposits. This is a good indicator, given that the range of the combustion level at the large oil producing companies in Russia in 2012 amounted to 12-48%<sup>315</sup>. Below there are some of the individual initiatives from companies concerning ODG utilization. It should be noted that despite the plans and activities for ODG utilization, there is a lack of detailed information about technologies for purification of ODG and further use of utilized gas on the official websites of some companies.

Naryanmarneftegas, LLC that recently became part of LUKOIL-Komi, LLC group of companies, has commissioned an installation for amine gas treatment from hydrogen sulfide, carbon dioxide and free sulphur granulation at the Central Production Facility of Yuzhno-Khylchuyuskoye deposit. As a result, the company has acquired two useful products -purified gas, used in oil preheaters, and sulfur (for sale)<sup>316</sup>.

LUKOIL-Severneftegas, TPE, as a territorial unit of LUKOIL-Komi, LLC, has also been implementing a program for gas byproduct utilization. Their activities in the NAD involve the reconstruction of the gas compression system on the Yuzhno-Shapkinskoye deposit<sup>317</sup>.

The website of another major polluter in the NAD (Polar Lights Company, LLC) reports that "utilization of oil dissolved gas as a raw material for the chemical industry or fuel to generate electricity and heat is one of the government's priorities in both environmental and economic terms"<sup>318</sup>.

The degree of ODG utilization is not constant for companies operating in the NAD: Naryanmarneftegas, LLC utilizes 64% of ODG, LUKOIL-Komi, LLC - 89%, Polar Lights Company, LLC - 68%, Pechoranefteft, OJSC - 97 %, Oil Company Rosneft, OJSC - 97% and the Northern Lights Oil Company, LLC - 98%<sup>319</sup>.

<sup>314</sup> [http://invest.adm-nao.ru/economic/Oil\\_Gas](http://invest.adm-nao.ru/economic/Oil_Gas).

<sup>315</sup> <http://ecology.adm-nao.ru/ekologicheskij-pasport-territorii-neneckogo-avtonomnogo-okruga> (See information about education, use, deactivation and disposal of production wastes and consumption of oil and gas companies for 2012-2013)

<sup>316</sup> <http://ccgs.ru/projects/NMNG>.

<sup>317</sup> [http://lukoil-komi.lukoil.com/main/static.asp?art\\_id=952](http://lukoil-komi.lukoil.com/main/static.asp?art_id=952).

<sup>318</sup> [http://plc-oil.ru/events/corp/SOM.php?sphrase\\_id=170](http://plc-oil.ru/events/corp/SOM.php?sphrase_id=170).

<sup>319</sup> <http://ecology.adm-nao.ru/ekologicheskij-pasport-territorii-neneckogo-avtonomnogo-okruga> (See information on utilization of oil-dissolved gas on the territory of the Nenets Autonomous District).



At the same time, there are companies operating with a low utilization degree for ODG in the NAD, e.g.: Total Exploration and Development Russia, JSC - 22%<sup>320</sup> and SK Rusvietpetro, LLC - 25%<sup>321</sup>. In 2012, Total Exploration and Development Russia, JSC the operator of the Kharyaginskoye oil deposit announced an investment in environmental protection of \$ 250 million and a phasing out of the burning of oil-dissolved gas in 2013<sup>322</sup>. Given the 25% rate for ODG utilization made by the company in 2013, it will probably require some time to achieve the intended results.

SK Rusvietpetro, LLC, another polluter in the NAD with a low ODG utilization level (25%), has plans to achieve a utilization level of 96% by 2015<sup>323</sup>.

It is expected that the utilization level for ODG will rise quite quickly in connection with the entry into force of the RF Government Ordinance of 08.11.2012 No. 1148, establishing the requirement for 95% utilization for ODG. Thus, the ODG combustion rate should not exceed 5% of the volume produced, and in case of infringement of such requirements doubled fines shall be imposed on the oil producing company to promote utilization and recycling of ODG at production facilities<sup>324</sup>.

## Measures for reducing the pollution of water bodies

The problems of untreated wastewater discharge from plants and accidental oil spill are still one of the most pressing problems. From 2010 to 2013, several major oil spills took place on the territory of the NAD. For example, in 2010, during a storm in the Barents Sea, as a result of impacts from storm waves and the pontoon, the Central Production Facility "Toboy" - Offshore Tank Farm "Varandey" was displaced from its piling foundation. As a result of the displacement of the oil pipeline, depressurization occurred leading to an oil spill of above 30 tons.

In April 2012, during well re-entry on the R. Trebsa deposit, at Varknavskaya well No. 11 (Bashneft – Polius LLC), due to a technical error by an employee, a non-controlled discharge of oil and gas mixtures took place. The oil was localized in an area of 1 hectare. According to preliminary estimates, as a result of the accident, about one thousand tons of oil leaked into the environment. Later on a similar accident occurred at Varknavskaya well No. 12.

In October 2012, there was an oil spill on the Kharyaginskoye deposit (LUKOIL-Komi, LLC). The area of the spill extended 3.500 m<sup>2</sup><sup>325</sup>.

On April 27<sup>th</sup>, 2013, there was an oil spill on the territory of the Kharyaginskoye oil deposit of LUKOIL-Komi, LLC in the vicinity of the group of wells No. 5. According to the mine survey, performed by LUKOIL-Komi, LLC, the spill area for FO reached 2.4 ha. LUKOIL-Komi, LLC reported that measures were taken to eliminate the depressurization of the infield pipeline (a crack in pipe wall): the spill area was localized,

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<sup>320</sup> Ibid.

<sup>321</sup> Ibid.

<sup>322</sup> [http://www.arctic-info.ru/News/Page/na-har\\_age-prekratat-fakel\\_noe-sjiganie-png-v-2013-gody](http://www.arctic-info.ru/News/Page/na-har_age-prekratat-fakel_noe-sjiganie-png-v-2013-gody).

<sup>323</sup> <http://www.oilru.com/news/243840>.

<sup>324</sup> [http://bellona.ru/news/news\\_2012/1339591191.45](http://bellona.ru/news/news_2012/1339591191.45); <http://ria.ru/economy/20120101/530926313.html>.

<sup>325</sup> Chibisov S. V. Nenetskiy avtonomnyy okrug: prioritet – ekologiya. Sbornik materialov Tretey mezhdunarodnoy nauchno-prakticheskoy konferentsii «EkoPechora-2012». Naryan-Mar, 10-11 oktyabrya, 2012 goda. [Nenets Autonomous Districts: priority - the environment. A compendium of materials from the Third International Scientific and Practical Conference "EkoPechora 2012". Naryan-Mar, October 10-11, 2012]

there was no threat of the oil seeping into the Kolva River. FO collection and transportation to the oil waste landfill were carried out<sup>326</sup>.

For a complete understanding of the existing measures for protecting water bodies, access to more detailed information is needed. On the websites of large oil producing companies, one can find a description of their environmental policy, but, unfortunately, descriptions do not contain detailed information on the modernization of production or implementation of specific technologies and measures to reduce the load on the water bodies, caused by the companies' industries, operating on deposits of the NAD. For example, the official website of LUKOIL-Komi, LLC reported that for the purpose of implementing environmental programs "plans for the prevention and elimination of accidental oil spills have been developed and implemented; comprehensive environmental monitoring has been conducted; a multi-level protection system has been provided for rivers, including hydraulic engineering facilities for capturing the oil present in waterways<sup>327</sup>". Information on specific activities on the territory of the NAD is unavailable.

Based on the analytical article "Vostanavlivaya ravnovesiye" (Restoring the balance) in the "Expert" magazine (December 2013) "a serious improvement is still far away, but the first stabilization steps have already been taken. Over the past five years, the volume of untreated water, discharged into water bodies of the NAD, has declined six fold. The state of the water system quality of the Pechora River has been permanently monitored. And most importantly, modern oil production processes minimize the impact on ecosystems, including water sources<sup>328</sup>". Currently, the NAD administration has been carrying out a number of target programs, water management and water protection measures aimed at providing the population within the NAD with clean water. To accomplish this, the reconstruction and construction of waste treatment facilities are underway.

The most potentially hazardous industrial facilities of the Barents Region located on the territory of the NAD, also involve the Fixed Offshore Ice-Resistant Off-loading Terminal (FOIROT) "Varandey terminal" and the Offshore Ice-Resistant Fixed Platform (OIRFP) "Prirazlomnaya".

The FOIROT "Varandey terminal" is an oil export terminal for exporting oil produced in the Timan-Pechora oil and gas-bearing province by sea. The terminal, which has a capacity of up to 12 million tons per year, was commissioned in 2008 and runs year-round. It is reported that the terminal is equipped with three automatic protection levels to prevent oil spills in any emergency situation<sup>329</sup>.

The oil producing platform "Prirazlomnaya" belongs to Gazprom Neft Shelf, LLC. It was installed in the sea 60 km from the coast (Varandey settlement). From OIRFP "Prirazlomnaya" well drilling and oil production is carried out on the shelf of the Pechora Sea (Prirazlomnoye deposit), as well as oil storage and export. The oil extraction from the platform started in December 2013. According to the report by the Research Centre "Risk informatics" concerning the behavior simulation for possible oil spills during the OIRFP "Prirazlomnaya" operations, as well as assessing the possibility of coping with emergency situations related to oil spills<sup>330</sup>, the given platform, as of February 2013, was not equipped with the facilities needed to eliminate the consequences related to emergency situations of oil spills in icy conditions.

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<sup>326</sup> The data is provided by environmental organizations of the Nenets Autonomous District.

<sup>327</sup> [http://lukoil-komi.lukoil.com/main/static.asp?art\\_id=952](http://lukoil-komi.lukoil.com/main/static.asp?art_id=952).

<sup>328</sup> <http://expert.ru/northwest/2014/03/vostanavlivaya-ravnovesie>.

<sup>329</sup> <http://www.arctic-info.ru/Projects/Page/varandeiskii-proekt>.

<sup>330</sup> Modelirovaniye povedeniya vozmozhnykh razlivov nefi pri ekspluatatsii MLSP «Prirazlomnaya». Otsenka vozmozhnosti likvidatsii chrezvychaynykh situatsiy, svyazannykh s razlivami nefi. Otchet o nauchno-issledovatel'skoy rabote [Modeling the behavior of possible oil spills during the operation of OIRFP "Prirazlomnaya". Assessing the possibility of emergency situations related to oil spills. Report on the research work]. M.: NITs «Informatika riska», 2012. (<http://www.wwf.ru/resources/publ/book/770>).

## Measures on waste management

The bulk of the waste is not utilized in the NAD. To implement a systematic approach to waste management, certain steps have been taken, namely: eliminating spontaneous dumps, creating a platform for the temporary accumulation of wastes, putting into operation a special installation for hazardous waste (mercury-containing lamps, etc.), oily waste and tyres<sup>331</sup>.

At the end of 2012, the situation regarding waste utilization by oil producing companies was as follows: "the largest mining companies have landfill areas for the dumping and burial of inhouse and industrial wastes on the deposits. The bulk of the organic waste, generated in the workers' settlements, is burned in specialized facilities. Part of the waste is transported by winter road to specialized companies for further recycling. The NAD administration has no information on violations in this field. Rosprirodnadzor has been monitoring the situation"<sup>332</sup>.

The situation relating to waste management by the companies involved in oil production requires greater openness and transparency.

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<sup>331</sup> <http://expert.ru/northwest/2014/03/vosstanavlivaya-ravnovesie>.

<sup>332</sup> <http://ria.ru/interview/20121207/913794842.html>.



Photo by Fedor Stroganov/flickr.com

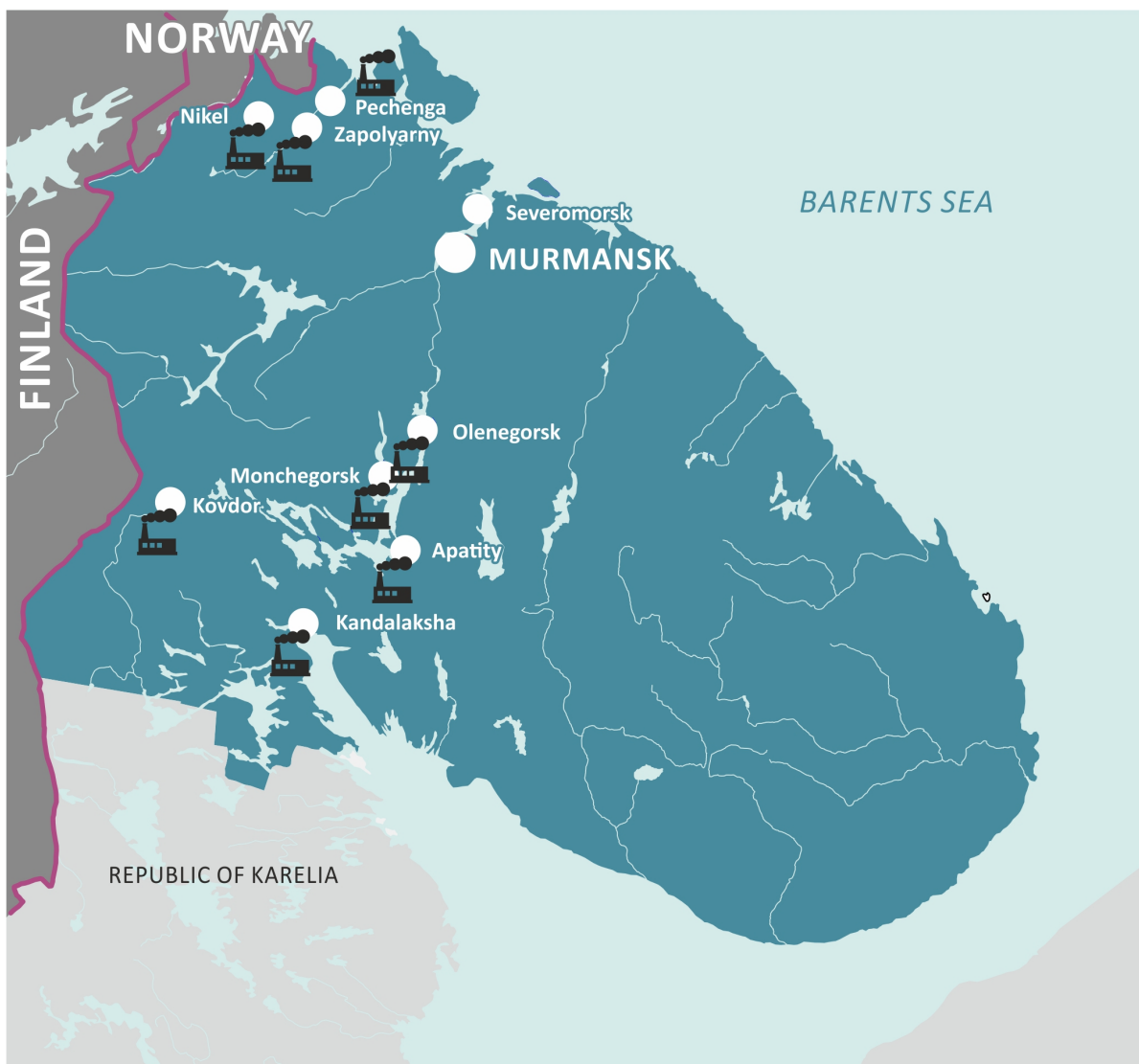


## Murmansk Region

The Murmansk region is located in the northwest of the Russian Federation, on the territory of the Kola Peninsula. To the west it borders on Norway and Finland, to the south - on the Republic of Karelia. The maximum length from north to south is 400 km, from west to east - 580 km, the area is about 144.9 thousand km<sup>2</sup>. Nearly the entire region is located beyond the Polar Circle. The population of the Murmansk region is 780 400 people, the majority of which (93%) are urban. The population of the cities (Murmansk and Kandalaksha) in 2014 was 299 000 and 49 500 inhabitants, respectively. The density of the population in these cities is quite high - 19 persons/km<sup>2</sup>, as compared with other northern areas, where the population density usually constitutes 2 persons/km<sup>2</sup>.

The Murmansk region occupies a leading position in the country in relation to mineral reserves. Over 60 large deposits of various minerals were found in the depths of the Kola Peninsula, the most valuable of which are copper-nickel, iron, apatite-nepheline ores, rare metal and rare-earth metal ores. The core of the economy in the Murmansk region is the mining complex, which consists of companies operating in the mining and chemical industry and ferrous and non-ferrous metallurgy.

The industrial complex of the Murmansk region occupies about 0.5% of the Kola Peninsula area. One feature of the Murmansk region is the elevated anthropogenic loads on limited areas of dense population<sup>333</sup>.



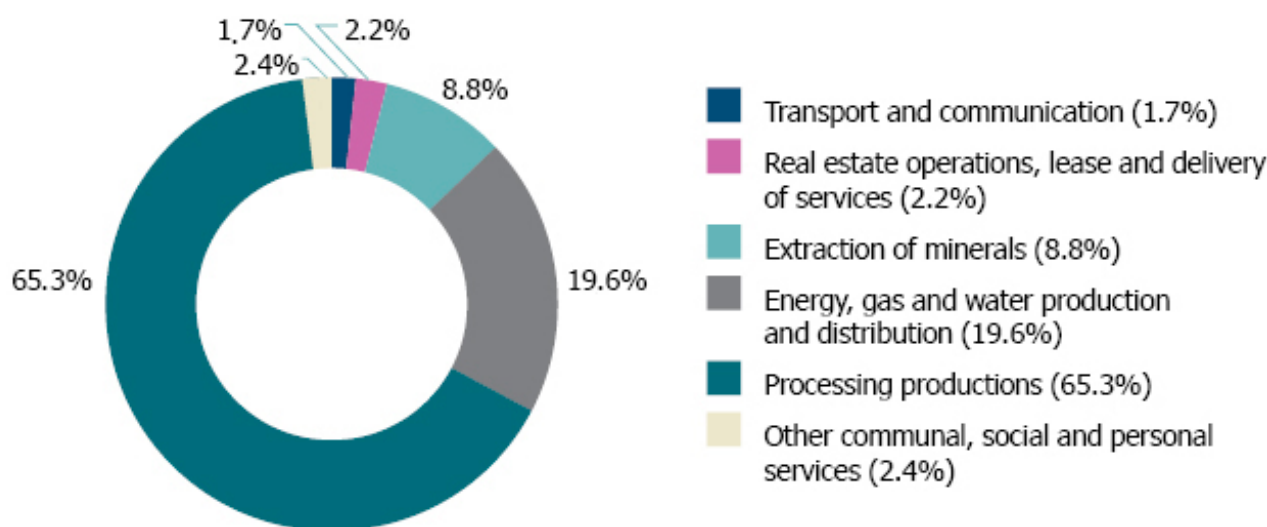
<sup>333</sup> <http://new.gov-murman.ru/region/index.php>.



## General characteristics of the environmental condition

### Atmospheric air condition

The main air pollutant sources in Murmansk region are mining and processing companies of the mining and smelting complex, companies dealing with the production of apatite and nepheline concentrates for mineral fertilizers and heating enterprises. In total in 2013, stationary sources emitted 269 800 tons (in 2012 – 258 900 tons) of pollutants, that is by 10 900 tons (4.2%) more than in 2012 <sup>334</sup>.



**Fig. 1 Structure for air pollutant emissions in the Murmansk region by types of economic activities in 2013<sup>335</sup>**

In the structure of pollutants the largest share of emissions is taken up by sulfur dioxide and heavy metals. Around large enterprises, tailing ponds covering large areas are currently being formed (storage sites for ore processing waste which are also sources of air pollution by solid particles). For the past three years, there had been a trend of increasing air pollution by substances, such as suspended substances and carbon monoxide.

The most air polluted zones are in the cities, where non-ferrous metal plants are located, such as Zapolarny, Nickel, Monchegorsk, Kandalaksha, and ferrous metal plants – in Olenegorsk, Kovdor. The main air pollutant sources in Murmansk are heating and transport enterprises.

### The condition of water resources

The rivers of the Murmansk region belong to the basins of the Barents and White Seas. Within the Kola Peninsula there are more than 127 000 water bodies, of which 20 600 are water courses and 107 000 are water reservoirs. The region has no shortage of water resources<sup>336</sup>.

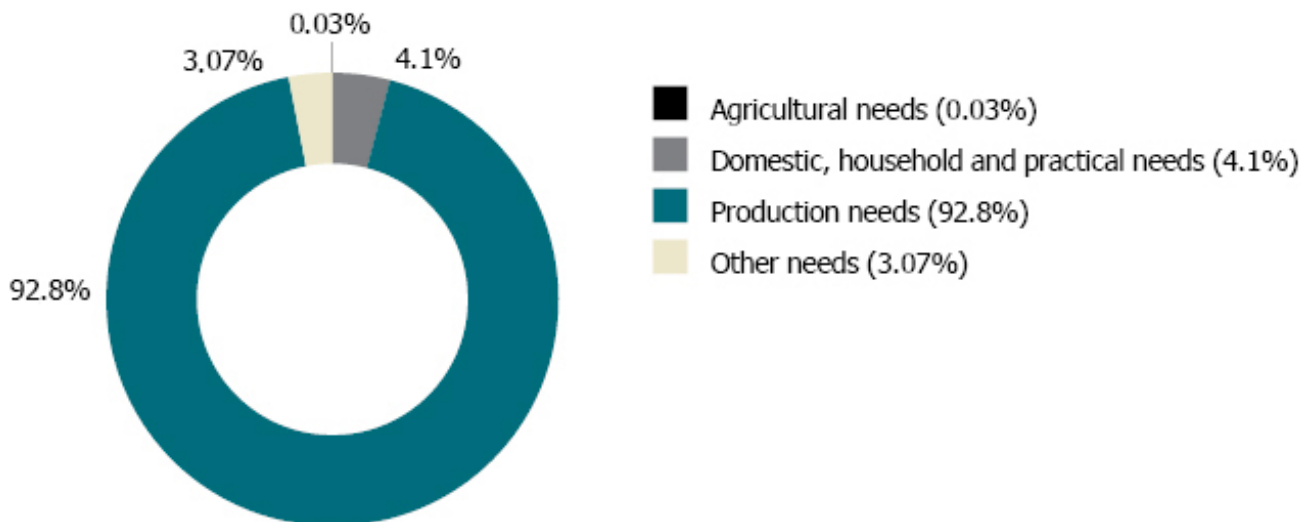
<sup>334</sup> Po materialam dokladov «O sostoyanii i ob okhrane okruzhayushey sredy Murmanskoy oblasti v 2012 godu» [Based on the reports "On state and environmental protection of the Murmansk region in 2012"] ([http://mpr.gov-murman.ru/upload/iblock/81d/2012\\_.pdf](http://mpr.gov-murman.ru/upload/iblock/81d/2012_.pdf)), «O sostoyanii i ob okhrane okruzhayushey sredy Murmanskoy oblasti v 2013 godu» ["On state and environmental protection of the Murmansk region in 2013"] (<http://mpr.gov-murman.ru/upload/iblock/da1/2013.pdf>).

<sup>335</sup> <http://mpr.gov-murman.ru/upload/iblock/da1/2013.pdf>.

<sup>336</sup> [http://www.kolgimet.ru/index.php?option=com\\_content&view=article&id=60&Itemid=68](http://www.kolgimet.ru/index.php?option=com_content&view=article&id=60&Itemid=68).

Industrial enterprises have a negative impact on the hydrosphere of the Kola Peninsula. Their operations lead to the ingress of contaminants into the water bodies. The contamination occurs due to both waste water discharge and atmospheric emissions. Some water bodies, close to which are metallurgical companies, are characterized by regularly high levels of pollution.

The production processes of companies in the Murmansk region are characterized by high water-retaining capacity. Out of the total water used in the Murmansk region in 2013 (1 592.80 million m<sup>3</sup>; in 2012 - 1 472.39 million m<sup>3</sup>), the bulk falls to industrial purposes, namely 93% (1 478.40 million m<sup>3</sup>)<sup>337</sup>.



**Fig. 2 Structure of water use in the Murmansk region in 2013<sup>338</sup>**

For the past year, the total wastewater discharges increased from 1 637.50 million m<sup>3</sup> (2012) to 1 723.58 m<sup>3</sup> (2013). Out of the total volume of wastewater discharged in 2013, 338.61 million m<sup>3</sup> was discharged without proper treatment. As compared with 2012, the volume of wastewater requiring treatment decreased by 42.29 million m<sup>3</sup>.

The mining and metallurgical sector (OJSC "Kola Mining and Metallurgical Company (Kolskaya GMK)", OJSC "Apatite", OJSC "Kovdor Mining and Processing Plant (Kovdorsky GOK)", OJSC "Olcon", LLC "Lovozero Mining and Processing Plant (Lovozersky GOK)") are the most significant polluters of water bodies.

In 2013, the Federal State Budget Enterprise "Murmansk Department of Hydrometeorology and Environmental Monitoring" (DHEM) conducted monitoring of the quality of surface water at 31 rivers, 8 lakes, and 4 water-storage basins. 165 cases of high pollution and 45 cases of extremely high pollution were recorded at 22 water bodies in terms of the following typical parameters: nickel, molybdenum, copper, sulphate, flotation reagents, nitrogen compounds, organic and other substances. These water

<sup>337</sup> Po materialam dokladov «O sostoyanii i ob okhrane okruzhayushey sredy Murmanskoy oblasti v 2012 godu» [Based on the reports "On the state and protection of the environment of the Murmansk region in 2012"] ([http://mpr.gov-murman.ru/upload/iblock/81d/2012\\_.pdf](http://mpr.gov-murman.ru/upload/iblock/81d/2012_.pdf)), «O sostoyanii i ob okhrane okruzhayushey sredy Murmanskoy oblasti v 2013 godu» ["On the state and protection of the environment of the Murmansk region in 2013"] (<http://mpr.gov-murman.ru/upload/iblock/da1/2013.pdf>).

<sup>338</sup> <http://mpr.gov-murman.ru/upload/iblock/da1/2013.pdf>.

bodies are situated in the vicinity of the following companies: Kolskaya GMK, OJSC – the Nyuduay River, the Hauki-Lampi-Yoki River and the Kolos-Yoki River; Kovdorsky GOK, OJSC – the Mozhel River and the Kovdora River;"Lovozerky GOK, LLC – the Sergevan River, the Umbozero Lake.

## Soil condition

The main sources of soil contamination are industrial emissions, as well as industrial and household wastes. For many years, it has been noted that the indicator for the portion of soil samples, not meeting hygienic standards, was higher than the Russian average. Monitoring results in 2013 have shown a trend of a reduction in the level of soil contamination, on the whole for the region, as compared with 2011 and 2012<sup>339</sup>. The state of the soil cover in the affected industrial areas, such settlements as Monchegorsk, Zapolarny and Nickel, does not meet hygienic standards in terms of sanitary and chemical indicators. The portion of soil samples, not complying with standards, in the residential areas of these settlements exceeds the average indicator in the Murmansk region by 41.5%<sup>340</sup>. The main pollutants of soils in the region are heavy metals, namely nickel, copper and cobalt.

## Industrial waste

The main sources of industrial waste in the Murmansk region are mining companies, such as Kolskaya GMK, OJSC (Pechenganikel and Severonikel plants), Apatite, OJSC, Kovdorsky GOK, OJSC, Olkon, OJSC, Lovozerky GOK, LLC, branch of SUAL - KAZ-SUAL, OJSC.

According to the companies' reporting in 2013, 240.9 million tons of waste were generated (in 2012 - 235.8 million tons), the most of which (240.5 million tons (99.8%)) are mining wastes (refinement tailings, overburden and tunnel rocks and so on)<sup>341</sup>.

Annually, the regional plants (GOK and GMK) store more than 200-250 million tons of rock refuse and overburden rocks. The dumps (used-up rocks and refinement tailings from the mining process) contain significant amounts of minerals available for extraction, but only 3-4% of the annual volume of waste is used in the industry.

## Main polluters

The following companies have had a significant anthropogenic impact on the environment: Apatite, OJSC, Olkon, OJSC, Kovdorsky GOK, OJSC, Lovozerky GOK, OJSC, Severonikel Plant, OJSC, GMK Pechenganikel, OJSC, Kandalaksha Aluminum Plant (branch of KAZ-SUAL, OJSC). These companies are the core of socio-economic development of the region and, at the same time, the biggest polluters of the environment.

The largest industrial companies of the Murmansk region, responsible for the anthropogenic load on the environment, are the township-forming enterprises located in single-industry cities: Olenegorsk (Olkon, OJSC), Kovdor (Kovdorsky GOK, OJSC), Kirovsk (Apatite, OJSC), Revda (Lovozerky GOK, OJSC), Monchegorsk (Severonikel Plant, OJSC), Zapolarny and Nickel (GMK Pechenganikel, OJSC), Kandalaksha (KAZ-SUAL, OJSC).

The actual basis for this section consists of data, taken from official sources of state authorities of the Murmansk region, reports on the state and protection of the environment in the Murmansk region,

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<sup>339</sup> Doklad «O sostoyanii i ob okhrane okruzhayushey sredy Murmanskoy oblasti v 2013 godu» [Report "On state and protection of the environment of the Murmansk region in 2013"] (<http://mpr.gov-murman.ru/upload/iblock/da1/2013.pdf>).

<sup>340</sup> Ibid.

<sup>341</sup> Doklad «O sostoyanii i ob okhrane okruzhayushey sredy Murmanskoy oblasti v 2012 godu» [Report "On the state and protection of the environment of the Murmansk region in 2012"] ([http://mpr.gov-murman.ru/upload/iblock/81d/2012\\_.pdf](http://mpr.gov-murman.ru/upload/iblock/81d/2012_.pdf)).

requests sent to companies, as well as materials of company speeches and reports on production activities and news articles. All materials are publicly available.

## *Olenegorsk Mining and Processing Plant, OJSC (Olkon, OJSC)*

### *General information*

Olkon, OJSC is located in the central part of the Kola Peninsula in Olenegorsk with a population of 29 524 inhabitants (in 2013), 3.5 km to the south-west of the Kolozero Lake and 4 km from the Permus Lake, and is a township-forming enterprise<sup>342</sup>. The average number of staff of Olkon, OJSC is 2300 employees (in 2013)<sup>343</sup>.

Olkon, OJSC is among the leading iron ore companies in Russia. Currently, the Olenegorsk Mining and Processing Plant is a large industrial complex related to the extraction and enrichment of ferruginous quartzite with iron ore concentrate separation.

The main products of the Olenegorsk mining and processing plant are iron-ore concentrate, strontium ferrite powders (PFS-28). The company has facilities for the production of construction gravel of various scales for railway ballasting. The volume of iron-ore concentrate production at Olkon, OJSC in 2013 stood at 4.6 million tons (in 2012 - 4.78 million tons)<sup>344</sup>. The main consumer of the concentrate is Severstal, OJSC.

100% of the Olkon, OJSC share capital is owned by the Holding Mining Company, LLC (Cherepovets, Vologda region).

The production base of the company consists of a quarry and crushing-and-dressing plant (CDP). The raw-material base of the plant is currently represented by six ferruginous quartzite deposits, explored ore reserves which, according to data as of January 1, 2013, amounts to 559.6 million tons.

The iron ore of the Olenegorsky district is unique in its composition and contains a low amount of impurities (sulfur, phosphorus). At the moment, Olkon, OJSC is developing six deposits: in open quarries - Kirovogorskoye deposit, XV-letiya Oktyabrya (15<sup>th</sup> year of October), Komsomolskoye, Kurkenpakhk, Yuzhno-Kakhozerskoye (Vostochny (Eastern) section); combined, open-cut and underground methods - Olenegorskoye deposit. All mines and CDPs are connected with the city by means of roads and local rail lines<sup>345</sup>.

Alongside each quarry there are dumps of overburden and host rocks. In quarries the iron ore is obtained using the open-cut method by using drilling-and-blasting operations to separate rocks from the massif and to crush to the required technological condition. The planning of the construction and utilization of quarry have been carried out by Institute Giproruda, JSC taking into consideration Gosgortekhnadzor's requirements, sanitary inspection, land and forest legislation and environmental requirements.

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<sup>342</sup> Based on website at <http://murmanskstat.gks.ru>.

<sup>343</sup> Auditorskoye zaklyuchenie o finansovoy otchetnosti OAO «Olenegorskiy gorno-obogatitelnyy kombinat» za 2013 god [Auditor's report on financial reporting of Olenegorsk Mining and Processing Plant, OJSC for 2013] (<http://www.olcon.ru/rus/disclosure/index.phtml>).

<sup>344</sup> Godovoy otchet OAO «Olenegorskiy gorno-obogatitelnyy kombinat» za 2013 god [Annual report of Olenegorsk Mining and Processing Plant, OJSC for 2013] (<http://www.olcon.ru/rus/disclosure/index.phtml>).

<sup>345</sup> Kozyrev A. A., Zhabin S. V., Churkin O. E. Sostoyaniye i potentsial gornopromyishlennogo kompleksa Murmanskoy oblasti / Vestnik MGTU. T. 12. 2009. No. 4. [Condition and potential of the mining complex of the Murmansk region/Bulletin MSTU. V. 12. 2009. No. 4.]

The mining process involves: drilling production wells for blasting; blasting the drilled blocks; excavating the crushed rock mass using mine excavators; transportation of ore and overburden rocks by dumptrucks, ore transportation to CDP by rail (at the Olenegorsky quarry the ore is transported to the CDP by means of a conveyor line placed in an inclined underground shaft leading from the quarry)<sup>346</sup>. In 2013, the company used 645 613 000 KWh of electricity<sup>347</sup>.

The company's future prospects are tied to the reconstruction of all existing quarries, in order to increase their capacity, as well as the commissioning of a quarry at the Anomaly section (2014)<sup>348</sup>.

### *Economic aspects*

In 2013, Olkon, OJSC had net profits from the sale of goods, works and services at the amount of 11 435 691 000 rubles (in 2012 – 11 695 204 000 rubles). The net profit for 2013 amounted to 1 281 319 000 rubles, or 52.5% like in 2012 (2 695 955 000 rubles). Olkon, OJSC is included in the consolidated group of taxpayers of Severstal, OJSC that pays income tax into the budget of the Vologda region<sup>349</sup>.

### *Air emissions*

In 2013, Olkon, OJSC emitted into the atmosphere 2 500 tons (in 2012 - 2.3 thousand tons), or about 1% of the total emissions from the stationary objects (269 800 tons)<sup>350</sup>. Environmental issues to be solved at Olkon, OJSC are associated with gas and dust emissions into the atmosphere from mining operations, especially at the Olenegorsky quarry, located close to the city.

The monitoring data, provided in 2011 by the Murmansk Department of Hydrometeorology and Environmental Monitoring, permits the conclusion that the main pollutants of the air basin in the affected area are nitrogen dioxide (1.1 MAC) and suspended substances (1.2 MAC). A low level of contamination by a total of five impurities ( $ASI_5 = 2$ ) was recorded in Olenegorsk<sup>351</sup>.

The main methods for emission abatement may be the use of explosives with a zero oxygen balance and the use of advanced dust suppression technology. Furthermore, it is necessary to improve the environmental purity of iron concentrate by reducing its sulfur content.

### *Discharges into water bodies*

A closed circulation water supply system with 100% water cycling was introduced at the processing plant. The facilities for circulation water supply system are designed to deliver turbidity-free water from the tailing

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<sup>346</sup> <http://www.murman.ru/ecology/cadastre/3-6.html>.

<sup>347</sup> Godovoy otchet OAO «Olenegorskiy gorno-obogatitelnyy kombinat» za 2013 god [Annual report of Olenegorsk Mining and Processing Plant, OJSC for 2013] (<http://www.olcon.ru/rus/disclosure/index.phtml>).

<sup>348</sup> <http://olcon.severstal.com/rus/about/strategy/index.phtml>.

<sup>349</sup> Godovoy otchet OAO «Olenegorskiy gorno-obogatitelnyy kombinat» za 2013 god [Annual report of OJSC "Olenegorsk Mining and Processing Plant" for 2013] (<http://www.olcon.ru/rus/disclosure/index.phtml>).

<sup>350</sup> Po materialam dokladov «O sostoyanii i ob ohrane okruzhayushey sredy Murmanskoy oblasti v 2012 godu» [Based on the reports "On the state and protection of the environment of the Murmansk region in 2012"] ([http://mpr.gov-murman.ru/upload/iblock/81d/2012\\_.pdf](http://mpr.gov-murman.ru/upload/iblock/81d/2012_.pdf)), «O sostoyanii i ob ohrane okruzhayushey sredy Murmanskoy oblasti v 2013 godu» ["On state and protection of the environment of the Murmansk region in 2013"] (<http://mpr.gov-murman.ru/upload/iblock/da1/2013.pdf>).

<sup>351</sup> Doklad «O sostoyanii i ob ohrane okruzhayushey sredy Murmanskoy oblasti v 2011 godu» [Report "On state and protection of the environment of the Murmansk region in 2011"] ([http://mpr.gov-murman.ru/upload/iblock/88a/2011\\_.pdf](http://mpr.gov-murman.ru/upload/iblock/88a/2011_.pdf)).



ponds into the production cycle. There is no discharge into surface waters. The impact on the environment takes the form of pollution of ground and surface waters.

The Kolozero Lake and source of the Kola River, water bodies in the area of OJSC «Olkon», fall into category 2: the water is polluted by several ingredients and quality indicators. The copper content (in 2012 and 2013) in the Kolozero Lake exceeded the permissible concentration in all samples and on average for the year constituted 6 MAC, and water quality in 2012, as compared to 2011, declined from 2 to category 3. A factor 2 signifies "polluted" (the total number of relevant indicators – 15, polluting indicators - 5). The water quality at the source of the Kola River is determined by the hydrochemical make-up of the Kolozero Lake, and the copper content in the river source in 2012 and 2013 exceeded the maximum permissible limit in all samples and varied in range from 2 to 7 MAC. In 2012, the water in the source of the Kola River corresponded to class 2 - "slightly polluted" (the total number of the relative indicators – 15, polluting indicators - 3)<sup>352</sup>.

### *Industrial wastes*

Mining wastes are non-toxic overburden and host rocks. The overburden rocks at the company are represented mainly by gneiss, diabase and pegmatite (maximum chunk size - up to 1000 mm). The content of iron oxides is 6%. The major portion in the chemical composition of rocks consists of oxide of silicon (77%), and aluminum oxide (17.8%).

The refinement tailings are tails from the crushing and dressing plant, a sand mass with a grain size up to 0.6 mm. The mineral composition mainly includes quartz, feldspar, amphibole, hematite and magnetite. According to the chemical composition, silicon oxide (up to 75%), iron oxides (12%), and calcium and magnesium oxide (7.5%) are the most prevalent chemicals. The tails are non-toxic based on the accepted waste classification.

The dumps containing overburden and host rocks of the mines (Olenegorsky, Kirovogorsky, Baumansky and XV-year of October) have been designed by JSC "Institute Giproruda" taking into consideration Gosgortekhnadzor's requirements, sanitary inspection, land and forest legislation and environmental requirements. The projects have been agreed and approved by all the relevant authorities, and have EIA. The dumps are located in the land and mining allotments of the respective mines<sup>353</sup>.

### *Production process modernization plans for reducing the negative impact on the environment*

In 2011-2013, JSC «Olkon» undertook the following actions:

- transfer and reconstruction of pulp lines for the water supply circulation system from the construction area of the Eastern section of the Yuzhno-Kakhozerskoye deposit with the aim of the safe operation of the tailing ponds within the crushing and dressing plant, included in the water supply circulation system of the company, in the case of the construction and further operation of the Eastern quarry of the Yuzhno-Kakhozerskoye deposit.
- mounting and dismantling of pulp lines within the water supply circulation system of the company.
- technical retooling of pulp pumping station (PNS-1A), in order to completely eliminate the discharge of solids of the tailing pulp from pulp pump station (PNS-1A) to the emergency pool of the Kolozero Lake, and to return the circulating water into the water cycle of the company<sup>354</sup>.

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<sup>352</sup> Doklady «O sostoyanii i ob ohrane okruzhayushey sredy Murmanskoy oblasti v 2012 godu» [Reports "On the state and protection of the environment of the Murmansk region in 2012"] ([http://mpr.gov-murman.ru/upload/iblock/81d/2012\\_.pdf](http://mpr.gov-murman.ru/upload/iblock/81d/2012_.pdf)), «O sostoyanii i ob ohrane okruzhayushey sredy Murmanskoy oblasti v 2013 godu» ["On the state and protection of the environment of the Murmansk region in 2013"] (<http://mpr.gov-murman.ru/upload/iblock/da1/2013.pdf>).

<sup>353</sup> Cadastre of mining and metallurgical industries of the Murmansk region (<http://www.murman.ru/ecology/cadastre>).

<sup>354</sup> Godovoy otchet OAO «Olenegorskiy gorno-obogatitelnyy kombinat» za 2013 god [Annual report of OJSC "The Olenegorsk Mining and Processing Plant" for 2013] (<http://www.olcon.ru/rus/disclosure/index.phtml>).

According to a statement of February 2014, «Olkon» plans a 1.4 billion ruble investment program which includes the modernization of the crushing and dressing plant, including technology related to the drying of iron ore concentrate, and a large-scale construction project of a high-angle conveyor, as well as the planned replacement of obsolete equipment with newer analogues<sup>355</sup>.

### *OJSC «Kovdor Mining and Processing Plant» (OJSC «Kovdorsky GOK»)*

#### *General information*

OJSC «Kovdorsky GOK» is located in Kovdor, Murmansk region, and is a township-forming enterprise. The population of the city is 17 991 inhabitants (in 2013)<sup>356</sup>.

Currently, OJSC «Kovdorsky GOK» is one of the leading companies in the North-West region of Russia and provides the comprehensive processing of mineral raw materials by using low-waste technologies. Moreover, the company is the second largest producer (in Russia) of apatite concentrate and the only (in the world) manufacturer of baddeleyite. Since 2001, the Kovdorsky Mining and Processing Plant is a part of the EuroChem Mineral and Chemical Company owning 92.2% of the shares<sup>357</sup>.

The plant's products comply with international standards. The production volume for iron ore concentrate at OJSC «Kovdor GOK» in 2012 amounted to 5700 thousand tons, apatite concentrate (37-38% P<sub>2</sub>O<sub>5</sub>) - 2700 thousand tons, baddeleyite concentrate - 10 thousand tons<sup>358</sup>.

The apatite, produced by Kovdorsky GOK and processing plant, is supplied to three companies dealing in the production of phosphate fertilizers: "Fosforit" (Leningrad region, Russia), Lifosa (Kėdainiai, Lithuania) and "EuroChem-BMU"<sup>359</sup>. The traditional consumer of iron ore concentrate, 80% of which is consumed in Russia, is OJSC "Severstal". 95% of baddeleyite concentrate is exported to Japan, USA and European countries<sup>360</sup>.

The Kovdorsky GOK has been developing the Kovdorskoye deposit of complex baddeleyite-apatite-magnetite ore at the Zheleznyi quarry, located to the west of Kovdor town (at a distance of 500 m from the city limits), processing ore at the magneto-concentrator (MC) and apatite-baddeleyite concentrator (ABC). The MC and ABC are part of the concentrating complex, located on the eastern side of the quarry, at 1 km from the city.

Ore mining is carried out at the quarry of the Zhelezny mine in open-cut mining operations using drilling and blasting operations to separate the rocks from the massif and crush them to the required technological conditions. The process involves drilling wells for blasting operations by roller drilling machines; blasting the drilled blocks with quarry explosives; excavating the crushed rock mass by mine excavators; transportation of the ore within the quarry and overburden rocks by dumptrucks to the dumps; ore transportation from quarry to crushing units of enrichment production by means of inclined conveyor line mounted on the eastern side of the quarry in a conveyer (closed) gallery. The ore is enriched using the combined magnetic-gravity-flotation method.

<sup>355</sup> [http://olcon.severstal.com/rus/press\\_center/news/document1299.phtml](http://olcon.severstal.com/rus/press_center/news/document1299.phtml).

<sup>356</sup> Based on website at <http://murmanskstat.gks.ru>.

<sup>357</sup> The consolidated financial reporting and auditor's report of EuroChem Group for 2013 (<http://www.eurochem.ru/news/press-releases/#/single-news/eurochem-reports-ifrs-financial-information-for-2013>).

<sup>358</sup> The annual report and financial reporting of EuroChem Group for 2012 ([http://www.eurochem.ru/wp-content/uploads/2013/05/EuroChem\\_Annual\\_Report\\_2012\\_rus3.pdf](http://www.eurochem.ru/wp-content/uploads/2013/05/EuroChem_Annual_Report_2012_rus3.pdf)).

<sup>359</sup> Based on website at <http://minec.gov-murman.ru>.

<sup>360</sup> <http://www.himtrade.ru/passport-description-199.htm>.

The construction planning and exploitation of the quarry have been carried out by JSC "Institute Giproruda" in line with Gosgortekhnadzor's requirements, sanitary inspection, land and forest legislation and environmental requirements. EIA is available<sup>361</sup>.

In 2013, the company used 733 349 000 KWh of electricity and 17 209 Gcal of heat which was produced on its own TPP, running on residual oil<sup>362</sup>.

### *Economic aspects*

More than 70% of the budget of Kovdorsky district consists of tax deductions from the plant. The company's revenues in 2013 amounted to 31 370.9 million rubles (in 2012 - 27 496.8 rubles). The net income in 2013 was almost 2 times higher than in 2012, and amounted to 10 708.3 million rubles (in 2012 - 5 935.3 million rubles.)<sup>363</sup>.

### *Air emissions*

In 2013, the Kovdorsky GOK emitted into the atmosphere 8 650 tons (in 2012 – 8 106 tons), or about 3.2% of the total emissions from stationary objects in the Murmansk regions (269 800 tons)<sup>364</sup>. The company's impact on atmosphere is due to the dusting of dumps. Four dumps of overburden rocks at Zhelezny mine were designed in view of the Gosgortekhnadzor's requirements, sanitary inspection, land and forest legislation and environmental requirements. The projects have been agreed by all the relevant authorities, are approved and contain EIA. The dumps are placed in the land allotment of the mine, to the north and west of the quarry, at a distance of 2.6 km in a straight line from Kovdor, by roads - 4.5 km. The length of the dump is 100-1500 m, width - 50-1000 m, height – up to 95 m<sup>365</sup>.

In 2013, Kovdor was among the Russian cities with a low level of pollution<sup>366</sup>, although in 2012 the level of air pollution in the city was estimated as increased; in the air there have been cases of pollution by oxides of nitrogen, phenol, formaldehyde, benz(a)pyrene and the elevated concentrations of nitrogen oxides (the largest ones - in the winter, in course of unfavorable weather conditions)<sup>367</sup>.

According to measurements made by the Murmansk Department of Hydrometeorology and Environmental Monitoring in 2011, the primary pollutant of the air basin in the zone of influence of "Kovdorsky GOK" was nitric oxides<sup>368</sup>.

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<sup>361</sup> <http://www.murman.ru/ecology/cadastre/3-5.html>.

<sup>362</sup> [http://www.eurochem.ru/wp-content/uploads/2010/10/%D0%9A%D0%93%D0%9E%D0%9A\\_%D0%93%D0%9E-%D0%B7%D0%B0\\_2013-%D1%83%D1%82%D0%B2.pdf](http://www.eurochem.ru/wp-content/uploads/2010/10/%D0%9A%D0%93%D0%9E%D0%9A_%D0%93%D0%9E-%D0%B7%D0%B0_2013-%D1%83%D1%82%D0%B2.pdf).

<sup>363</sup> Ibid.

<sup>364</sup> Po materialam dokladov «O sostoyanii i ob okhrane okruzhayushey srede Murmanskoy oblasti v 2012 godu» [Based on the reports "On the state and protection of the environment of the Murmansk region in 2012"] ([http://mpr.gov-murman.ru/upload/iblock/81d/2012\\_.pdf](http://mpr.gov-murman.ru/upload/iblock/81d/2012_.pdf)), «O sostoyanii i ob okhrane okruzhayushey srede Murmanskoy oblasti v 2013 godu» ["On the state and protection of the environment of the Murmansk region in 2013"] (<http://mpr.gov-murman.ru/upload/iblock/da1/2013.pdf>).

<sup>365</sup> <http://www.murman.ru/ecology/cadastre/3-5.html>.

<sup>366</sup> Doklad «O sostoyanii i ob okhrane okruzhayushey srede Murmanskoy oblasti v 2013 godu» [Report "On the state and protection of the environment of the Murmansk region in 2013"] (<http://mpr.gov-murman.ru/upload/iblock/da1/2013.pdf>).

<sup>367</sup> Doklad «O sostoyanii i ob okhrane okruzhayushey srede Murmanskoy oblasti v 2012 godu» [Report "On the state and protection of the environment of the Murmansk region in 2012"] ([http://mpr.gov-murman.ru/upload/iblock/81d/2012\\_.pdf](http://mpr.gov-murman.ru/upload/iblock/81d/2012_.pdf)).

<sup>368</sup> Ibid.

### *Discharges into water bodies*

The company has a negative impact on water bodies, such as the Kovdora and Mozhel rivers. The impacts on the hydrosphere by Kovdorsky GOK are mainly connected to pit sump at a capacity of 3000 m<sup>3</sup>/h, or 28.6 million m<sup>3</sup>/year<sup>369</sup>.

The specific pollutants within GOK are molybdenum, manganese, phosphates, sulphates, bicarbonates, suspended substances. The most polluted water body is the Mozhel River (a tributary of the Kovdora River). In all samples the concentration of organic substances in term of COD, phosphates, manganese, molybdenum and sodium was higher than the maximum allowable one. In the waters of the Mozhel River two cases of high pollution by molybdenum were recorded. In 2012, there were 6 of 15 polluting ingredients analyzed in the Mozhel River, and the water of the river was classified as "very polluted" (class 3, category "b").

The monitoring of water quality in the Kovdora River was made on two alignments: at 4 km above the Kovdor town (located above the main sources of pollution) and at 7 km below the mouth of the Mozhel River. The concentration of pollutants in the Kovdora River increases from the background sample taken from the location above the sources and city to the estuary. At the location, located below the mouth of the Mozhel River, an excess in MAC was observed in relation to copper and molybdenum content in all samples.

In 2012, the river water from the background sample to the estuary, respectively, changed from class 2 ("slightly polluted") to class 3, category "a" ("polluted"), and the amount of pollutant indicators increased from 4, at the upper location, to 7 out of the 15 considered in the analysis<sup>370</sup>.

### *Industrial wastes*

Mining wastes are overburden rocks and the simultaneously extracted ore (low-iron and apatite-staffelite), the waste from the enriching process consists of refinement tailings.

Four dumps of overburden rocks are located on the territory of the Zhelezhny mine (in the area of the northern and western sides of the quarry), at a distance of 1.9 - 2.6 km from the city. The dumps for overburden rocks have been designed by the Institute Giproruda, JSC in line with the Gosgortekhnadzor's requirements, sanitary inspection, land and forest legislation and environmental requirements. The projects have been agreed and approved by all the relevant authorities, and have EIA. Storage of the associated ores is located separately. The ores are not utilized due to a lack of consumer demand and unprofitable processing (although low-iron and apatite-staffelite ore can be used to produce apatite and iron ore concentrates, as well as lime and cement from carbonatites). The deposit contains a small amount of the rare-metal variation of baddeleyite-apatite-magnetite ore, which is stored in a special dump after extraction. The overburden rocks are partially used for civil works (crushed stone for road fill in the quarry, for ballasting and so on).

Two dumps of refinement tailings are located to the south of the Kovdor town at a distance of 2.4 km. The tails of the magnetic enrichment plant, which produces iron ore concentrate, are used for civil works. The material of tails of the apatite-baddeleyite plant (where by means of flotation technology the apatite concentrate is produced from tailings of magnetic enrichment) is sands with a maximum grain size of 1.25 mm. The tailing material is non-toxic, insoluble in water and practically not used<sup>371</sup>.

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<sup>369</sup> Ibid.

<sup>370</sup> Doklady «O sostoyanii i ob ohrane okruzhayushey sredy Murmanskoy oblasti v 2012 godu» [Reports "On the state and protection of the environment of the Murmansk region in 2012"] ([http://mpr.gov-murman.ru/upload/iblock/81d/2012\\_.pdf](http://mpr.gov-murman.ru/upload/iblock/81d/2012_.pdf)), «O sostoyanii i ob ohrane okruzhayushey sredy Murmanskoy oblasti v 2013 godu» ["On the state and protection of the environment of the Murmansk region in 2013"] (<http://mpr.gov-murman.ru/upload/iblock/da1/2013.pdf>).

<sup>371</sup> Cadastre of mining and metallurgical industries of the Murmansk region (<http://www.murman.ru/ecology/cadastre>).

## *Production process modernization plans for reducing the negative impact on the environment*

In the framework of the Strategy for the development of Kovdorsky GOK for the period 2013-2017, more than 11 billion rubles of investments have been provided to implement a number of measures to modernize production. Examples of projects, aimed at reducing the negative impact on the environment are given below:

- Processing 16.7 million tons of ore, 2.2 million tons of apatite-staffelite ores and 5.4 million tons of waste from technogenic deposit annually according to base projections of company development.
- Organizing the production of iron-ore concentrate with a low content of sulfur and phosphorus.
- Modernizing the technology for the reception and storage of fuel and lubricants, while ensuring industrial safety and environmental protection at the fuel and transport sector of the TPP<sup>372</sup>.

It is known that the project related to reducing the discharge of waste water at the company is on the list of priority environmental projects of the Murmansk region. Based on available information "Assessment for report on environmental "hot spots" in the Barents Region", it is known that certain organizational and technical measures have been taken, and it is necessary to finish the modernization of wastewater treatment facilities<sup>373</sup> to achieve the effects.

## *Apatite, OJSC*

### *General information*

Apatite, OJSC, Europe's largest producer of phosphate raw materials for the production of mineral fertilizers, is a subsidiary of FosAgro, OJSC, the main owner of which is a group of companies, registered on the territory of the Republic of Cyprus, each of which owns from 5% to 10% of common shares of FosAgro, OJSC<sup>374</sup>.

Apatite, OJSC is located in Kirovsk and is the township-forming enterprise of the Kirovsk and Apatity towns. The average number of employees is approximately 13 000 people (according to 2012). The main products of the company are apatite and nepheline concentrates, produced at the apatite-nepheline enrichment factory (ANOF) ANOF-2, dealing with the processing of apatite-nepheline ore from four active mines. The company is developing the Khibinsky deposits of apatite-nepheline ores, extracting and enriching them.

The extraction of apatite-nepheline ore takes place at six deposits: "Kukisvumchorr", "Yukspor", "Apatitovyi Tsirk" (Apatite Circus), "Plateau Rasvumchorr", "Koashva" and "N'yorkpakhk-Suoluayv". There are four operating mines: Kirovsky (the first two deposits), Rasvumchorrsky ("Apatite Circus"), Central (Tsentralny) ("Plateau Rasvumchorr") and Eastern (Vostochny) (other deposits). The exploited field reserves, judging from industrial categories, constitute 2.4 billion tons, the reserve of prospected deposits is 1.1 billion tons. The high quality of products is confirmed by the certificate issued by the world-known organization TUV Ecoplen Umwelt (Germany) in 1998<sup>375</sup>.

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<sup>372</sup> Annual report and financial reporting of EuroChem Group for 2012 ([http://www.eurochem.ru/wp-content/uploads/2013/05/EuroChem\\_Annual\\_Report\\_2012\\_rus3.pdf](http://www.eurochem.ru/wp-content/uploads/2013/05/EuroChem_Annual_Report_2012_rus3.pdf)).

<sup>373</sup> [http://www.barentsinfo.fi/beac/docs/Environment\\_Ministers\\_Meeting\\_4\\_5\\_Nov\\_2013\\_Inari\\_HotSpots\\_Assessment\\_Report\\_RUS.pdf](http://www.barentsinfo.fi/beac/docs/Environment_Ministers_Meeting_4_5_Nov_2013_Inari_HotSpots_Assessment_Report_RUS.pdf)

<sup>374</sup> Annual report and financial reporting of EuroChem Group for 2012 ([http://www.eurochem.ru/wp-content/uploads/2013/05/EuroChem\\_Annual\\_Report\\_2012\\_rus3.pdf](http://www.eurochem.ru/wp-content/uploads/2013/05/EuroChem_Annual_Report_2012_rus3.pdf)).

<sup>375</sup> Godovoy otchet OAO «Apatit» za 2013 god [Annual report of Apatite, OJSC for 2013] (<https://www.phosagro.ru/ori/111/company49.php>).



The activities of Apatite, OJSC are primarily focused on the domestic market, the share of which in total sales in 2013 amounted to 85.39%. The products are also exported to CIS and EU markets.

Ore mining is performed by the combined open-cut and underground mining method (underground being predominant) at Kirovsky and Rasvumchorrsky mines, and by open-cut mining at Tsentralny (Central) and Vostochny (Eastern) mines. The company is located in the southern sector of the foothills of the Khibiny Mountains. The quarries and mines cover the foothills and the mountain slopes.

The projects for construction and exploitation of the mines have been implemented by "Institute Giproruda" in line with Gosgortekhnadzor's requirements, sanitary inspection, land and forest legislation and environmental requirements. EIA is available<sup>376</sup>.

In 2013, the company used 1 562 875 800 KWh of electricity and 392 300 Gcal of heat (purchased)<sup>377</sup>.

### *Economic aspects*

The annual report has no information about profits. The news sources provided information that the company's revenues for the first 9 months of 2013 amounted to 36 446 907 000 rubles, which is 7% more than in 2012. The net profit of Apatite, OJSC in the same period doubled and amounted to 8 889 289 000 rubles (in 2012 - 4 465 039 000 rubles)<sup>378</sup>.

### *Air emissions*

The volume of total emissions from the company in 2013 amounted to 12 400 tons (in 2012 – 12 300 tons), or 4.6% of total emissions of stationary sources in the Murmansk region (269 800 tons)<sup>379</sup>. One of the major environmental problems in Apatity town is the problem regarding the dusting of tailing ponds; in this connection, the company is on the list of "hot spots" in the Murmansk region and is under the close monitoring of Rosprirodnadzor<sup>380</sup>.

The pollution level in Apatity in 2012-2013 is estimated as low, but, as compared with 2011, in 2012 there was an increase in the portion of samples with air pollution levels, exceeding the MAC (from 0 to 5.3%), that is connected to operations at the tailing ponds of Apatite, OJSC. During 2012 and 2013, in the air of Apatity (especially, in summer) an excess in the single concentration of total suspended substances and PM<sub>10</sub> of up to 2.5 (2012), and 2 MAC (2013) was found<sup>381</sup>.

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<sup>376</sup> <http://www.murman.ru/ecology/cadastre/3-7.html>.

<sup>377</sup> Godovoy otchet OAO «Apatit» za 2013 god [Annual report of Apatite, OJSC for 2013] (<https://www.phosagro.ru/ori/111/company49.php>).

<sup>378</sup> <http://quote.rbc.ru/news/fond/2013/11/14/34062023.html>.

<sup>379</sup> Po materialam dokladov «O sostoyanii i ob ohrane okruzhayushey sredy Murmanskoy oblasti v 2012 godu» [Based on the reports "On the state and protection of the environment of the Murmansk region in 2012"] ([http://mpr.gov-murman.ru/upload/iblock/81d/2012\\_.pdf](http://mpr.gov-murman.ru/upload/iblock/81d/2012_.pdf)), «O sostoyanii i ob ohrane okruzhayushey sredy Murmanskoy oblasti v 2013 godu» ["On the state and protection of the environment of the Murmansk region in 2013"] (<http://mpr.gov-murman.ru/upload/iblock/da1/2013.pdf>).

<sup>380</sup> Doklad «O sostoyanii i ob ohrane okruzhayushey sredy Murmanskoy oblasti v 2013 godu» [Report "On the state and protection of the environment of the Murmansk region in 2013"] (<http://mpr.gov-murman.ru/upload/iblock/da1/2013.pdf>).

<sup>381</sup> Doklady «O sostoyanii i ob ohrane okruzhayushey sredy Murmanskoy oblasti v 2012 godu» [Reports "On the state and protection of the environment of the Murmansk region in 2012"] ([http://mpr.gov-murman.ru/upload/iblock/81d/2012\\_.pdf](http://mpr.gov-murman.ru/upload/iblock/81d/2012_.pdf)), «O sostoyanii i ob ohrane okruzhayushey sredy Murmanskoy oblasti v 2013 godu» ["On the state and protection of the environment of the Murmansk region in 2013"] (<http://mpr.gov-murman.ru/upload/iblock/da1/2013.pdf>).

### *Discharges into water bodies*

The company has a significant impact on water bodies; thus, in 2013, 173 million m<sup>3</sup> of water was discharged. At the same time, only up to 30 parameters, characterizing the water quality, were monitored<sup>382</sup>. The discharges from the mining and processing plants enter the Niva River (which flows from the Imandra Lake, the largest lake of the Kola Peninsula) and the Uмба River (which flows from the Umbozero Lake). Upon implementing 80% water recycling at OJSC "Apatite", volumes of discharge of suspended substances have significantly decreased, but, at the same time, there was an increase in the relative content of the smallest suspended solid particles in the wastewater<sup>383</sup>.

According to the results of six surveys, carried out at the alignments in the zone of the location of companies and settlements in the coastal area of the Imandra Lake in the period from May to October in 2012, 3 cases of high and 1 case of extremely high pollution by molybdenum were found, in 2013 - 1 case of high and 1 case of extremely high pollution by molybdenum on the alignment of Apatity (1.7 km from the mouth of the Malaya Belaya River). The copper content was above the norm throughout the lake in 2012-2013 years. According to data for 2012, the water in the lake in Apatity, at the mouth of Belaya River, is classified as "polluted" - class 3, category "a" (out of 16 calculated ingredients - 4 are polluting ones and the critical indicator was molybdenum). On the other alignments of the lake the water is classified as class 2 - "slightly polluted": out of 16 polluting components, tested in the analysis, their quantity ranged from 4 to 6 for these alignments.

In the Bolshoy Vudyavr Lake, which is the source of drinking water for Kirovsk, 6 cases (all samples) of extremely high pollution by molybdenum was recorded during 2012, and the water of the lake is characterized by the category 3, category "b" - "very polluted". In 2013, 6 cases of extremely high pollution by molybdenum were also recorded.

In the Belaya (White) River (which flows from the Bolshoy Vudyavr lake), connecting the Imandra Lake and the Bolshoy Vudyavr lake, in all samples, collected in 2012 and 2013, the molybdenum content was extremely high and the mercury content was above the MAC. The annual average content of molybdenum in 2011-2013 increased from 7 (2011) to 10 MAC (2012), and in 2013 - up to 12 MAC. The waters of the Belaya River in 2012 were characterized as class 4, category "a" - "polluted" (out of 16 accounted indicators, 10 are polluting ones. The critical indicators of pollution were molybdenum and nitrite nitrogen)<sup>384</sup>.

### *Industrial waste*

The negative impact on soil is caused by mining operations, the exploitation of tailing ponds and sludge storages for two active processing plants (ANOF-2 and ANOF-3). The processing plant ANOF-1 ceased its operations more than 20 years ago, and this territory is under reclamation.

Apatite, OJSC stored at least 1.5 billion tons of overburden and host rocks and more than 11.0 million tons of balanced ores. The small volumes of overburden, after extraction, are used for industrial purposes (bedding the roads in the winter months, concrete production and reinforcing the slopes of tailing ponds).

Although the tails, in accordance with the criteria for hazard waste classification for the environment, are classified as V hazard class (practically non-hazardous), throughout their entire operational career Apatite,

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<sup>382</sup> Otchet OAO «FosAgro» po ustoychivomu razvitiyu v 2013 godu [Report of OJSC "FosAgro" on sustainable development for 2013] ([www.phosagro.ru/investors/reports/get/item7040.php](http://www.phosagro.ru/investors/reports/get/item7040.php)).

<sup>383</sup> Doklad «O sostoyanii i ob ohrane okruzhayushey sredy Murmanskoy oblasti v 2012 godu» [Report "On the state and protection of the environment of the Murmansk region in 2012"] ([http://mpr.gov-murman.ru/upload/iblock/81d/2012\\_.pdf](http://mpr.gov-murman.ru/upload/iblock/81d/2012_.pdf)).

<sup>384</sup> Ibid; Doklad «O sostoyanii i ob ohrane okruzhayushey sredy Murmanskoy oblasti v 2013 godu» [Report "On the state and protection of the environment of the Murmansk region in 2013"] (<http://mpr.gov-murman.ru/upload/iblock/da1/2013.pdf>).

OJSC has stored in the tailing ponds about 900 million tons of solid tailings, including 17 million tons in 2013. On the existing tailing ponds of processing plants ANOF-2 and ANOF-3 work is being carried out to reduce dusting by means of fixing with special compositions (bitumen emulsion YeBK-3), as well as by growing grass. Owing to the use of the bitumen emulsion YeBK-3, only 2-3% of the volume of dusts which can be generated within the entire area of the tailing pond<sup>385</sup> is emitted.

At this stage, no work on land reclamation in open quarries is being carried out, as they are still in operation and extraction on these lands is possible for another 75 years<sup>386</sup>. The tailing ponds at ANOF-2 of the hydraulic fill method are designed for the hydraulic placement of tails after enrichment of apatite-nepheline ore at the factory. Since 1990, ashes and slag waste from Apatitskoy TPP have also been dumped there, by agreement of the parties, which complicates the task of dust suppression, since bitumen emulsion is poorly fixed at the slurry plots, generated due to the discharge of TPP wastes. But due to a reduction in production in 2010, dam was constructed at the tailing pond ANOF-2, by means of which a part of the tailing pond from the side of the Imandra Lake (in area of 538 ha) was taken out of operation. Since 2011, at this site recultivation has been carried out, the result of which should be a decrease by 10% in the total area of possible dusting. At the same time, cooperation with scientific organizations, conducting research in the area of dust suppression, is ongoing<sup>387</sup>.

### *Production process modernization plans for reducing the negative impact on the environment*

The reduction in emissions of acidifying substances in dust and decrease in discharge of organic matters and salts at Apatite, OJSC are the priority environmental projects of the Murmansk region which are in the process of implementation.

The management of Apatite, OJSC has specified measures to prevent dusting, when abnormal wind force arises. Now the company has developed a project for the reconstruction of the tailing pond ANOF-2, increasing the height of the tailing ponds by 20 m. It is envisaged to increase the dam height (from 50 to 70 m), by developing the territory that is already in use (10 km<sup>2</sup>)<sup>388</sup>.

By increasing the height, the range capacity of dust may lengthen too. In order to prevent dust formation from the tailing pond, Apatite, OJSC annually conducts works to fix the dusty surfaces by using a special emulsion YeBK-3, which prevents dusting. However the plant is continuously in operation and there are always areas not covered by the emulsion. Residents believe that dusting of tails may increase after reconstruction. In addition, measures to reduce emissions of air pollutants include the following: underground crushing complexes are to be equipped with gas-handling and dust catching systems and the reduction of pollutant emissions (including carbon dioxide) is to be achieved by means of transition of the heating of households and companies from boiler stations to heat supply from TPP.

In 2012, the company also modernized the water supply main pipes of water intake from the Imandra Lake that led to a decrease in the total water consumption for Apatite, OJSC. In addition, at the Eastern mine the company established a system of water-reducing wells enabling a reduction in the groundwater level in the bedrock and eliminating the pollution of natural groundwater<sup>389</sup>.

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<sup>385</sup> Otchet OAO «FosAgro» po ustoychivomu razvitiyu v 2013 godu [Report of OJSC "FosAgro" on sustainable development for 2013] ([www.phosagro.ru/investors/reports/get/item7040.php](http://www.phosagro.ru/investors/reports/get/item7040.php)).

<sup>386</sup> Ibid.

<sup>387</sup> Coordination Council's decision on industrial and environmental safety of the Murmansk region dated 10.12.2012 No. 9 (<http://safety.gov-murman.ru/opencms/export/sites/safety/komiss/prombezop/docs/9resh101212.pdf>).

<sup>388</sup> <http://www.hibiny.com/news/archive/25713>.

<sup>389</sup> Otchet OAO «FosAgro» po ustoychivomu razvitiyu v 2013 godu [Report of FosAgro, OJSC on sustainable development for 2013] ([www.phosagro.ru/investors/reports/get/item7040.php](http://www.phosagro.ru/investors/reports/get/item7040.php)).

## *Lovozero Mining and Processing Plant, LLC (Lovozersky GOK)*

### *General information*

Lovozersky GOK, LLC (Lovozersky MPP) is located in the center of the Kola Peninsula, in the Lovozersky district. This town-forming enterprise of Revda (population of 7 900 inhabitants, in 2014). Lovozersky GOK, LLC is controlled by Silvinit, OJSC which, in turn, is a subsidiary of Uralkali, OJSC.

The company produces a number of products containing rare minerals, such as loparite concentrate for the production of tantalum, niobium and rare earth metals, as well as titanium, strontium, thorium concentrate, eudialite concentrate, aegirite concentrate, rubidium hydroxide (50% solution), cesium hydroxide deuterated (solution in heavy water), cesium hydroxide (55% solution), cesium in vials and containers, and so on. It is hard to overestimate the significance of production at the Lovozersky MPP, as currently the production of high-tech products is impossible without the use of rare earth metals; they are needed for the production of lasers, LCDs, silicon chips, fiber optics, memory devices, etc. and cover a wide range of areas, such as the nuclear industry, electronics, the oil industry, surgery, optics and science.

The raw material base for Lovozersky GOK, LLC is the Lovozerskoye deposit which has unique reserves and mineral complexity. The ore reserves, available for exploitation through the open-cut method, are estimated at 80 million tons. Ore extraction is carried out by the underground mining method, the ore processing is performed at the plant using the gravitational scheme and upgrading the metal content (concentrate) with electromagnetic separation.

The prospects for increasing the loparite concentrate output are dependent on an increase in the production capacity for its processing. The company is tightly pegged to its only customer, namely Solikamsk Magnesium Plant, OJSC. The actual production capacity is 20-30% of the design parameters.

Currently, the principal direction for Lovozersky GOK, LLC investment program is to change the ore extraction technology to improve performance<sup>390</sup>.

### *Economic aspects*

In publicly available sources there is only information on the financial condition of the company in 2009<sup>391</sup>. The company's revenues in 2009 amounted to 348 286 000 rubles, its outgoings were 126 052 000 rubles. The income tax is transferred to the budget of the Murmansk region.

### *Air emissions*

The atmosphere of the north-eastern foothills of the Khibiny Mountains, where Lovozersky GOK, LLC is situated, is characterized as clean. The company does not have a significant impact on it, and the extensive sparsely populated areas, surrounding this segment of the mountain perimeter, are covered with forest lands and wetlands (at the foot of the mountains) that have a healthy effect on air quality. The impact from other large plants, located in Monchegorsk and Olenegorsk, are neutralized by distance and a mountain range.

### *Discharges into water bodies*

At the processing plant 'Karnasurt' there are two fresh water intakes and six outlets serving the discharge of household, industrial and drainage water. Water reuse is related to the lightening of liquid wastes in ponds and the depositing of sediments in the tailing pond.

At present, the mine water is not treated and is discharged into the Sergevan River which is the main

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<sup>390</sup> Based on websites at <http://www.mineral.ru/Facts/Russia/131/293/index.html>; <http://lovgok.ru>.

<sup>391</sup> <http://www.list-org.com/company/398473>.

tributary of Lovozero Lake which has the highest category of reservoir in terms of fishing stock. In addition, in 2011 in connection with the jump in production (mining) capabilities of the company, an increase of up to 12.042 m<sup>3</sup> was observed in the volume of polluted and discharged untreated wastewater.

The composition of deposit rocks involves villiaumite mineral (NaF). It is easily soluble in water, so in the mine waters an increased content of fluoride ions can be observed, significantly exceeding the permissible limits. Furthermore, the water discharge contains elevated concentrations of manganese, iron, and oil products. The actual daily volume of mine waters on average contains 27 500 m<sup>3</sup>/day, the average hourly inflow – 1 150 m<sup>3</sup>/h, the average monthly inflow - 851600 m<sup>3</sup><sup>392</sup>.

According to hydrochemical observations on the Virma and the Sergevan rivers, in the zone of influence of Lovozersky GOK, two cases of high pollution by molybdenum in the Sergevan River was detected. The total iron content exceeded the permissible level in the majority of samples taken. In 2012, the water quality deteriorated slightly, as compared to 2011, and was classified as class 3, category "b" - "very polluted". As for the Virma River, the main pollutants were metals and organic substances. In 2012-2013, cases of high iron contamination were recorded (50 MAC in 2012 and 30 MAC in 2013). The content of iron, manganese and easily oxidized organic matters above the MAC was found in all samples. In the Virma and Sergevan rivers high concentrations of iron, manganese, molybdenum and organic substances were observed in the low streamflow period (time of low water levels in the river): winter - in March and summer - in August, with a minimum of water dilution. In 2012, the water in the Virma was classified as class 3, category "b" - "very polluted". The polluted waters in the Virma and Sergevan rivers, which feed into the Lovozero Lake, have an impact on its quality. The content of manganese and iron in all samples in 2012 was observed to be above the maximum allowable level in the lake. The lake waters were classified as class 3, category "a" - "polluted"<sup>393</sup>.

### *Industrial wastes*

The main solid technogenic wastes are the current and final tails of the processing plant (OF-1) (Karnasurt) and rocks from tunnel works. The tails contain minerals such as nepheline, sodalite, zeolites, aegerine, feldspar, and rocks from tunnel works at Karnasurt mine are represented mainly by urtites and foyaites.

The strontium contamination of a vast area to the south of Revda can be explained by the influence of Lovozersky GOK, CJSC specializing in the extraction of rare earth metal ores<sup>394</sup>.

The plant has been implementing the partial disposal of mining waste in underground mines, but utilization activities require significant material and labor costs related to transportation, elevation and storage of waste for which there needs to be economic means<sup>395</sup>.

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<sup>392</sup> Tyutin A. A. Analiz usloviy formirovaniya kachestva shakhtnyih vod rudnika Karnasurt v Murmanskoy oblasti / A. A. Tyutin, E. A. Lebedeva // Materialy III yezhegodnyh smotrov-sessiy aspirantov i molodyih uchenyih po otraslyam nauk: v 2 t. T. 1: Tehnicheskie nauki. Vologda, 2009 [Analysis for formation conditions regarding the quality of mine water at Karnasurt mine in Murmansk region / A.A Tyutin, E.A. Lebedeva// Materials of the III annual review sessions of graduate students and young scientists based on the fields of sciences: in 2 volumes, Volume 1: Tehnicheskie nauki. Vologda, 2009] (<http://www.pandia.ru/text/78/451/81855.php>).

<sup>393</sup> Doklady «O sostoyanii i ob okhrane okruzhayushey sredy Murmanskoy oblasti v 2012 godu» [Reports "On the state and protection of the environment of the Murmansk region in 2012"] ([http://mpr.gov-murman.ru/upload/iblock/81d/2012\\_.pdf](http://mpr.gov-murman.ru/upload/iblock/81d/2012_.pdf)), «O sostoyanii i ob okhrane okruzhayushey sredy Murmanskoy oblasti v 2013 godu» ["On the state and protection of the environment of the Murmansk region in 2013"] (<http://mpr.gov-murman.ru/upload/iblock/da1/2013.pdf>).

<sup>394</sup> [http://npa-arctic.iwlearn.org/publications/da\\_res\\_ru/Content/ch4.htm](http://npa-arctic.iwlearn.org/publications/da_res_ru/Content/ch4.htm).

<sup>395</sup> Cadastre of mining and metallurgical industries of the Murmansk region (<http://www.murman.ru/ecology/cadastre>).



## *Production process modernization plans for reducing the negative impact on the environment*

No information on modernization of production is available. The Lovozersky GOK website only states that "modernization is underway, but not as fast as we would like"<sup>396</sup>.

## *Affiliate of SUAL KAZ-SUAL, OJSC (Kandalaksha Aluminium Plant – SUAL)*

### *General information*

The Kandalaksha Aluminium Plant (KAZ)-SUAL is located in Kandalaksha in the south of the Murmansk region. The city's population is 33 500 inhabitants (in 2014). The plant is an enterprise with a complete production cycle in alumina processing and aluminum production of different marks. The main products of KAZ-SUAL are the large-sized aluminum ingot weighing 750 kg, the aluminum rod and cylindrical aluminum bullions. The company is owned by the Siberian-Urals Aluminium Company, OJSC (SUAL, OJSC). This is one of the top ten producers of aluminum in the world. The company's assets in 2007 were merged with the assets of the company Russian Aluminum and Swiss commodity trader Glencore, forming the world's largest aluminum company Russian Aluminum (United Company Rusal).

KAZ is the only aluminum production plant (in the world), located beyond the Polar Circle. The aluminum is produced by the electrolytic decomposition of alumina in Soderberg electrolyzers with self-baking anodes. The Soderberg technology, widely used in Russia, is a source of environmental risks. This form of production also involves high energy consumption<sup>397</sup>.

Up to 1992, the alumina for Kandalaksha Aluminum Plant was mainly delivered from Pikalevo Alumina Plant (Leningrad region). And in recent years, about half of the alumina is imported from Spain.

47% of KAZ output is exported, the rest is sold domestically. On the basic parameters of production KAZ is recognized as the best among all companies with similar equipment in Russia and CIS countries. The high quality of its products was awarded with international prizes. In 2012, 71 200 tons of aluminum were produced. In 2012, the number of employees of the plant was 953 people<sup>398</sup>.

### *Economic aspects*

Information on financial indicators at KAZ-SUAL is not available. There is consolidated financial reporting of the company RUSAL<sup>399</sup>, according to which the revenues of RUSAL for one year decreased by \$1.131 billion, or 10.4%, from \$10.891 billion in 2012 to \$ 9.760 billion in 2013. The company explains the decrease in revenues by a fall in world aluminum prices and a reduction in sales volume. After the publication of the financial report of Norilsk Nickel, it was found that the share in the concern brought RUSAL less profits than expected. After the revision, the loss of RUSAL for 2013 amounted to \$3.322 billion, by \$100 million more than previously reported<sup>400</sup>. The company pays income tax into the budget of Moscow.

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<sup>396</sup> <http://lovgok.ru/about/press-center/27-articles/71-bu-900>.

<sup>397</sup> Yevdokimova G. A. *Harakteristika sovremennogo sostoyaniya pochv v zonakh vozdeystviya metallurgicheskikh predpriyatij Murmanskoy oblasti*. Institut problem promyshlennoy ekologii Severa Kolskogo nauchnogo tsentra Rossiyskoy akademii nauk, 2013 [Characteristics for current state of soils in the zones of influence of metallurgical enterprises of the Murmansk region. Institute of North Industrial Ecology Problems, Kola Scientific Center, Russian Academy of Sciences, 2013].

<sup>398</sup> Based on websites at <http://murmanskstat.gks.ru>; <http://minec.gov-murman.ru>; <http://www.rusal.ru>.

<sup>399</sup> <http://www.rusal.ru/investors/kpi.aspx>.

<sup>400</sup> [http://www.rbc.ru/rbcfreenews/5448d29acbb20f34bc105cfe#\[lenta\\_body\]-\[freenews\]](http://www.rbc.ru/rbcfreenews/5448d29acbb20f34bc105cfe#[lenta_body]-[freenews]).

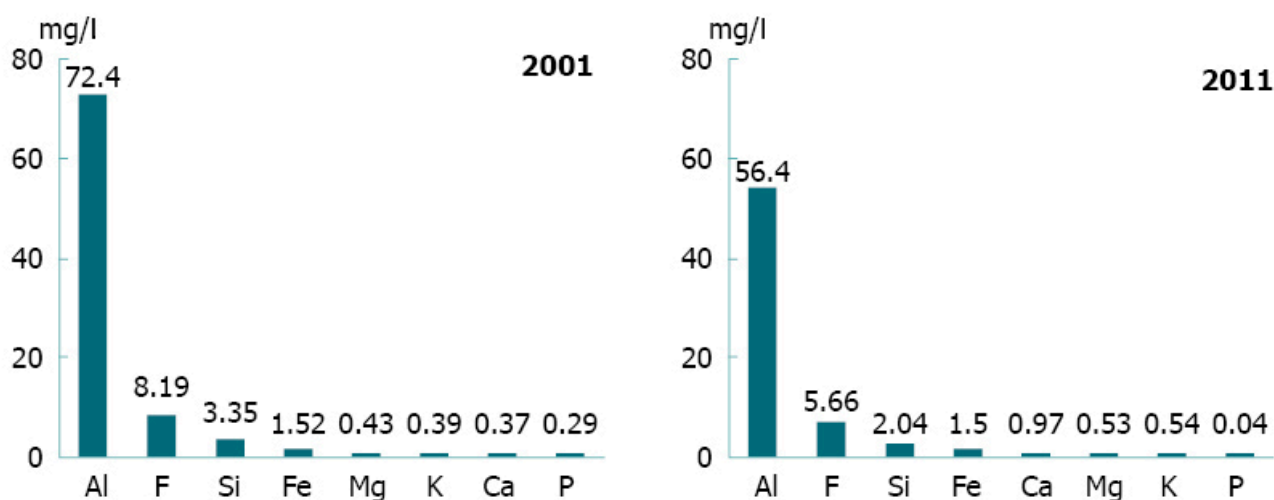
## Air emissions

Despite all efforts at modernization of production, currently Kandalaksha Aluminum Plant is still on the list of companies who are the main sources of air pollution in the Murmansk region. In 2013, gross emissions amounted to 13 070 tons, or about 5% of the total emissions from stationary objects in the region (269 800 tons)<sup>401</sup>. The main toxic substances, emitted by Kandalaksha Aluminum Plant, are hazardous resinous substances resulting in the combustion of anodes and fluorides. The report of the Murmansk Department of Hydrometeorology and Environmental Monitoring (DHEM) for 2012 specified a periodic increase in MAC for benz(a)pyrene in the atmosphere of the town of Kandalaksha when winds blow from the plant.

In 2011, according to the measurements (made by Murmansk DHEM) of overall air condition within the operating zone of KAZ-SUAL, the predominant toxic pollutants were carbon monoxide (1.4 MAC), hydrogen fluoride (1.1 MAC), benz(a)pyrene (2, 9 MAC)<sup>402</sup>.

The aerial emissions of the plant contain a considerable amount of contaminants: hydrogen fluoride, poorly soluble fluorides, resinous substances, polycyclic aromatic hydrocarbons, inorganic dust. In speaking of priority pollutants in air technogenic emissions of the plant, it should be particularly noted that fluorides are classified as highly hazardous substances (II hazard class) and are of greater danger to living organisms (including human beings) than aluminum compounds (IV hazard class)<sup>403</sup>.

Over the past ten years, there has been a reduction in harmful air emissions.



<sup>401</sup> Po materialam dokladov «O sostoyanii i ob okhrane okruzhayushey sredy Murmanskoy oblasti v 2012 godu» [Based on the reports "On the state and protection of the environment of the Murmansk region in 2012"] ([http://mpr.gov-murman.ru/upload/iblock/81d/2012\\_.pdf](http://mpr.gov-murman.ru/upload/iblock/81d/2012_.pdf)), «O sostoyanii i ob okhrane okruzhayushey sredy Murmanskoy oblasti v 2013 godu» ["On the state and protection of the environment of the Murmansk region in 2013"] (<http://mpr.gov-murman.ru/upload/iblock/da1/2013.pdf>).

<sup>402</sup> Doklad «O sostoyanii i ob okhrane okruzhayushey sredy Murmanskoy oblasti v 2012 godu» [Report "On the state and protection of the environment of the Murmansk region in 2012"] ([http://mpr.gov-murman.ru/upload/iblock/81d/2012\\_.pdf](http://mpr.gov-murman.ru/upload/iblock/81d/2012_.pdf)).

<sup>403</sup> Yevdokimova G. A. Harakteristika sovremennogo sostoyaniya pochv v zonah vozdeystviya metallurgicheskikh predpriyatiy Murmanskoy oblasti. Institut problem promyshlennoy ekologii Severa Kolskogo nauchnogo tsentra Rossiyskoy akademii nauk, 2013 [Characteristics for current state of soils in the zones of influence of metallurgical enterprises of the Murmansk region. Institute of North Industrial Ecology Problems, Kola Scientific Center, Russian Academy of Sciences, 2013].

**Fig. 3. Concentration of chemical elements in the snow water in the zone of maximum pollution<sup>404</sup>**

### *Discharges into water bodies*

KAZ-SUAL is located on the northern shore of Kandalaksha Gulf of the White Sea near the estuary part of the Niva River. The water bodies in the area of the company's location are the Niva River and the drainage channel of the Niva HPP-III (hydropower plant -III). In 2012, the waters of the Niva River were classified as class 3, category "a" - "polluted" (in 2011, class 3, category "b" - "very polluted"), in the drainage channel - class 2 ("slightly polluted"). Out of the 15 indicators, tested in the analysis, 5 are polluting ones in the Niva River and 4 in the drainage way, and in both water bodies the mercury content corresponds to critical values<sup>405</sup>.

The company uses a circulating water supply system with a design capacity of 17.5 thousand m<sup>3</sup>/day, which provides a closed cooling cycle for electrolyte separation equipment (including chillers for semicontinuous casting installation) and a compressor.

### *Soil contamination*

The reduction in air emissions of harmful substances had an impact on the state of the surface soil. The main pollutants of soil near KAZ are aluminum (Al) and fluorine (F), compounds containing a different degree of toxicity. In 2011, the gross fluorine content in the soil significantly decreased in comparison with 2001<sup>406</sup>.

**Table 1. Zone of soil pollution by fluorine in 2001 and 2011<sup>407</sup>**

Pollution	2001		2011	
	Distance from KAZ, km	Content F, mg/kg	Distance from KAZ, km	Content F, mg/kg
Maximum	0-2.5	>1200	0-1.5	> 1000
Strong	2.5-13	1200-400	1.5-8.0	1000-400
Moderate	13-20	400-200	8.0-15	400-200
Not available	>20	<200	>15	<200

In connection with a reduction in total pollutants emitted by the plant and a decrease in soil contamination, the highly polluted zone shortened from 2.5 km to 1.5 km from the emission source, the length of zones for strong and moderate pollution decreased by 5 km<sup>408</sup>.

<sup>404</sup> Ibid.

<sup>405</sup> Doklady «O sostoyanii i ob okhrane okruzhayushey sredy Murmanskoy oblasti v 2012 godu» [Reports "On the state and protection of the environment of the Murmansk region in 2012"] ([http://mpr.gov-murman.ru/upload/iblock/81d/2012\\_.pdf](http://mpr.gov-murman.ru/upload/iblock/81d/2012_.pdf)), «O sostoyanii i ob okhrane okruzhayushey sredy Murmanskoy oblasti v 2013 godu» ["On the state and protection of the environment of the Murmansk region in 2013"] (<http://mpr.gov-murman.ru/upload/iblock/da1/2013.pdf>).

<sup>406</sup> Yevdokimova G. A. Harakteristika sovremennogo sostoyaniya pochv v zonah vozdeystviya metallurgicheskikh predpriyatiy Murmanskoy oblasti. Institut problem promyshlennoy ekologii Severa Kolskogo nauchnogo tsentra Rossiyskoy akademii nauk, 2013 [Characteristics for current state of soils in the zones of influence of metallurgical enterprises of the Murmansk region. Institute of North Industrial Ecology Problems, Kola Scientific Center, Russian Academy of Sciences, 2013].

<sup>407</sup> Ibid.

<sup>408</sup> Ibid.

## *Industrial waste*

As a result of production activities, a great number of technogenic solid waste is generated.

In Kandalaksha there is a first hazard class waste storage (deactivated in the 90s), containing 816.2 tons of beryllium<sup>409</sup>. To reduce the negative impact on environment, it is necessary to develop solutions for disposal of the waste.

## *Production process modernization plans for reducing the negative impact on the environment*

To reduce the anthropogenic impact on the environment, the company has been carrying out activities aimed at reducing emissions of harmful substances into the environment. In 2005, the largest dry gas cleaning installation for electrolyzers in Russia and the CIS was introduced, with lateral current lead and self-baking anodes, modern gas purification from hydrogen fluoride by using dry sorption purification. Alumina is used as a sorbent. In addition to new gas treatment facilities, air emissions from KAZ-SUAL fell more than 2 times from the end of 2005. Apart from the improvement in environmental conditions, dry gas cleaning reduces the consumption of the main raw material in electrolytic production<sup>410</sup>.

At the company's alumina storage there is an air aspiration system which captures small particles of alumina (the air cleaning efficiency constitutes 99.8%)<sup>411</sup>. Prior to installing a modern gas purification installation, Kandalaksha Aluminum Plant was a source of air emissions with increased concentrations of pollutants (resinous substances, inorganic dust, hydrogen fluoride, solid fluorides, sulfur dioxide, benz(a)pyrene, naphthalene and carbon oxide). In the process of gas purification primarily Russian equipment is used, e.g., sack filters with pulse regeneration designed and manufactured by SF NIIOGAZ, OJSC jointly with FINGO Engineering, the completion of these works amounted to \$13 million. In the near future, the introduction of a system for automatic alumina feed is planned<sup>412</sup>.

## *Kolskaya GMK, OJSC*

### *General information*

Kola Mining and Metallurgical Company (MMC), OJSC is a subsidiary of MMC Norilsk Nickel, and operates on the basis of production capacity at the Pechenganikel and Severonikel plants. The company is the single mining complex for the extraction of sulfide copper-nickel ores and the production of electrolytic nickel, copper, high-quality nickel powder, cobalt concentrate, precious metals and sulfuric acid. The sole shareholder of Kolskaya GMK, OJSC is GMK Norilsk Nickel, OJSC (MMC Norilsk Nickel).

The objects of Kolskaya GMK (Kola MMC) are located in Monchegorsk (Severonikel Plant) and to the north-west of the Murmansk region in Nikel village and Zapolyarny town ("Pechenganikel" Plant). For these settlements these plants are township-forming enterprises. The number of employees is 9115 people (in 2012).

Information on the energy consumed by the companies of Kolskaya GMK is not available, but it is known that in 2012 all branches of GMK Norilsk Nickel consumed 9 623 906 000 KWh of electricity and 8 025 655 Gcal of heat power<sup>413</sup>.

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<sup>409</sup> The final report "Preparation of regional pre-investment studies in the Western sector of the Russian Arctic, Fifth stage of the services according to Contract No. CS-NPA-Arctic-06/2008 dated 20.08.2008-2010

<sup>410</sup> <http://www.rusbonds.ru/enwsinf.asp?emit=6690&nid=408962>.

<sup>411</sup> <http://www.b-port.com/news/item/33168.html>.

<sup>412</sup> [http://www.htk.edu.ru/prof/predp\\_kaz.html](http://www.htk.edu.ru/prof/predp_kaz.html).

<sup>413</sup> [http://www.nornik.ru/\\_upload/GO\\_s\\_priloz.pdf](http://www.nornik.ru/_upload/GO_s_priloz.pdf).

## *Economic aspects*

Kolskaya GMK forms about a third of the regional budget and about 40% of export in the region<sup>414</sup>. In 2013, the consolidated revenues of GMK Norilsk Nickel amounted to 11.5 billion dollars, 7% less than in 2012. The decline in revenues is explained by low prices for nickel, copper and platinum that were partially compensated by a steady rise in prices for palladium. The net income (excluding non-cash write-downs) reached \$ 2.6 billion, decreasing by 15%, as compared with 2012<sup>415</sup>.

The revenues of Kolskaya GMK for 2013 amounted to \$1.019 billion, or about 12% of revenues for the whole company of Norilsk Nickel. Income tax is allocated to the budget of the Murmansk region<sup>416</sup>.

## *GMK Pechenganikel, OJSC*

### *General information*

GMK Pechenganikel Plant (or Pechenganikel MMC), a territorially separate structural enterprise of Kolskaya GMK, OJSC, is located in the northwest of the Murmansk region, close to the border with Norway, 180 km from Murmansk. The Pechenga mining region, where there are deposits of copper-nickel ores, belongs administratively to the Pechengsky district of Murmansk region. All mining and steel processing shops within Pechenganikel Plant are in Zapolarny (population – 15 400 inhabitants, in 2014) and Nikel village (population – 12 100 inhabitants, in 2014).

It consists of two underground mines, 2 quarries, an ore-dressing plant, a burning department, melting and sulfuric acid shops, as well as production supporting departments.

Mining operations are carried out at the plant using open-cut and underground methods. The plant annually produces about 8 million tons of sulfide copper-nickel ores (mostly, ordinary disseminated ore with a nickel content of 0.5-0.6%). It enriches them and provides metallurgical processing to nickel matte, which is sent for further processing to the Severonikel Plant for the production of nickel, copper, cobalt, precious metals and sulfuric acid<sup>417</sup>.

### *Air emissions*

Air pollution is mainly caused by emissions of sulfur dioxide from the ore-dressing plant in Zapolyarny and the melting shop in Nikel village. Along with the gas, containing sulfur dioxide, there are air emissions of metal-containing dust, polluting the atmosphere with heavy metals, namely nickel (Ni) and copper (Cu). At present, the level of sulfur dioxide emissions in the production area of "Pechenganikel" Plant has been significantly reduced in comparison with the 1980's.

Despite this, a very alarming situation remains due to emissions of harmful substances from the companies of Kola MMC. As compared with 2012, Pechenganikel and Severonikel increased emissions of sulfur dioxide (SO<sub>2</sub>) in 2013. In general, it should be noted that there has been a reduction in air emissions of heavy metals from objects of the "Pechenganikel" Plant as a result of reducing copper emissions from the production site in Nikel village. Against this background, an increase in nickel released into the atmosphere by the production capacity of the melting shop (in Nikel village) was observed.

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<sup>414</sup> Godovoy otchet OAO «GMK «Norilskiy nikel» za 2013 god [Annual report of GMK Norilsk Nickel, OJSC for 2013] (<http://www.nornik.ru/investoram/raskrytie-informaczii/godovyie-otchetyi1>; <http://www.kolagmk.ru>).

<sup>415</sup> <http://www.nornik.ru/assets/files/RUS-FY13-IFRS-PressRelease-Apr7.pdf>.

<sup>416</sup> [http://www.nornik.ru/assets/files/2200-NN-IFRS-Consolidated-FS-2013-Rus-USD-04\\_04\\_2014\\_FINAL.pdf](http://www.nornik.ru/assets/files/2200-NN-IFRS-Consolidated-FS-2013-Rus-USD-04_04_2014_FINAL.pdf).

<sup>417</sup> Godovoy otchet OAO «GMK «Norilskiy nikel» za 2013 god [Annual report of GMK Norilsk Nickel, OJSC for 2013] (<http://www.nornik.ru/investoram/raskrytie-informaczii/godovyie-otchetyi1>; <http://www.kolagmk.ru>).



**Table 2 (based on responses from Kolskaya GMK by the request of Bellona<sup>418</sup>)**

Production site	Ore-dressing plant (Zapolyarny)		Melting shop (Nikel)		«Severonikel» (Monchegorsk)	
	2012	2013	2012	2013	2012	2013
Emissions, thousand tons	2012	2013	2012	2013	2012	2013
Sulphur dioxide	N/A	N/A	63 592	74 978 ↑	33 325	36 617 ↑
Heavy metals	0.693	0.639	190.364	177.887 ↓	768.51	898.3 ↑
including nickel	0.440	0.440	93.999	97.272 ↑	303.5	374.5 ↑
including copper	0.184	0.184	92.204	76.492 ↓	459	523.8 ↑

The official response from Kola MMC does not contain data on sulfur dioxide emissions from the ore-dressing plant in Zapolyarny. In total, in 2013, the companies of Kola MMC in Nickel and Zapolyarny emitted 115 000 tons of sulfur dioxide into the atmosphere<sup>419</sup>. It is possible to determine from this data the approximate amount of SO<sub>2</sub>, emitted as a result of the production process at the site of the ore-dressing plant in Zapolyarny, which comes to 40 thousand tons.

Recently, there has been a significant increase in the number of days, when SO<sub>2</sub> concentrations in the air in the vicinity of Nickel and Zapolyarny reach critical levels. Since the beginning of 2014, very often the Murmansk DHEM has recorded an excess in MAC within the Nickel and Zapolyarny settlements; sulfur dioxide concentrations were several times higher than the maximum permissible limits. For example, on May 13 - 5.7 MAC, in Zapolyarny - 3.4 MAC; on May 22, in Nickel the maximum single concentration of sulfur dioxide reached 4.6 MAC, on May 23 - 3.6 MAC, on May 25 - 4.5 MAC, on May 29 - 8.2 MAC<sup>420</sup>.

However, when Rosprirodnadzor made a routine inspection of Kola MMC in 2010 and 2014, an excess in MAC for sulfur dioxide emissions was not found<sup>421</sup>.

In June 2013, at the request of the Party "Green Alliance - People's Party", an inspection by the state prosecutor was carried out, the aim of which was to check the environmental compliance of Kola MMC in Nickel. The results of the inspection revealed violations (committed by Kola MMC) of the mandatory requirements of the legislation on air protection<sup>422</sup>.

As of today, emissions from the production sites of Pechenganikel Plant significantly exceed the established standards for maximum admissible discharges (MAD). In 2014, Rosprirodnadzor in the Murmansk region issued permission for industrial sites in Nickel and Zapolyarny to carry out production activities on the basis of temporary agreed emissions (TAE). Moreover, the deadline for MAD achievement (2018) was also agreed<sup>423</sup>.

<sup>418</sup> Response from Kolskaya GMK No. 34930-283 dated 11.07.2013 ([http://bellona.ru/filearchive/fil\\_NorNik.pdf](http://bellona.ru/filearchive/fil_NorNik.pdf)); Response from Kolskaya GMK by request of «Bellona» dated 30.07.2014 ([http://bellona.ru/filearchive/fil\\_KGMK\\_2012.pdf](http://bellona.ru/filearchive/fil_KGMK_2012.pdf)).

<sup>419</sup> Otchet OAO «GMK» Noril'skiy nikel» «Novyy vzglyad na strategicheskie priority», 2013 [Report of OJSC "GMK "Norilsk Nickel" «New look at strategic priorities», 2013] ([http://www.nornik.ru/\\_upload/2014/NN\\_AR\\_2013\\_rus\\_EGO.pdf](http://www.nornik.ru/_upload/2014/NN_AR_2013_rus_EGO.pdf)).

<sup>420</sup> [http://www.bellona.ru/articles\\_ru/articles\\_2014/1401890582.93](http://www.bellona.ru/articles_ru/articles_2014/1401890582.93).

<sup>421</sup> [http://bellona.ru/filearchive/fil\\_Rosprirodnadzor.pdf](http://bellona.ru/filearchive/fil_Rosprirodnadzor.pdf).

<sup>422</sup> Response from Environmental Prosecutor's Office in Murmansk dated 27.06.2013 ([http://bellona.ru/files/fil\\_Mitvol.pdf](http://bellona.ru/files/fil_Mitvol.pdf)).

<sup>423</sup> [http://bellona.ru/filearchive/fil\\_Rosprirodnadzor.pdf](http://bellona.ru/filearchive/fil_Rosprirodnadzor.pdf).

**Table 3 (based on responses from Rospirodnadzor in the Murmansk region by the request of Bellona)**

Name of site	Maximum admissible discharges, thousand tons	Temporary agreed emissions, thousand tons	Actual discharges, thousand tons
«Pechenganikel» (Zapolyarny, Nickel)	50 042.2	129 511.8	122 644.2
«Severonikel» (Monchegorsk)	49 018.4	-	41 975.2

### *Discharges into water bodies*

About 11 030 240 m<sup>3</sup> of industrial wastewater annually flows into natural water bodies from the companies of "Pechenganikel". Mechanical cleansing cannot provide complete purification, 405 850 m<sup>3</sup> is discharged into water bodies, without any treatment, the rest is insufficiently treated<sup>424</sup>.

The Kolos-Yoki River, the largest watercourse near Nickel, takes the off-flow from plant and feeds into the Kuetsyarvi Lake, located near the border with Norway. Zapolyarny is located behind the watershed from Nickel and is surrounded by numerous watercourses belonging to the Pechenga River Basin. Hauki-lamp-Yoki River, Bystraya (Fast) River and others are exposed to technogenic impact from the plant. The main pollutants in the rivers are heavy metals, such as copper and nickel compounds. The nickel content reached a level of high pollution in the most polluted waters of the Kolos-Yoki basin, and in five water samples, collected in the autumn-winter period, an extremely high pollution level was found<sup>425</sup>.

### *Soil contamination*

An investigation of soil condition revealed strong contamination of soils with heavy metals: copper content (Cu) at a distance of 3 km from the contamination source exceeded the allowable standard by 61-87 times, and nickel (Ni) - by 97-137 times. With increased distance from the plant, the soil pollution by heavy metals Cu and Ni falls. The average contamination area has a length of 16 km, and a mild contamination zone lies within a radius of 16-30 km from the emission source. The results of studies (1998, 2012) concerning the content of heavy metals Ni and Cu in soil in the vicinity of plant allow the conclusion that the soil contamination in the affected area of gas emissions from this plant has not decreased for the last decade<sup>426</sup>.

### *Industrial waste*

The main waste for nickel extraction and production are overburden rocks, tails from the processing plant and dumped granulated slag. About 1.3 billion tons of overburden rocks, more than 200 million tons of refinement tailings and 45 million tons of slag have been accumulated on industrial waste storage of plant Pechenganikel with an area of 9800 hectares<sup>427</sup>.

<sup>424</sup> Ibid.

<sup>425</sup> Po materialam dokladov «O sostoyanii i ob okhrane okruzhayushey sredy Murmanskoy oblasti v 2012 godu» [Based on the reports "On the state and protection of the environment of the Murmansk region in 2012"] ([http://mpr.gov-murman.ru/upload/iblock/81d/2012\\_.pdf](http://mpr.gov-murman.ru/upload/iblock/81d/2012_.pdf)), «O sostoyanii i ob okhrane okruzhayushey sredy Murmanskoy oblasti v 2013 godu» ["On the state and protection of the environment of the Murmansk region in 2013"] (<http://mpr.gov-murman.ru/upload/iblock/da1/2013.pdf>).

<sup>426</sup> Yevdokimova G. A. Harakteristika sovremennogo sostoyaniya pochv v zonah vozdeystviya metallurgicheskikh predpriyatiy Murmanskoy oblasti. Institut problem promyshlennoy ekologii Severa Kolskogo nauchnogo tsentra Rossiyskoy akademii nauk, 2013. [Characteristics for current state of soils in the zones of influence of metallurgical enterprises of the Murmansk region. Institute of North Industrial Ecology Problems, Kola Scientific Center, Russian Academy of Sciences, 2013].

<sup>427</sup> Cadastre of mining and metallurgical industries of the Murmansk region (<http://www.murman.ru/ecology/cadastre>).

## *Production process modernization plans for reducing the negative impact on the environment*

The company is on the list of environmental "hot spots", drawn up by the Nordic Environment Finance Corporation (NEFCO) and the Arctic Monitoring and Assessment Program (AMAP), and approved in 2003 by Ministers of the Arctic countries. The reduction in SO<sub>2</sub> emissions and wastewater discharges at Pechenganikel Plant in Zapolyarny and Nikel and at Severonikel Plant in Monchegorsk are priority environmental projects of the Murmansk region<sup>428</sup>.

Currently, Kola MMC continues to implement a project for reconstructing the burning department in Zapolyarny town. The commissioning of pelletizing technology will significantly reduce pollutant emissions, primarily sulfur dioxide. In figures, sulfur dioxide emissions from the industrial site in Zapolyarny should be reduced from 37-40 000 tons to about 1 000 tons. As for putting the pelletizing shop into operation, there was a time delay connected to some technical reasons, including problems concerning the installation of equipment supplied by "Keppern" (Germany). After terminating the contracts with the suppliers, Kola MMC continues to set-up the technological process independently and intends to enter the pelletizing installation into operation at the end of 2014 approximately. The reconstruction of the burning department will reduce emissions only in Zapolyarny. The problem is that, after the pelletizing shop, the products are supplied to the melting shop in Nikel. The modernization of melting production has been postponed without date, and "thus, all sulfur remaining as a part of the ore concentrate, will be emitted into atmosphere (as a result of the melting process) in the form of the same sulfur dioxide"<sup>429</sup>. In order to reduce sulfur dioxide emissions, it is necessary to modernize the production process in Nikel. The activities and technical upgrade, carrying out by company for today, are insufficient to actually reduce SO<sub>2</sub> emissions from the production site in Nikel. It is necessary to complete technological modernization of production.

According to the report of "Akvaplan Niva", a recycling water supply was introduced and the station for treatment of mine water from the Severny (Northern) mine was expanded in 2003 with the aim of reducing the discharge of waste water at the plant. Furthermore, the pulp pump station of the tailing pond was also reconstructed, the cooling towers of the recycling water supply system in the melting shop were repaired, untreated water discharge was stopped at the Kotselvaara deposit and ultraviolet disinfection was provided at stations for bio-oxidation of domestic waste water instead of chlorine treatment. As a result of these measures, the volume of wastewater discharges decreased by 46.1%. Nevertheless, the volume of discharges exceeds the maximum allowable levels by individual substances<sup>430</sup>.

The plant has been utilizing only a small part of its industrial waste. In underground mines a mixture of slags (amounting to 75 000 tons/year) and rocks from mine workings (30-40 000 m<sup>3</sup>/year) are used for solid stowing. It is planned to increase the use of slags and tails from the processing plant for solid stowing mixtures. Apparatus for processing slag into material for sand blasters (at a capacity of 50 tons per shift) has been installed. To further reduce the level of environmental pollution it is necessary to decrease the volume of waste generation together with an increase in waste utilization<sup>431</sup>.

## *Severonikel Plant, OJSC*

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[http://www.barentsinfo.fi/beac/docs/Environment\\_Ministers\\_Meeting\\_4\\_5\\_Nov\\_2013\\_Inari\\_HotSpots\\_Assessment\\_Report\\_RUS.pdf](http://www.barentsinfo.fi/beac/docs/Environment_Ministers_Meeting_4_5_Nov_2013_Inari_HotSpots_Assessment_Report_RUS.pdf)

429 [http://www.bellona.ru/articles\\_ru/articles\\_2011/1298317121.5](http://www.bellona.ru/articles_ru/articles_2011/1298317121.5).

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[http://www.barentsinfo.fi/beac/docs/Environment\\_Ministers\\_Meeting\\_4\\_5\\_Nov\\_2013\\_Inari\\_HotSpots\\_Assessment\\_Report\\_RUS.pdf](http://www.barentsinfo.fi/beac/docs/Environment_Ministers_Meeting_4_5_Nov_2013_Inari_HotSpots_Assessment_Report_RUS.pdf)

431 Cadastre of mining and metallurgical industries of the Murmansk region (<http://www.murman.ru/ecology/cadastre>).

### *General information*

Severonikel Plant (or Combine Severonikel) is a structural unit of Kola MMC, OJSC (together with the Pechenganikel Plant). It is located in the central part of the Murmansk region, and is a township-forming enterprise, providing employment for the population in Monchegorsk (the population is 43.4 thousand inhabitants, in 2014).

Severonikel processes nickel matte, supplied by the Pechenganikel Plant and GMK Norilsk Nickel, OJSC (Zapolyany branch), and secondary materials of domestic and foreign suppliers, containing nonferrous and precious metals. The annual capacity of the plant is up to 70 000 tons of nickel. The plant produces nickel electrolyte, nickel carbonyl (powder) and nickel carbonyl (grit), electrolytic copper, precious metal concentrates and so on.

The main shops of the plant are: melting, nickel matte separation, refining and smelting of anode nickel, a copper electrolysis shop, two shops for nickel and nickel carbonyl electrolysis, as well as steel, copper and sulfuric acid<sup>432</sup>.

### *Air emissions*

Severonikel Plant is one of the main sources of environmental pollution in the Murmansk region. The volume of gross emissions from the company in 2013 amounted to 41 900 tons, or 15% of the total emissions from stationary sources in the Murmansk region (269 800 tons)<sup>433</sup>.

In recent years (2012-2013) there has been a negative trend for increasing emissions of harmful substances into the atmosphere. In 2013, emissions of sulfur dioxide increased almost by 10%, as compared with 2012. The emission of heavy metals, such as copper and nickel, significantly grew as well; cases of MAC excess for sulfur dioxide became more frequent in Monchegorsk<sup>434</sup>. Despite the increase in emission of harmful substances, their total volume does not exceed the limits for maximum allowable emissions (see Table. 3).

### *Discharges into water bodies*

The production sites of Severonikel Plant do not comply with the standards for allowable discharges. In 2014, Rosprirodnadzor agreed temporary allowable discharges into water bodies<sup>435</sup>. The entire volume of wastewater (13 436 000 m<sup>3</sup>) in 2013 was discharged without proper treatment.

The composition of wastewater, discharged into water bodies, involves nickel, copper, oil products, suspended substances and toxic flotation reagents<sup>436</sup>. The most polluted water body is the Nyuduay River, in the waters of which in 2013 were recorded 8 cases of extremely high and 18 - high pollution of compounds of copper, nickel, mercury and sulfates. The Moncheozero Lake, a source of drinking water for

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<sup>432</sup> Godovoy otchet OAO «GMK «Norilskiy nikel» za 2013 god [Annual report of GMK Norilsk Nickel, OJSC for 2013] (<http://www.nornik.ru/investoram/raskryitie-informaczii/godovyie-otchetyi1>; <http://www.kolagmk.ru>).

<sup>433</sup> Po materialam dokladov «O sostoyanii i ob okhrane okruzhayushey sredy Murmanskoy oblasti v 2012 godu» [Based on the reports "On the state and protection of the environment of the Murmansk region in 2012"] ([http://mpr.gov-murman.ru/upload/iblock/81d/2012\\_.pdf](http://mpr.gov-murman.ru/upload/iblock/81d/2012_.pdf)), «O sostoyanii i ob okhrane okruzhayushey sredy Murmanskoy oblasti v 2013 godu» ["On the state and protection of the environment of the Murmansk region in 2013"] (<http://mpr.gov-murman.ru/upload/iblock/da1/2013.pdf>).

<sup>434</sup> [http://bellona.ru/articles\\_ru/articles\\_2014/1401890582.93](http://bellona.ru/articles_ru/articles_2014/1401890582.93).

<sup>435</sup> [http://bellona.ru/filearchive/fil\\_Rosprirodnadzor.pdf](http://bellona.ru/filearchive/fil_Rosprirodnadzor.pdf).

<sup>436</sup> Doklad «O sostoyanii i ob okhrane okruzhayushey sredy Murmanskoy oblasti v 2009 godu» [Report "On the state and protection of the environment of the Murmansk region in 2009"] ([http://mpr.gov-murman.ru/upload/iblock/586/1\\_3\\_chast.pdf](http://mpr.gov-murman.ru/upload/iblock/586/1_3_chast.pdf)).

Monchegorsk, is located in the zone of the negative impact of atmospheric emissions from Kola MMC and has an excess in MAC in terms of copper content of 13 times<sup>437</sup>.

### *Soil contamination*

At present, some scientists have noted a decline in soil acidity and the content of copper and nickel in the affected area for air emissions from Severonikel Plant in relation to the levels of the 1980's - early 1990's. But at the same time, a significant reduction in nickel and copper concentration in soil has not been marked.

**Table 4. Heavy metal content in soil, 2009<sup>438</sup>**

Pollution	Distance, km	Heavy metal content, mg/kg	
		Cu	Ni
Strong	0-3	1330-3500	2500-4200
Average	3-25	300-840	590-1460
Weak	25-50	140-200	180-250
N/A (background)	>50	76	56
MAC		100	50

Based on the result of studies, three areas, differing in term of intensity of soil pollution by the given elements have been identified. Strong contamination (17-46 times higher than background content for copper and 44-93 times for nickel) covers a relatively short distance (3km) from the source of contamination. The medium contamination zone extends up to 25 km, and, notably, throughout its length there is a very significant reduction of copper content in the soil - from 11 to 4 times, nickel - from 26 to 10 times, in comparison with background readings. Within the area of weak concentration (45-50 km), the copper content is less than twice that of the background, nickel content is four times greater<sup>439</sup>.

An alarming situation arose in 2013 due to an increase in emissions of nickel and copper, and if the trend continues, there is a real risk of higher soil contamination with heavy metals.

### *Industrial wastes*

The growth and accumulation of technogenic waste leads to an increase in ecological pressures on environment. Each year, the plant generates a huge amount of waste, namely slag generated in the process of ore-thermal electrofusion. The percentage of slag formation is 80% of the total weight of the loaded burden. The dumped slag of steel production primarily consists of silica and iron oxide, with a content of chromium (Cr) impurities - 0.4%, nickel (Ni) - 0,1%, copper (Cu) - 0.2% and cobalt (Co) - 0.05%. A large amount of technical water assists in the transformation of technogenic sediments and migration of contaminants from the main section of the dump into the environment. The increase in intensity of heavy metal migration creates an increase in acidity of infiltration water due to severe air

<sup>437</sup> Doklad «O sostoyanii i ob okhrane okruzhayushey sredy Murmanskoy oblasti v 2013 godu» [Report "On the state and protection of the environment of the Murmansk region in 2013"] (<http://mpr.gov-murman.ru/upload/iblock/da1/2013.pdf>).

<sup>438</sup> Yevdokimova G. A. Harakteristika sovremennogo sostoyaniya pochv v zonah vozdeystviya metallurgicheskikh predpriyatij Murmanskoy oblasti. Institut problem promyshlennoy ekologii Severa Kolskogo nauchnogo tsentra Rossiyskoy akademii nauk, 2013 [Characteristics for current state of soils in the zones of influence of metallurgical enterprises of the Murmansk region. Institute of North Industrial Ecology Problems, Kola Scientific Center, Russian Academy of Sciences, 2013].

<sup>439</sup> Ibid.



pollution by sulfur dioxide<sup>440</sup>. The washing-out of contaminants and their migration into the environment is a serious environmental problem.

### *Production process modernization plans for reducing the negative impact on the environment*

In order to reduce the negative impact of nickel production on the ecosystem, the company has been implementing a project for salt outflow utilization. In 2013, works are also carried out to clean the technological settlers at the site in Monchegorsk<sup>441</sup>.

The new strategy of GMK Norilsk Nickel is aimed at neutralizing the negative impact of nickel production on the rivers and lakes in the areas of industrial activity of Kola MMC. After successful implementation of project, the sodium chloride and boron emissions will be nullified, and sodium sulphate emissions will be decreased nearly by 4 times<sup>442</sup>.

According to the new strategy for the development of Norilsk Nickel, Severonikel will be developed as a refining center for all companies. To accomplish this, the plant started replacing the existing nickel production with modern electro-extraction technology. In addition, the company has been developing cobalt production as well.

## Conclusions

The analysis of the environmental situation has shown that the Russian part of the Barents region, as a whole, is characterized by a high level of technogenic impact. A high anthropogenic load in combination with the vulnerability of ecosystems in the northern latitude has a strong negative impact on the environment. The form of pollution and its scale depend on the composition of raw materials used in production, the technological process and the environmental compliance on the part of the company.

The industry of the European North of the Russian Federation was developed in the Soviet era, and most industrial companies, operating in the region today, typically use obsolete technologies and worn-out equipment.

The use of worn-out equipment not only yields economic losses, but also does irreversible harm to the environment. The reconstruction of individual parts in the technological chain and the technical upgrades performed by companies, do not achieve a significant reduction in the effects on the environment. The modernization level of the production process and extent of application in relation to the advanced technologies at industrial enterprises in the Russian part of the Barents region remains very low.

Insufficient measures are taken to solve the problems of eliminating the accumulated environmental damage and restoring the areas negatively affected.

There is a widespread practice of environmental non-compliance on the part of companies. In recent years, some companies have increased the emissions and discharges of hazardous substances, reporting at the same time that they have spent significant resources on environmental protection. Based on the results of

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<sup>440</sup> Parshina M. V. Zashchita prirodnoy sredy na osnove ratsionalnoy tehnologii skladirovaniya othodov Kolskoy GMK [Protection of the environment on the basis of rational technology for waste storage from Kolskoya GMK]. SPb, 2006.

<sup>441</sup> Otchet OAO «GMK» Norilskiy nikel» «Novyy vzglyad na strategicheskie priority», 2013 [Report of GMK Norilsk Nickel, OJSC «New look at strategic priorities», 2013]. ([http://www.nornik.ru/\\_upload/2014/NN\\_AR\\_2013\\_rus\\_EGO.pdf](http://www.nornik.ru/_upload/2014/NN_AR_2013_rus_EGO.pdf)).

<sup>442</sup> <http://www.interros.ru/projects/pages/nornikel-review>.

inspections of companies made by Rosprirodnadzor, numerous violations of environmental laws by industrial companies were found. Nevertheless, many environmental violations go unpunished.

It is necessary to green up the industry, in other words - to create conditions, under which ecologically clean production would eventually become economically sound.

The disclosure of environmental information depends on companies' openness and willingness to provide data on anthropogenic impact on the environment. The analysis of companies' annual and non-financial reports and information, posted on corporate websites, does not give a complete picture of their impact on the environment.





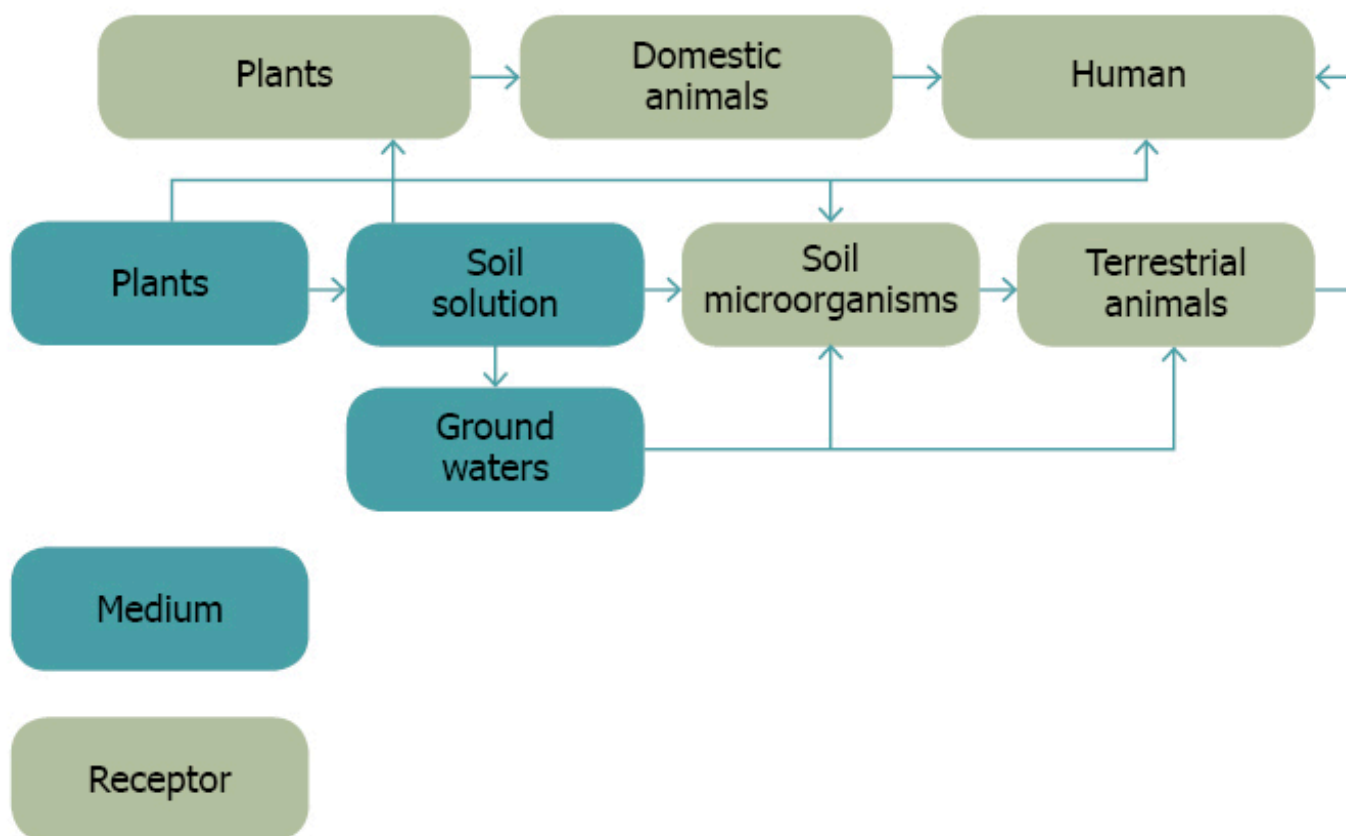
**The negative effect  
of industrial plants  
on the environment  
and human health**

Photo by Sergey Yeliseev/flickr.com



In science there is the concept of the "biogeochemical chain" which describes the migration of chemical elements, present in the atmosphere, hydrosphere and soil, to plants, animals, and on to the end link in the chain – the human being. An important feature of the movement of chemical elements, from an environmental standpoint, is the increase in their concentration in end links of the food chain<sup>443</sup>.

**A simplified scheme of the biogeochemical food chain in terrestrial ecosystems<sup>444</sup>**



The degree of pollution of air, water bodies and soil by chemical elements is an indicator of adverse effects on public health. The pollution level is determined by a combination of factors: volume of production, raw materials consumed, technological production processes, as well as environmental activities undertaken by industrial companies.

Companies associated with the industrial sector are one of the major sources of air, hydrosphere, and soil pollution and have a negative impact on human health and the environment.

<sup>443</sup> <http://dic.academic.ru/dic.nsf/ecolog/5661/%D0%9F%D0%98%D0%A9%D0%95%D0%92%D0%90%D0%AF>.

<sup>444</sup> Doklad ob'edineniya «Bellona» «Gorno-metallurgicheskaya kompaniya «Norilskiy nikel» (vliyanie na okruzhayuschuyu sredu i zdorove lyudey)», 2010 [Report of the "Bellona" Foundation "Mining and Metallurgical Company" Norilsk Nickel "(impact on environment and human health)", 2010]. ([http://bellona.ru/filearchive/fil\\_nikel-report-bellona-2010-ru.pdf](http://bellona.ru/filearchive/fil_nikel-report-bellona-2010-ru.pdf)).

## Atmospheric air pollution

Aerogenic pollution is one of the main factors of anthropogenic impact on human health. The World Health Organization (WHO) has recognized the risk of air pollution as the main negative factor affecting human health<sup>445</sup>. Experts from the World Bank estimate the contribution of this factor to the mortality of the population of the Russian Federation at about 1.2% of total mortality, corresponding to 24 000 additional deaths per year<sup>446</sup>. WHO's European Regional Bureau quotes the following data: 37 000 additional deaths per year as a result of air pollution. There are much higher expert assessments concerning the impact of this risk factor, namely 17.5% of the total mortality of the population<sup>447</sup>.

Emissions from industrial enterprises play a significant role in air pollution. A large amount of harmful emissions into the atmosphere is the responsibility of companies in the mining industry, ferrous and non-ferrous metallurgy, and chemical production.

The main pollutants are carbon oxide, nitrogen oxides, chlorine compounds, sulphurous anhydride (sulfur dioxide), hydrogen sulfide and carbon disulfide and fluorine compounds. These substances enter the body mainly through the respiratory system, so air pollution primarily causes such conditions as injury of upper air passages, heart failure, bronchitis, asthma, pneumonia, heart trouble and strokes. The structure of the disease depends on the chemical composition of emissions and the sectoral affiliation of the company.

## Pollution of the hydrosphere

The condition of water bodies and water quality has a great impact on human health. Untreated or inadequately treated industrial wastewaters are a major contributor to the negative impact on environment and human health. Over a quarter of the total polluted wastewater in Russia is discharged by industrial companies. The wash-off from industrial sites has a complex chemical composition. Thus, the average concentration of suspended particles from sites, belonging to metallurgical plants, mining and processing plants, construction companies, contain 6.4 g/l of suspension. In wash-off of ash dumps from TPP, large woodworking and pulp-and-paper mills the content of volatile phenols is 25-45 mg/l, and non-volatile - 250-300 mg/l<sup>448</sup>. Oil spills cause great damage to aquatic ecosystems. As a result of water pollution they degrade and the ecosystems are disrupted. The concentration of pollutants in surface and ground waters has a negative biological effect on humans, in particular, causing general toxic, carcinogenic, and allergic effects.

## Soil contamination

The soil, being an integral part of the environment, has a direct impact on human health. The chemical elements from soil partially migrate into plants, and from plants by means of food they penetrate into animals and humans.

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<sup>445</sup> [www.bbc.co.uk/news/health-26730178](http://www.bbc.co.uk/news/health-26730178).

<sup>446</sup> Rano umirat. Problemyi vysokogo urovnya zaboлеваemosti i prezhdevremennoy smertnosti ot neinfektsionnyih zabolevaniy i travm v Rossiyskoy Federatsii i puti ih resheniya [Too young to die. High levels of morbidity and premature mortality from non-communicable diseases and injuries in the Russian Federation and ways to address them]. M., 2005 ([http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2009/05/25/000333037\\_20090525040455/Rendered/PDF/323770SR0RUSSI00Box338915B00PUBLIC0.pdf](http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2009/05/25/000333037_20090525040455/Rendered/PDF/323770SR0RUSSI00Box338915B00PUBLIC0.pdf)).

<sup>447</sup> Rahmanin Yu. A., Novikov S. M., Ivanov S. I. Sovremennyye nauchnyye problemy sovershenstvovaniya metodologii otsenki riska zdorovya naseleniya [Modern scientific problems for improving the methodology for assessing the risks of public health]// Gigiena i sanitariya, 2005 No.2.

<sup>448</sup> <http://www.bstpress.ru/article.asp?issue=842&article=1>.



The main industrial sources of soil pollution in our country are the companies in the metallurgical complex, providing 27.3% of pollution, the energy sector - 21.1% and the petrochemical complex - 19.8%<sup>449</sup>. Soil contamination by industrial waste and chemicals can cause the deterioration of human health and many diseases.

This section provides an overview of the impact of the production activities of industrial companies, located on the territory of the Russian part of the Barents Region, on human health. Given the limited information on impact of industrial emissions and discharges made by various companies, the information on negative effects on human health is provided based on sectoral attributes.

### *Pulp and paper production (PPP)*

PPI emissions pose a particular danger to public health due to the presence of complex pollutants, such as sulfur dioxide, hydrogen sulfide, mercaptans, dimethyl disulfide, sulphurous anhydride<sup>450</sup>.

The main pollutant source of wastewater is cellulose production which is based on sulfate and sulfite wood cooking, as well as bleaching of semi-finished product with a mixture of chlorine-containing substances. The wastewater of pulp-and-paper plants contain harmful substances such as sulfates, chlorides, oil products, phenols, formaldehyde, dimethyl disulfide, turpentine<sup>451</sup>.

In urban areas, where the pulp and paper companies are located, there is a proven relationship between the air pollution level and the level of general illness amongst children. An analysis of various indicators of the health of citizens residing near pulp-and-paper plants, including Koryazhma, Novodvinsk, Kondopoga and Segezha shows that in these polluted towns the total morbidity rate of pre-school children is 1.3 - 2 times higher in comparison with benchmarks, and the number of sickly children is 2 times higher<sup>452</sup>.

These studies testify that the population of Segezhsy and Pitkyarantsky districts of Karelia (where Segezha PPM, Kondopoga, OJSC and Pitkyaranta pulp mill, OJSC are located), the most frequent case is pathology of upper respiratory passage, in particular chronic tonsillitis and vascular heart diseases. A significant reduction (18.3%) in emissions from Kondopoga, OJSC in 2006, as compared to 2005, had a positive impact on indicators for infantile and adolescent morbidity in Kondopozhsky district. Data on overall morbidity for children and adolescents was, respectively, 2.0 and 1.7 times lower than the republic-wide level. The reduction in emissions occurred due to a decline in the amount of sulfur dioxide (by 24.9%) and carbon oxide (by 14.7%), as a result of the company's phased transition from a coal-fired boiler to natural gas. In 2003, the overall infantile morbidity level in Kondopozhsky district was one and half times higher than in 2006. Then sulfur dioxide emissions exceeded the indicators by 40.8%, as compared to 2006, and emissions of solid substances - 31.3%<sup>453</sup>.

Monitoring of the health of residents in the vicinity of the pulp-and-paper companies (Novodvinsk, Koryazhma and Arkhangelsk) showed elevated levels of immune system defects in comparison with the regional average level. 50% of children have been found to have a shortage of immunoglobulin A that leads to more rapid penetration of infection into body. At the same time, increased concentrations of

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<sup>449</sup> <http://ecology-portal.ru/publ/ekologiya-cheloveka/502552-vliyanie-na-organizm-cheloveka-faktorov-litosfery.html>.

<sup>450</sup> [http://science.viniti.ru/index.php?option=com\\_content&task=view&Itemid=139&Section=&id=316&id\\_art=V000937](http://science.viniti.ru/index.php?option=com_content&task=view&Itemid=139&Section=&id=316&id_art=V000937).

<sup>451</sup> Ibid.

<sup>452</sup> Ibid.

<sup>453</sup> Masyuk V. S. Sostoyanie immunnoy sistemy detskogo naseleniya Karelii kak biomarker vliyaniya okruzhayushey sredy [State of immune system for child population of Karelia as a biomarker of environmental impact]: Avtoref. dis. ... kand. med. nauk. Petrozavodsk, 2003.

immunoglobulin E were observed in children, that can lead to the allergies underlying asthma, bronchitis and urticaria<sup>454</sup>.

The Pulp and Paper Mill "Mondi Syktyvkar Forest Industry Complex" (Mondi SFIC, OJSC) is one of the major industrial polluters of Syktyvkar, Ezhvinsky district and Zelenets, Koytybozh, Parcheg villages in the Komi Republic. Despite the fact that the measurements of pollutant concentrations did not exceed the established limits, throughout 2012 the inhabitants of these settlements complained of harsh, foul odors brought by winds from the plant. They caused headache, exacerbation of respiratory diseases and allergic reactions, such as diathesis, edema, asthmatic attacks. A recent study of the Komi Republic on the impact of the northern industrial hub on health condition of residents in Ezhvy, where one of the main polluters is Mondi SFIC, OJSC, revealed a high risk of emerging pathologies of the upper respiratory passages, congenital malformations and neoplasia in children and adolescents<sup>455</sup>.

A particular danger to public health consists in chloroorganics sewage from PPP. The experimental evaluation of water with real concentrations of organochlorine substances, sampled from drinking water of Priozersk and Pitkyaranta (Karelia), revealed the presence not only of general toxic impacts, but also distant biological effects: reducing the osmotic resistance of spermatozoids, increasing the number of their abnormal forms, and so on. The analysis of the mortality for these two cities for 26 years showed a significant increase, as compared with control, in such causes of death as diseases related to the digestive and urogenital system, as well as malignant neoplasms. Almost all diseases of the digestive and urinary systems have high coefficients of correlation with the level of organic pollution of water and content of organochlorine compounds<sup>456</sup>.

### *Mining and smelting production*

The metallurgical industry occupies one of the leading positions among industries producing air emissions. When extracting metals, raw material with a comparatively low content of useful components is frequently used. In the process of concentration and smelting a huge amount of ore is used, which, in its turn, generates large amounts of waste gases from unused components<sup>457</sup>.

The discharge of untreated sewage into water bodies by mining, processing and metallurgical companies leads to pollution of surface waters with heavy metals (copper, nickel, cobalt), sulfates, fluorides, manganese, organic substances, ammonium nitrogen<sup>458</sup>.

The content of heavy metals in the soil is an indicator of environmental contamination. Joining the biochemical chain, heavy metals are absorbed by plants and living organisms, and pose a potential threat to public health.

### *Aluminum production*

Fluorine compounds, formed in the process of aluminum production, pose a significant danger to human health. Due to good solubility, most fluorine compounds with technogenic origin are highly mobile in an aquatic environment, posing a real threat to drinking water sources. The perennial fluorine pollution of surface waters, used for water supply in Nadvoitsy village, by the Nadvoitsky aluminum plant in Karelia, has led to massive fluorosis disease among villagers. The most negative impact of fluorine pollution has been on the health of children.

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<sup>454</sup> <http://www.ecfor.ru/pdf.php?id=books/revich/05>.

<sup>455</sup> <http://komi-nao.ru/komi/syktyvkar/novosti/13096-v-komi-predkrisnaya-ekologicheskaya-situatsiya>.

<sup>456</sup> [http://science.viniti.ru/index.php?option=com\\_content&task=view&Itemid=139&Section=&id=316&id\\_art=V000937](http://science.viniti.ru/index.php?option=com_content&task=view&Itemid=139&Section=&id=316&id_art=V000937).

<sup>457</sup> Bolshina E. P. Ekologiya metallurgicheskogo proizvodstva [Ecology of metallurgical production]. Novotroitsk, 2012.

<sup>458</sup> [http://npa-arctic.iwlearn.org/Documents/da\\_full/section\\_4.5.pdf](http://npa-arctic.iwlearn.org/Documents/da_full/section_4.5.pdf).

Fluoride compounds can penetrate bones and lead to changes in the musculoskeletal system. They replace active ion and phosphorus in bone formation and change the bone tissue. This, in its turn, increases the rate of bone dysplasias. In Nadvoitsy village orthopedic pathology, identified by experts of the G.I. Turner Research Institute of Children's Orthopedic Institute (St. Petersburg), was found in 70% of children surveyed, which is 3.8 times higher than the average rate of such conditions<sup>459</sup>. However, in 2006, according to E. M. Kuzmina, doctor of medical sciences (M. D.), the number of fluorosis cases in children at Nadvoitsy fell. The structure of the spread of disease was as follows: in the age group 26-41 years - 87% diseased, 13-14 years - 60%, 9-11 years - 23%, 7-8 years - 17%, 6 years - 1.9%. The reduction in morbidity level occurred owing to a reduction in the concentration of fluoride in drinking water, as a result of the termination of fluorinated drain water discharge into the Uzkaya Salma Lake, a source of drinking water supply for Nadvoitsy village<sup>460</sup>.

### *Copper-nickel production*

Copper-nickel production is concentrated in Murmansk region in such towns, as Zapolyarny, Monchegorsk and the settlement Nikel. The production process is characterized by a large amount of sulfur dioxide (SO<sub>2</sub>) emissions. In addition to sulfur dioxide, in the production activities of Kola MMC a variety of heavy metals, such as nickel (Ni), copper (Cu), cobalt (Co), and arsenic (As), penetrate into the environment. The main heavy metal pollution takes place due to nickel and copper.

High concentrations of sulfur dioxide and heavy metals adversely affect the health of people residing in close proximity to Pechenganikel and Severonikel. The high percentage and frequency of respiratory diseases is caused by emissions and high concentrations of sulfur dioxide in the air. The results of surveys, conducted in Monchegorsk, where the capacities of Severonikel plant are situated, revealed a correlation between the number of respiratory diseases and the level of emissions and concentrations of sulfur dioxide in the air<sup>461</sup>.

B.A. Revich in his studies concludes that an increase in SO<sub>2</sub> concentration in ambient air by 10 mcg/m<sup>3</sup> may increase the mortality from respiratory and cardiovascular system diseases by 0.9%<sup>462</sup>.

Recently, there has been an increase in the number of days when the measurement stations of Murmansk DHEM have recorded a significant excess in MAC for sulfur dioxide near the Kola MMC plants (Nikel, Zapolyarny)<sup>463</sup>.

**The table is compiled on the basis of FSBI Murmansk DHEM: the number of days, exceeding MAC for sulphur dioxide; exceedance range is given in brackets**

#### **MAC for SO<sub>2</sub>**

<b>2014</b>	<b>Zapolyarny</b>	<b>Nikel</b>	<b>Monchegorsk</b>
January	15 (1.2-4.2)	5 (1.2-4.8)	0
February	11 (1.3-6.8)	2 (1.3-2.1)	0

<sup>459</sup> <http://www.ecfor.ru/pdf.php?id=books/revich/05>.

<sup>460</sup> [http://www.yabloko.ru/books/eco\\_reg/book\\_Kareliya.pdf](http://www.yabloko.ru/books/eco_reg/book_Kareliya.pdf).

<sup>461</sup> Revich B. A. Zagryaznenie okruzhayushey sredy himicheskimi veschestvami i ekologicheski obuslovlennyye izmeneniya sostoyaniya zdorovya naseleniya v gorodah Rossii [Environmental pollution by chemicals and environmentally-caused changes in the health status of the population in the cities of Russia] ([http://www.ecfor.ru/pdf.php?id=books/revich02/gor\\_t](http://www.ecfor.ru/pdf.php?id=books/revich02/gor_t)).

<sup>462</sup> Ibid.

<sup>463</sup> [http://www.kolgimet.ru/index.php?option=com\\_content&view=article&id=54&Itemid=239](http://www.kolgimet.ru/index.php?option=com_content&view=article&id=54&Itemid=239).

March	9 (1.4-3.0)	6 (1.2-4.0)	6 (1.2-2.0)
April	9 (1.1-6.1)	4 (1.3-4.5)	5 (1.2-3.2)
May	7 (1.3-6.8)	15 (1.1-8.2)	5 (1.2-3.1)
June	2 (1.8-2.0)	17 (1.6-7.1)	0
July	7 (1.4-4.8)	15 (1.3-5.5)	0
August	9 (1.3-4.8)	17 (1.2-7.0)	1 (2.8)
September	8 (1.0-4.0)	6 (1.2-6.2)	0
October	6 (1.3-7.3)	6 (1.3-8.3)	0

The official data of Kola MMC also confirms an increase in sulfur dioxide emissions by melting shops in Nickel in 2013 (74 978 tons), as compared with 2012 (63 602 tons)<sup>464</sup>. A 15% increase in sulfur dioxide emissions in Nickel and an increase in SO<sub>2</sub> emissions by 10% in Monchegorsk, as well as high concentrations of this substance in the air, can lead to serious consequences both for the environment, and for human health.

Environmental pollution by heavy metals is also dangerous for human health. According to the World Health Organization classification, nickel (Ni) is recognized as an ecotoxicant and is a dangerous environmental pollutant. Nickel compounds are also carcinogenic. Sulfate and nickel chloride cause skin and respiratory passage diseases, injury to nose blennosis, ulceration and destruction of the nasal interseptum. The extremely active form of these compounds is aerosols, tiny particles of nickel salts in the air<sup>465</sup>. As a result of nickel electrolysis, sulfate and nickel chloride aerosols are emitted; moreover, aerosols are formed in the air as a consequence of the between oxides and sulphides, contained in the dust, and sulfuric acid<sup>466</sup>. These studies, carried out in due time in Monchegorsk, clearly showed that the people, working at the plant, have a disease incidence of malignant neoplasms three times higher than other inhabitants of Monchegorsk<sup>467</sup>.

In connection with recognition of the high toxicity of emissions from copper-nickel production in Monchegorsk, a number of oncologic and epidemiological studies were conducted. The studies have shown that among the workers in hydrometallurgical and pyrometallurgical production the mortality level from malignant neoplasms of all focalizations is significantly higher than among administrative personnel<sup>468</sup>.

In 2013, Severonikel, in addition to increasing sulfur emissions, increased heavy metal emissions, namely Ni – up to 374.5 tons and Cu – up to 523 tons, as compared with 2012, when heavy metal emissions from the production site in Monchegorsk were, respectively, 303.5 tons and 459 tons. A significant reduction in

<sup>464</sup> [http://www.bellona.ru/articles\\_ru/articles\\_2014/1408017233.89](http://www.bellona.ru/articles_ru/articles_2014/1408017233.89).

<sup>465</sup> Sidorenko G. I., Itskova A. I. Nickel [Nickel]. M.: Meditsina, 1980.

<sup>466</sup> <http://www.lapland-nature.info/ru/3.html>.

<sup>467</sup> Posledstviya zagryazneniya prirodnoy sredy. Byulleteni Tsentra Gossanepidnadzora v Murmanskoy oblasti za 1980-2000 godyi [Consequences of environmental pollution. Bulletins of the Centre of Sanitary Inspection in Murmansk region for 1980-2000 years] (<http://www.lapland-nature.info/ru/5.html>).

<sup>468</sup> Nibur E., Tomassen I., Chaschin V., Odland Y. Yu. Otsenka professionalnoy vrednosti metallov [Evaluation of occupational hazard of metals] Barents Newsletter on Occup Health and Safety 2006; 9:12-16 ([http://www.ttl.fi/en/publications/electronic\\_journals/barents\\_newsletter/pages/default.aspx](http://www.ttl.fi/en/publications/electronic_journals/barents_newsletter/pages/default.aspx)).

emissions, as a result of copper production capacities of melting shop in Nikel in 2013 (76.492 tons), as compared with 2012 (92.204 tons), was accompanied by the increased emissions of other toxic metals - nickel from 93.999 tons (2012) to 97.272 tons (2013)<sup>469</sup>.

The increase in toxic emissions increases anthropogenic pressure on the environment and has a negative impact on human health.

The wastewaters of copper-nickel production have a negative impact on the condition of water bodies. The degree of this influence appears to be dependent on the amount of inflowing contaminants and the proximity of the water reservoir to sources of emissions and discharges. The problem for toxification of water reservoirs with heavy metals arises, even when the concentration of heavy metals in the water does not exceed the MAC.

In Monchegorsk it was revealed that the drinking waters contained the highest concentration of nickel (Ni), but the renal tissue of human are accumulated in the greatest number of cadmium (Cd) (50 times as compared with control data). For the city, where the drinking water contains elevated concentrations of a group of metals (Ni, Cu, Cd, Pb and other elements), it is typical to have an increased rate of human morbidity (neoplasms, urinary diseases and cholelithiasis, glomerulonephritis) as compared with data of other cities in this region<sup>470</sup>. Despite the fact that water quality and content of toxic elements stay within requirements of standards (MAC, SanPin) for drinking waters, scientists warn about the chronic action of low doses of metals, contained in drinking water, that leads to an accumulation of toxic substances in the body and causes the development of various diseases, including cancer morbidity<sup>471</sup>.

The ecological and toxicological study concerning agricultural soils near Nikel village revealed a significant excess of MAC for nickel, copper and arsenic<sup>472</sup>. The analysis for content of mobile forms of copper and nickel, which makes these elements more susceptible to absorptions by plants, also points to an excess of MAC values.

### *Ferrous metallurgy: the Kovdorsky GOK, Olkon and Karelian Pellet mining companies*

The specific pollutants in wastewater from Kovdorsky GOK are molybdenum, manganese, phosphates, sulfates, hydrocarbons and suspended substances. The most polluted water body is the Mozhel River, a tributary of the Kovdora River. In all selected samples from the Mozhel River the concentration of phosphates, manganese, molybdenum, sodium was higher than the maximum permissible. The maximum permissible concentration for copper and molybdenum was also recorded in all samples, taken from the Kovdora River<sup>473</sup>.

The water bodies of Kolozero and Kola are affected by the negative impact of polluted wastewater from

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<sup>469</sup> [http://www.bellona.ru/articles\\_ru/articles\\_2014/1408017233.89](http://www.bellona.ru/articles_ru/articles_2014/1408017233.89).

<sup>470</sup> Moiseenko T. I., Gashkina N. A., Sharov A. N. Vliyaniye gornorudnyh proizvodstv na kachestvo vod i zdorovye naseleniya [Influence of mining production on water quality and public health]. Tezisy dokladov na konferentsiyah i seminarah po nauchnym napravleniyam Programmy «Fundamentalnyie nauki – meditsine», 2010 [Thesis of reports from conferences and seminars on scientific directions of the program "Basic Sciences - Medicine", 2010] (<http://www.ras.ru/SciForMed/Msg.aspx?id=50>).

<sup>471</sup> Ibid.

<sup>472</sup> Ekologo-toksikologicheskoe issledovanie zemel selskohozyaystvennogo naznacheniya na uchastke Kuets-Yarvi v rayone pgt Nikel [Ecological and toxicological study of agricultural land in the area Kuets-Yarvi near Nickel town]. FGBU Gosudarstvennaya stantsiya Agrohimicheskoy sluzhby «Murmanskaya» [FGBU State Agrochemical Service Station "Murmansk"], 2012.

<sup>473</sup> Doklad o sostoyanii i ob ohrane okruzhayushey sredy Murmanskoy oblasti v 2013 godu [Report on state and environmental protection of the Murmansk region in 2013] (<http://gov-murman.ru/envcond/2013.pdf>).



Olkon. The copper content in Kolozero Lake exceeded the permissible concentration in all samples, and in average for the year reached 6 MAC. The copper content in the source of the Kola River exceeded the maximum allowable limit in all samples and varied in range from 2 to 7 MAC<sup>474</sup>.

Karelian Pellet, OJSC plays a negative role in the pollution of water bodies through nitrate, manganese, nickel, magnesium, potassium and calcium. Heavy metals have a cumulative effect, that is, tend to accumulate in the body and "activate" above a certain concentration. For example, in the case of chronic intoxication with copper, functional disorders of the nervous system arise and liver and kidney functions are disrupted. Manganese has a tendency to be accumulated and poorly excreted from the body. The presence of manganese in the body interferes with the elaboration of neurotransmitters, namely serotonin and dopamine, responsible for nerve impulses. Molybdenum at high concentrations in food can cause gastrointestinal diseases and endomic podagra (diseases of the joints)<sup>475</sup>.

### *The mining industry*

The composition of coal industry emissions includes inorganic dust ( $\text{SiO}_2 < 20\%$ ,  $F = 2.5$ ;  $\text{SiO}_2 < 20\%$ ,  $F = 3$ ), sulphurous anhydride, nitrogen dioxide, carbon monoxide, methane, hydrocarbons, oxides of manganese, ammonia etc<sup>476</sup>. In the Russian part of the Barents Region, the mining industry is concentrated in the Komi Republic. Vorkuta is a leader in the country in relation to air pollutant emissions (33.7 thousand tons/year) and emissions of hydrocarbons and volatile organic compounds<sup>477</sup>.

Coal mining companies in the Republic of Komi have a very negative impact on the environment and human health. The presence of coal suspensions in the air and harmful substances causes serious diseases, such as bronchial asthma, chronic bronchitis, and anemia. Vorkuta is in the top five cities with the highest level of respiratory diseases<sup>478</sup>.

Oncopathology in the republic is indicative and reflects the level of the negative impact of industrial emissions. These observations demonstrate the growth of primary morbidity with malignant neoplasms, in average, by 33% between 2000 (229.6 cases per 100 000 people) - 2009 (305.5 cases). The greatest increase in the incidence of malignant neoplasms was observed during this period in Syktyvkar (311.5) and Ukhta (312.9)<sup>479</sup>.

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<sup>474</sup> Ibid.

<sup>475</sup> Ushakov A. S., Chmyhalova S. V. Vyyavleniye faktora vliyaniya othodov GOK na sostoyaniye okruzhayushey sredy i zdorovye cheloveka s uchetom ih himicheskogo sostava [Identifying the influence of Mining and Beneficiation Complex's wastes on environment and human health with regard to their chemical composition], 2011 ([http://www.giab-online.ru/files/Data/2011/8/Ushakov\\_08\\_2011.pdf](http://www.giab-online.ru/files/Data/2011/8/Ushakov_08_2011.pdf)).

<sup>476</sup> Volkovskaya S. V. Ekologicheskaya otsenka vozdeystviya gornyh predpriyatiy na prirodnyuyu sredu Vorkutinskogo rayona i ratsionalnyye sposoby ohrany prirodnykh resursov [Environmental impact assessment of mining enterprises on natural environment of the Vorkutinsky district and rational ways of protection of natural resources] (<http://www.dissercat.com/content/ekologicheskaya-otsenka-vozdeistviya-gornykh-predpriyatii-na-prirodnyuyu-sredu-vorkutinskogo-#ixzz3JvU6y6d3h>).

<sup>477</sup> Revich B. A. K otsenke vliyaniya deyatel'nosti TEK na kachestvo okruzhayushey sredy i zdorovye naseleniya [Towards an assessment of the impact of Fuel & Energy Complex on environmental quality and public health]// Problemy prognozirovaniya. 2010. No. 4 (<http://demoscope.ru/weekly/2010/0439/analit04.php>).

<sup>478</sup> <http://finnougr.ru/life/index.php?ID=5175>.

<sup>479</sup> Bodnar I. S., Zaynullin V. G. Ekologo-meditsinskaya otsenka zaboлеваemosti naseleniya Respubliki Komi [Ecological and medical assessment of public morbidity of the Republic of Komi]. Izvestiya Komi nauchnogo tsentra UrO RAN. Syktyvkar, 2012. Release 1 (9) (<http://cyberleninka.ru/article/n/ekologo-meditsinskaya-otsenka-zaboлеваemosti-naseleniya-respubliki-komi>).

Conclusions, drawn by I.S. Bodnar and V.G. Zaynullin, based on long-term observations, state that the areas, exposed to strong anthropogenic influence, are territories of risk for environment-related pathogenic conditions<sup>480</sup>.

This report has not set the goal of addressing issues of anthropogenic impact on environment and human health by running fuel and energy companies (thermal power stations, thermal power plants). But in speaking of the coal industry, it must be kept in mind that in coal mining and processing, fuel is widely used for power generation. Among the fuel and energy companies, electric power installations using coal as a fuel are dominant in terms of the number of emissions. Energy production on the basis of coal in Russia has an insufficient level of technology for capturing, transporting, storing and using the ash and slag, and is characterized by relatively large air pollutant emissions<sup>481</sup>. The emissions of fine silt suspended substances and sulfur dioxide on many domestic power units of coal-fired power plants are about ten times higher than coal-fired power plants in the EU. To reduce the anthropogenic load in areas where power supply is carried out by coal-fired plants, it is necessary to introduce clean coal technologies to decrease particulate emissions, sulphurous anhydride, nitrogen oxides, and mercury.

### *The gas-and-oil producing industry*

The centers of the oil and gas industry in the Russian part of the Barents Region are the Komi Republic and Nenets Autonomous District.

Air pollution by oil companies mainly occurs due to the burning of oil-dissolved gas (ODG). In this connection, pollution with toxic substances such as carbon monoxide, nitrogen dioxide, carbon and methane takes place.

Oil production, transportation and storage is accompanied by the formation of oil and drilling sludge; wastewaters, penetrating into the ecosystem from oil production and oil refining, contaminate these ecosystems with oil products and other chemical compounds.

Oil spills pose a threat to all life forms. The devastating effects from oil and gas are distributed across the entire biochemical chain. As a result of chronic oil pollution, seabirds die each year. The implications for fish populations are also extremely negative. The oil blocks the respiratory system of marine animals and impedes oxygen consumption. Industrial water pollution creates a hazardous contamination level for biological systems.

The contaminants tend to settle in bottom sediments and to be accumulated in stagnant zones and the mouths of rivers. Results of the analysis of bottom sediments demonstrate the ongoing tendency for the accumulation of a number of microelements, such as arsenic, mercury, manganese, chromium, strontium and oil products in the upper layers. The highest concentration of oil products is in the lower reach of the Pechora River (Korovinskaya and Golodnaya inlets). This poses a special environmental danger, as contaminated sediments can be a source of secondary pollution of ecosystems over extended intervals. Due to the deterioration of water quality in the Pechora River, for the last 30 years, the pathological changes of general nature was diagnosed in whitefish organisms: non-specific inflammation with a predominance of degenerative and necrotic phenomena, degeneration of epithelial and cartilage tissues, tumors of several types; overdevelopment of connective tissues, etc.

The determination of the Pechora River basin in the Komi Republic and the Nenets Autonomous District as a locale for hydrocarbon extraction and processing leads to the penetration of a number of metals (Al, Mn, Cu, Cr, Pb, Sr, As) into water passages from the territory of coal mining companies, both by air, as well as

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<sup>480</sup> Ibid.

<sup>481</sup> Revich B. A. K otsenke vliyaniya deyatel'nosti TEK na kachestvo okruzhayushey sredy i zdorovye naseleniya [To assessment of the impact of Fuel & Energy Complex on environmental quality and public health]// Problemy prognozirovaniya. 2010. No. 4 (<http://demoscope.ru/weekly/2010/0439/analit04.php>).

through the sewage system. This has led to a sharp increase in the anthropogenic load on ecosystems, including water reserves. At present, the current situation in the Pechora basin has been aggravated by the fact that through its tributaries a lot of oil pipelines were laid and, thus, accidents often occur. 95% of drinking water in the Nenets Autonomous District comes from the Pechora. The main problem and permanent pollutants are arsenic and mercury that come from the industrial areas in the upper river (the Komi Republic)<sup>482</sup>.

After a large-scale accident in 1994, the oil content in the water of the Kolva River reached 0.15-0.40 mg/l, while MAC is 0.05 mg/l. Furthermore, a high content of phenols and chlorides was recorded in the reservoir. An examination of children's health in Kolva village in 1997 revealed significant disorders of the urinoexcretory and gastrointestinal tract. The kidneys are one of the most vulnerable organs in cases of the effects of contaminated drinking water. In the urine of children a high phenol content was diagnosed (an indicator of the metabolism of oil products in the organism)<sup>483</sup>.

In November 2012, as a result of depressurization of the pipeline, more than three tons of oil spilled into the water bodies and foreshores of the Vozey-Shor stream, Usa and Kolva rivers. As a result of foreshore contamination, all the vegetation was destroyed<sup>484</sup>. 204 oil-contaminated areas with a total area of about 130 hectares, including more than 20 fresh oil spills, were found in 2014 throughout the territory of the Komi Republic<sup>485</sup>.

The ongoing oil pollution of soil and water bodies leads to their degradation, disrupting the normal functioning of ecosystems and causing irreparable harm to human health.

### *Mining and chemical production*

In the Khibiny mountains the main source of environmental impact is the apatite-nepheline ore concentrator works of Apatite, OJSC. Apatite mines and processes apatite-nepheline phosphate ores. The toxicity of apatite-nepheline ore dust is determined by its chemical composition. The main industrial pollutant emissions of the "Apatite" production process are strontium, zinc, phosphorus, and aluminum compounds.

In the soils of Kirovsk and Apatity towns a high level of strontium was found. The drinking water in the area is sweet water, has a high alkalinity and is characterized by relatively high aluminum content<sup>486</sup>.

The tailing ponds annually emit up to 70 thousand tons of pollutants. On the territory of Apatite, OJSC at the area of about 3000 km<sup>2</sup> per year more than 30 million tons of waste rock, containing strontium, is stored. Strontium has the tendency to accumulate in the organism and is deposited mainly in the bone tissue and to a lesser extent - in the kidneys, liver, and brain<sup>487</sup>.

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<sup>482</sup> Monitoring razvitiya territorii traditsionnogo prirodopolzovaniya v Nenetskom avtonomnom okruge, Severo-Zapadnaya Rossiya. Otchet proekta [Monitoring for development of the territory of traditional nature use in the Nenets Autonomous District, North-Western Russia. Project report] (<http://ipy-nenets.npolar.no/pdf%20files/Part%201%20RU.pdf>).

<sup>483</sup> Revich B. A. Osnovy otsenki vozdeystviya zagryaznennoy okruzhayushey sredy na zdorove cheloveka [Basis for assessing the impact of pollution on human health] (<http://www.ecfor.ru/pdf.php?id=books/revich/00>).

<sup>484</sup> <http://itar-tass.com/proisshestiya/622951>.

<sup>485</sup> <http://usinsk.in/13944-ekologi-naschitali-na-territorii-komi-i-nao-204-neftyanyh-razliva.html>.

<sup>486</sup> Revich B. A. «Goryachiye tochki» himicheskogo zagryazneniya okruzhayushey sredy i zdorovye naseleniya Rossii ["Hot spots" of chemical contamination of the environment and public health of the population of Russia] (<http://www.xn--e1agpdiev.xn--p1ai/files/publications/publication8.pdf>).

<sup>487</sup> <http://toxi.dyndns.org/base/nonorganic/Strontium.htm>.

Numerous studies have found that the dynamics for diseases among the population residing in the vicinity of the mining and chemical complex Apatite, correlate with changes in the level of environmental pollution<sup>488</sup>.

## Conclusions

These studies confirm a direct dependence of the state of human health and the environment on anthropogenic load level.

The statistics on population morbidity are characterized by dynamism, therefore, it is necessary to provide constant monitoring of the health status of the population in order to identify the causes of certain diseases. The research and study of the adverse effects of companies' industrial activities on human health should play a decisive role in the development of objective criteria for assessing the risks of industrial pollution.

The chemicals, entering the body, as a consequence of pollution of air, water, environment and soil cover tend to be accumulative. There may be some lag between the entry time of contaminants into the organism and the appearance of their negative impact on human health. This feature must be also taken into account, when assessing the risks of industrial pollution.

The statistics and study results indicate the significant socio-economic impact of population morbidity and mortality which should also be taken into account, when calculating and assessing environmental risks.

The socio-economic impact of diseases, associated with pollution in the Russian regions of the Barents region in 2004, was estimated at 26.4% of the gross regional product (GRP) for the Republic of Komi, 25.2% for the Murmansk region and 23.0% for the Arkhangelsk region<sup>489</sup>.

Objective assessment of the risks for industrial pollution of environment and human health should serve as a basis for the preparation and adoption of effective technological, environmental and management strategies.

Improvement and modernization of the production process, rejection of "dirty" technologies and environmental compliance are fundamental factors to reduce the anthropogenic impact on environment and human health.

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<sup>488</sup> Kornachev I. P., Zhiron V. K., Zagvozdina O. I., Krymskaya M. M. Ekologo-gigienicheskaya otsenka sostoyaniya okruzhayushey sredy v rayone razmescheniya Hibinskogo gorno-metallurgicheskogo kompleksa Murmanskoy oblasti [Ecological and hygienic assessment of the environment in the location of the Khibiny mining and metallurgical complex of Murmansk region] ([http://vestnik.mstu.edu.ru/v14\\_3\\_n45/articles/18\\_karna.pdf](http://vestnik.mstu.edu.ru/v14_3_n45/articles/18_karna.pdf)).

<sup>489</sup> Dushkova D. O., Yevseev A. V. Otsenka parametrov prirodnogo i chelovecheskogo kapitala v kontekste sovremennoy strukturyi prirodopolzovaniya Severa Rossii [Estimation of parameters for natural and human capital in the context of modern natural management structure of the Russian North]. MGU, Geograficheskiy fakultet //Arktika: ekologiya i ekonomika. 2012. No. 3 (7).



A satellite photograph of Earth showing a large, swirling storm system over the ocean. The storm is characterized by a dense, white cloud core with a distinct eye-like structure. The surrounding ocean is a deep blue, and the surrounding landmasses are visible in shades of green and brown. The image is taken from a high altitude, providing a wide view of the storm's extent.

**Application of best available technologies (BAT) – a way for reducing the anthropogenic load on the environment**

Photo by NASA Goddard Space Flight Center/flickr.com



To ensure economic growth and reduction of factors for anthropogenic load, first of all, it is necessary to solve the problem of reducing emissions and discharges of harmful chemicals into the environment. The greening of the production process on the basis of the best available technologies (BAT) should be adopted for this purpose.

The best available technologies are technologies that have already been introduced in one or more companies and provide minimal impact on natural systems in the current economic conditions<sup>490</sup>. In European practice, to reduce the negative impacts on ecosystems, the mechanism for calculating environmental impact based on BAT (Directive 2008/1 / Eu.2008) is applied.

For calculating the regulation of negative impact, the BREFs (BREF - Best Available Techniques Reference Document) has been widely used for several years in Europe, and, furthermore, the BAT list is constantly updated. The BAT lists are advisory and are developed for different industries.

## **Recommendations on BAT (BREF) for pulp and paper industry (PPI)**

The European Commission's BREF considers the main trends in the application of BAT to the pulp and paper industry to be as follows: using the sustainable forest management method (raw material source for PPI), bleaching without elementary chlorine (elementary chlorine free) or bleaching without chlorine (total chlorine free), minimizing water consumption and reuse of treated technical water by means of modern systems (integrated into production) for water purification, energy-saving and energy-recovery measures and environmentally friendly waste disposal.

Detailed information on BAT with special technological recommendations on the types of productions, in particular, for kraft pulp production, sulfite pulp processing, mechanical and chemical-mechanical pulp cooking, processing of recycled fiber and paper-making process, is available in BREF<sup>491</sup>.

### ***General BAT recommendations for PPI***

The BAT recommendations, which apply to different types of pulp and paper production, cover the technological process, water-saving and reduction of pollutant discharges. Particular attention is paid to such technological moments as:

- Dry wood debarking;
- Extended delignification prior to bleaching (by using extended or modified cooking);
- High-performance of sulphate pulp washing and closed cycle of sulphate pulp screening;
- Bleaching without chlorine;
- Replacement of the use of potentially harmful substances in the production process with less harmful substances;
- Utilization of process water, especially alkaline water, from the bleaching process;
- Removal and reuse of condensate from the evaporator plant;
- Collection and reuse of clean water for cooling.

### ***Energy saving***

To achieve the goals of energy saving, the use of combined heat and power production and renewable energy, such as biofuel (wood waste) is recommended.

### ***To reduce pollutant emissions, BREF recommends:***

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<sup>490</sup> Venitsianov E. V., Zvezdenkova G. A. Sistema meropriyatiy pri perehode regulirovaniya vrednyh vozdeystviy na okruzhayuschuyu sredu na osnove printsipa nailuchshih dostupnyih tehnologiy [System activities during the transition for regulation of harmful effects on the environment on the basis of the best available technologies]. Institut vodnyh problem RAN [Institute of Water Problems of RAS] ([www.econorus.org/c2013/files/tzvk.docx](http://www.econorus.org/c2013/files/tzvk.docx)).

<sup>491</sup> [http://eippcb.jrc.ec.europa.eu/reference/BREF/PP\\_BREF\\_FD\\_07\\_2013.pdf](http://eippcb.jrc.ec.europa.eu/reference/BREF/PP_BREF_FD_07_2013.pdf).

- Collection and burning of concentrated gases, as well as control over SO<sub>2</sub> emissions, TRS (total reduced sulphur) emissions and NO<sub>x</sub> emissions.
- To reduce SO<sub>2</sub> emissions, it is proposed to use fuel with low sulfur content or to implement control over sulfur emission by using scrubber.
- To control NO<sub>x</sub> emissions from recovery, limekiln and auxiliary boilers, it is recommended to regulate the conditions of combustion and installation of a burner with a low NO<sub>x</sub> indicator.

#### ***Production waste minimization***

To achieve these goals, it is recommended to minimize the generation of solid waste and to recycle and reuse production wastes.

The main problems facing the Russian PPI today are the high degree of wear of equipment, as well as the emissions and discharges of hazardous substances into the environment. Today a difficult situation has arisen in the pulp and paper industry in Russia, a decline in production is being observed. Since December 2012, the indexes of paper and paperboard production have been constantly decreasing; indicators are approaching the indexes of the 2008 crisis. The shutdowns of Kondopozhsky, Solombalsky and some other plants have severely affected economic performance. Experts are at one in thinking that modernization will be expensive, but it is the only chance to return Russian companies to their former position in the competitive production market<sup>492</sup>.

### **BAT in the mining and processing industry**<sup>493</sup>

This reference document provides information on BAT for the management of waste dumps and mine soils in the field of mineral mining and processing, waste handling in the extraction and processing of metal ores, coal and industrial minerals: barytes, borates, phosphates, potash, strontium, etc.<sup>494</sup>

The recommendations on BAT emphasize the importance of life-cycle management of tailing ponds, from the beginning to the end of the project, as well as the need to reduce reagent consumption, prevention of water erosion of soils and prevention of dusting. Special attention is drawn to the development of plans for the consumption and rational use of water resources and monitoring of groundwater around tailing ponds.

#### ***Acid generation management***

The handbook describes the best drainage management practices in cases of acid generation in tails and waste rocks. The best way is to prevent acid generation. If this is not possible, it is necessary to monitor the impact and application of appropriate measures taking into account the factors of water balance, groundwater level, etc.

#### ***Management of leakages from tailing ponds***

The BAT focus on the careful selection of the location of tailing ponds and waste dumps, which eliminates the possibility of leaks.

In the event of leakage from tailing ponds recommendations are provided to stop leaks, and measures are described for taking control over the situation.

#### ***Water discharges***

BAT give priority to the efficient use of resources: water reuse; mixing of technical water with other effluents containing dissolved metals; placement of sedimentation ponds for entrapping small particles; removal of suspended solid particles and dissolved metals prior to the discharge of treated wastewater into

<sup>492</sup> <http://www.rg.ru/2014/04/01/kombinati.html>.

<sup>493</sup> BAT-recommendation also includes mining industry.

<sup>494</sup> [http://eippcb.jrc.ec.europa.eu/reference/BREF/mmr\\_adopted\\_0109.pdf](http://eippcb.jrc.ec.europa.eu/reference/BREF/mmr_adopted_0109.pdf).

waterways; the neutralization of alkaline waste with sulfuric acid or carbon dioxide and the removal of arsenic from mining effluents by adding iron salts.

*To purify acid waste waters, the following BAT are recommended:*

- Adding limestone (calcium carbonate), hydrated lime or quicklime.
- Adding caustic soda for acid rock drainage with a high content of manganese.
- Creation of wetlands.
- Open limestone channels/oxygen-free limestone run-off.
- Well re-profiling.

A number of technical recommendations describe the construction of tailing ponds, tail and waste rock storage conditions, storage shutdown and their management after shutdown.

At present, the technical and technological level of ferrous and nonferrous metallurgy in Russia, as well as the competitiveness of a number of products in these sectors, cannot be considered satisfactory. Non-ferrous and ferrous metallurgy are among the main consumers of electricity, fuel, and water in the country. In comparison with foreign countries (EU, USA, Japan and others), excluding the cost for fuel and energy in the mining, ferroalloy and refractory industries, the specific energy consumption of steel in Russia was above 30%<sup>495</sup>.

The degree of wear for main production assets in the mining industry is high. Thus, in ferrous metallurgy the degree of wear on average constitutes 43%, and at some plants it reaches 55%<sup>496</sup>. The absence of modernization and technical re-equipment of current production poses a threat in terms of technogenic accidents and increasing anthropogenic load on the environment. To minimize the risk, it is necessary to encourage companies to modernize through the use of best available technologies.

In order to enhance the economic efficiency of the mining and metallurgical complex and increase environmental safety, the implementation of BAT should be immediately effected. This will facilitate the provision of resources and energy saving to improve environmental safety, will contribute to a greater involvement in the processing of industrial waste and therefore have a positive impact on the competitiveness of Russian products.

## **BAT: chemical production, phenolic-formaldehyde resin production**

This reference document provides general BAT recommendations for the production of a large amount of organic compounds. While selecting BAT for production processes with a large amount of organic compounds, it is recommended that one is guided by the following approaches (according to the hierarchy given below):

- Exclude the generation of all waste types (gaseous, aqueous and solid) by improving the production process and using appropriate catalysts.
- Decrease waste generation through introduction of new raw materials, modern equipment and innovative operating procedures in the production process.
- Recycle Waste by direct reuse or utilization.
- Extract raw value from waste.
- Process and utilize waste with the use of end-of-pipe techniques.

*To prevent and minimize pollutant discharges, the following recommendations are made:*

- identify all waste water generated and characterize its quality, quantity and variability.
- minimize water usage in the production process.
- minimize the pollution of water by raw materials, product or waste.
- maximize the reuse of waste water;
- maximize the recovery/preservation of substances from mother waters that cannot be reused.

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<sup>495</sup> [http://www.consultant.ru/document/cons\\_doc\\_LAW\\_165502/?frame=3](http://www.consultant.ru/document/cons_doc_LAW_165502/?frame=3).

<sup>496</sup> Ibid.

*In the field of energy efficiency, first of all, it is recommended that attention is paid to:*

- the optimization of energy saving;
- the implementation of accounting systems;
- the regular monitoring of energy consumption;
- the optimization of heat integration;
- the minimization of the use of cooling systems;
- the introduction of a combination system for heat and energy, where it is economically and technically reasonable.

*To improve air pollution control* and select the efficient BAT, it is recommended that parameters such as the type of pollutant, the concentration at inlet, the gas flow rate, the presence of impurities and the allowable concentration of emissions; safety; investments and operating costs; plant scheme and availability of communal services are all considered.

*For burning on flare systems BAT recommend* the use of units with low NO<sub>x</sub> emissions for both new and existing installations.

*BAT for reducing carbon dioxide emissions.* In this case, the most effective way is to increase energy efficiency, including transition to a low carbon fuel or stable (non-fossil) fuels.

*For control of pollutants in water BAT recommend the provision of:*

- separate purification or recovery of waste water streams containing heavy metals or toxic or non-biodegradable organic compounds using (chemical) oxidation, adsorption, filtration, extraction, (steam) cleaning, hydrolysis or anaerobic pre-treatment and subsequent biological treatment;
- organic waste waters, not containing heavy metals or toxic or non-biodegradable organic compounds, can be considered potentially fit for the combined biological treatment (taking into account the evaluation of biological degradation, inhibitory effects, volatility, level of residual contaminants, and so on).

BAT proposals on waste:

- for catalysts - metal recovery or reuse.
- for material used for cleaning - regeneration where possible.
- for wastes of organic processes - maximum use as a raw material or fuel, or, in the absence of such opportunity – combustion.
- for used reagents - maximum recovery or use as fuel.

The Russian chemical and oil chemical industry is a significant source of environmental pollution. The chemical complex ranks tenth among the industries in terms of gross emissions of harmful substances into the atmosphere; as for wastewater discharges into natural surface water bodies, it ranks second<sup>497</sup>. Every year industry-specific companies generate about 15.0 million tons of toxic substances (excluding V waste class) with only about 20% of the substances neutralized<sup>498</sup>. Technical apparatus undergoes heavy wear in the chemical industry. On average in the industry the degree of wear of basic production assets (in 2006) was 46.2%, and for equipment - 48.1%. Moreover, for certain types of equipment the degree of wear is more than 80%, and for others it is 100%<sup>499</sup>. The technologies, used in the industry, are highly resource-

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<sup>497</sup> Стратегия развития химической и нефтехимической промышленности России на период до 2015 года [Development strategy for chemical and petrochemical industry in Russia for the period up to 2015] (old.minpromtorg.gov.ru/ministry/strategic/.../6/Strategiya\_razvitiya\_.doc).

<sup>498</sup> Ibid.

<sup>499</sup> Ibid.

intensive. For example, 1300 m<sup>3</sup> natural gas is consumed for the production of one ton of ammonia in Russia, and in foreign countries - 800 m<sup>3</sup><sup>500</sup>.

To overcome technological backwardness and to improve the competitiveness of Russian products, to reduce the negative impact on the environment and public health it is necessary to start technological and technical re-equipment of the chemical industry on the basis of BAT immediately.

## **BAT: cement production**

Cement production causes major damage to the environment by air pollutant emissions in the form of dust and gases, as well as waste generation. The BAT recommendations cover measures to reduce energy consumption and emissions of harmful chemicals and waste management.

Firstly the recommendations reflect the need to select the corresponding technological process.

### ***Reduction in energy consumption***

To reduce energy consumption, the use of a dry kiln process, with multistage preheating and precalcination is recommended. In this type of kiln system the waste gas and excess heat from the cooler can be used for heating and the precalcination of raw material, prior to feeding into the kiln, providing considerable savings in energy consumption. The usage of this technology is possible both at new cement plants, and at modernized production capacities (in view of the moisture content in the raw material).

In order to reduce/minimize thermal energy consumption, the use of improved and optimized kiln systems is recommended. In particular, the excess heat from the kiln can be used for drying the raw material. In order to reduce primary energy consumption, reduction of the content of clinker in cement and cement products is proposed. This can be achieved by adding such fillers (in accordance with cement standards), as blast furnace slag, limestone, ash and puzzolana in the reduction stage. Among the effective measures for reducing primary energy consumption, the BREFs define cogeneration of heat and electricity.

### ***Reduction in nitrogen oxides (NO<sub>x</sub>) emissions***

In order to reduce NO<sub>x</sub> emissions from flue gases of the kiln and/or preheating/precalcination, the following measures are proposed:

- Flame cooling. It applies to all types of kilns used for cement production. The degree of applicability may be limited by the requirements for product quality and the potential impact on the stability of the process.
- Burners with low NO<sub>x</sub> emissions are recommended for all rotary kilns, main furnaces and in the precalciner.
- Mid-kiln firing; usually applicable when using long rotary kilns.
- Addition of mineralizers (to improve the incineration capacity of the mineralized clinker) can be applicable for all types of rotary kilns, in view of the requirement for output quality.

The reference documents also contain detailed recommendations for optimization of the technological process, indicating nitrogen oxide emissions, depending on the use of a particular technology.

### ***Reduction in sulfur oxides (SO<sub>x</sub>) emissions***

In order to reduce emissions of SO<sub>x</sub> from the flue gas of the kiln and/or preheating/precalcination, the following measures are proposed:

- Adding absorbents. This measure is applicable to all types of kilns, although it is most commonly used in preheating kilns with a suspended ceiling. Addition of lime into the kilns can cause a reduction in quality of the granules and complicate the flow in Lepol system kilns (rotary kilns with conveyor calciner).
- Wet scrubbers are recommended for use in all types of kilns in case of high content of sulfur dioxide (SO<sub>2</sub>) in the production of gypsum. Depending on feedstock quality and the qualitative characteristics of the fuel, when SO<sub>x</sub> content is low, use of emission abatement measures is not required. The wet scrubbers

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<sup>500</sup> Ibid.



are successfully applied in practice in productions, where the initial SO<sub>x</sub> levels reach indicators of 800-1000 mg/Nm<sup>3</sup>.

- To reduce SO<sub>2</sub> emissions from furnaces, it is recommended that the crushing of raw material is optimized. A decrease in sulfur dioxide emissions can be achieved by changing/adjusting the following parameters: the moisture of raw materials, the crushing temperature, the time in grinder/mill and the crushing size.

Application of these measures is justified where a dry crushing process is operated.

The Russian cement industry numbers approximately 50 cement plants. The fixed assets for cement production are characterized by a high progressive wear of more than 57%, exceeding 70% in the active parts of the equipment. On top of this the production capacity of the most cement plants is at 55-60%<sup>501</sup>. The technology of cement production in Russia is significantly behind the world: 72% of the plants operate using outdated and energy-intensive technologies. Unlike other countries, cement plants in Russia mainly work with the "wet" method. It is worth noting that the recent trend is a transition to "dry" production. Over a five-year period (2005-2010), the percentage of cement, produced by the "wet" method, has declined from 85% to 72%<sup>502</sup>.

There is an urgent need to modernize production with use of the best available technologies in the industry in order to update basic production assets, to raise the technical level of equipment by means of energy efficient technologies and to reduce the negative impact of industrial activity on the environment.

The BAT recommendations for the wood processing industry, aluminum production and the oil and gas industry are not reflected in the BREFs.

## Conclusions

The use of outdated technologies, the worn-out state of production assets at industrial enterprises, low resource-saving equipment and energy efficient technologies lead to low economic efficiency of production, an increase in the level of environmental hazards and negative impact on the competitiveness of Russian companies and products in the global market.

The key solution to these problems is the modernization of industrial enterprises by use of the best available technologies.

The application of BAT principles has now been adopted in the legislation of the Russian Federation (See section "Environmental legislation of the Russian Federation in the field of reducing the anthropogenic load on the environment" of this report). According to Russian legislation, the actual transition to BAT by companies must precede the development of BAT lists and procedure for transition to BAT.

### Procedure and time frames for transition to BAT by Russian companies<sup>503</sup>

Developing the regulatory and legal basis to ensure the improvement of standardizing in the field of environmental protection and transition of industry to BAT principles	2014-2017
Developing information and technical BAT manuals and registers	2015-2018

<sup>501</sup> <http://www.giprocement.ru/about/articles.html/p=5>.

<sup>502</sup> [http://www.perspektivy.info/table/mirovaja\\_cementnaja\\_promyshlennost\\_2012-06-06.htm](http://www.perspektivy.info/table/mirovaja_cementnaja_promyshlennost_2012-06-06.htm).

<sup>503</sup> Rasporyazhenie Pravitelstva Rossiyskoy Federatsii ot 19.03.2014 No. 398-r «Ob utverzhdenii kompleksa mer, napravlennykh na otkaz ot ispolzovaniya ustarevshih i neeffektivnykh tekhnologiy, perehod na printsipy nailuchshih dostupnykh tekhnologiy» [The Decree of the Government of the Russian Federation of 19.03.2014 No. 398-p "On approval of a package of measures aimed at avoiding the use of outdated and inefficient technologies, transition to the principles of best available technologies"] (<http://cdnimg.rg.ru/pril/94/48/33/398.pdf>).

Developing the regulatory and technical documents on the basis of information and technical BAT manuals and registers	2015-2018
Implementing the package of measures to stimulate the production of modern technical equipment in RF, according to BAT principles	2016-2026
Ensuring the implementation of pilot projects on BAT introduction in RF subjects	2016-2022

Thus, prior to the development of BREF and adoption of the regulatory and legal base ensuring the transition of industry to BAT principles, Russian legislation allows the construction of environmentally hazardous facilities in the country without the use of BAT<sup>504</sup>.

Currently, there are 33 BREFs in Europe. They are not governed by international copyright rules. EC BREFs can serve as a basis for the development of other documents, on the condition that links are provided to these reference documents.

The delay in the implementation of BAT principles can become a missed opportunity for Russian producers in forming a lead in eco-innovative technologies, and lead to a reduction in the competitiveness of Russian products in international markets and decreasing export opportunities.

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<sup>504</sup> Ibid.



The background image is a wide-angle landscape photograph. In the foreground, a dark, rocky slope descends from the right, partially covered with a layer of snow. The middle ground shows a valley with a winding path and several patches of snow. The background features rolling hills and mountains under a bright blue sky with scattered white clouds. The overall color palette is dominated by blues, greys, and whites, with some greenish-brown tones in the valley.

# **Environmental legislation of the Russian Federation in the field of reducing the anthropogenic load on the environment**

Photo by [dic.academic.ru](http://dic.academic.ru)

With the development of urban and rural settlements and industry (especially mining and processing, metallurgical, chemical, oil and gas, as well as energy facilities), the anthropogenic load on the natural environment increases. The environmental situation in Russia as a whole, and in terms of individual subjects and municipalities of the Russian Federation, is still deteriorating. Environmental quality is unsatisfactory on approximately 15% of the territory of the Russian Federation, where 60% of the population reside<sup>505</sup>.

This information is confirmed by the annual reports of the Ministry of Natural Resources and Ecology of the Russian Federation "On the state and protection of the environment in the Russian Federation".

An analysis of environmental conditions of the Russian Federation allows us to conclude that the main environmental problems are caused both by the results of economic activity in the past, and by current negative impact on the environment.

The unfavorable environmental situation is primarily associated with the fact that in the last few years, environmental and resource legislation has been weakened and does not comply with international legislation. Moreover, in addition to legislative changes in the Russian Federation, state environmental control, alongside municipal control, has been abolished, and public participation in environmental decision-making has been minimized.

## Environmental legislation

Environmental legislation is a system of laws and other normative legal acts containing legal rules governing public relations to the protection of the environment, the rational management of natural resources and ensuring the environmental safety of people. Thus, legal actions may be directed both to the use of natural resources, and the protection of the natural world.

The rules regulating the exploitation of natural resources are contained primarily in natural resource legislation, namely land, water, mineral resources, forestry and so on.

Accordingly, environmental legislation contains rules and laws aimed at preserving natural resources and conditions. They establish and monitor the limits for pollutant concentration in soils, water, air, etc.

Monitoring of the execution (enforcement) of the legislation is an obligatory condition for its effectiveness.

## State supervision

In 2012, pursuant to Federal Law of 18.07.2011 No. 242-FZ "On amendments to certain legislative acts of the Russian Federation on implementation of state control (supervision) and municipal control" the Decree of the Government of the Russian Federation of 19.11.2012 No. 1193 "On approval of the list of violations of environmental legislation, posing a threat of damage to the environment, for the purposes of state environmental supervision".

Due to changes, state environmental control is actually replaced by environmental oversight, including 14 kinds of supervisory bodies, i.e., activities by authorized federal executive bodies and executive bodies of subjects of the Russian Federation, aimed at the prevention, detection and suppression of violations.

Based on types of supervisory bodies, the question is not just about control (oversight) in the field of environmental protection in relation to facilities that have a negative impact on the environment, but also on the rational use of natural resources.

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<sup>505</sup> Gosudarstvennaya programma Rossiyskoy Federatsii «Ohrana okruzhayushey sredy» na 2012-2020 gody [State program of the Russian Federation "Environmental Protection" for 2012-2020] ([http://www.sbras.ru/win/anons/1689/13/gosprogramma-2012\\_2020.pdf](http://www.sbras.ru/win/anons/1689/13/gosprogramma-2012_2020.pdf)).



However, there is no clear regulation and delineation of powers in the above-mentioned law concerning state environmental control (oversight) between federal authorities and state authorities of the subjects.

In recent years, there has been a tendency for delegation of powers for environmental control (oversight) from the federal level to the level of Federation subjects. However, not all subjects, especially those that are state subsidized, are able to execute these powers, since the delegation of powers to the regional level, actually takes place without the transfer of financial resources for their implementation, which is a violation of federal law.

The effectiveness of state environmental monitoring (oversight) is provided through active interaction with such mechanisms as environmental impact assessment for dangerous objects, environmental monitoring, setting environmental norms, compensation payment for negative impact on the environment, restoring damage caused to the environment and others.

In addition, there are currently no legal mechanisms for compulsory environmental insurance, environmental auditing, implementation of best available (existing) technologies or the phased reduction of environmental impact, which does not compel the users of natural resources to pay more attention to the solution of environmental problems, and makes government supervision in this area ineffective.

One of the key issues, leading to the degradation of the environment, is an inefficient system of setting environmental norms of negative impact on the environment. In recent decades, payment rates for negative impact on the environment have not been actually indexed, and administrative penalties for violation of environmental laws are not comparable with the costs of eliminating such violations.

This leads to a situation where for decades the majority of industrial companies have exceeded established norms, paying small amounts in fines for negative impact on the environment, and have no incentive to modernize. The current rationing system is not conducive to solving the problems of reducing the pollution of air, water bodies, and soils.

## Legislative background

As noted in the framework for long-term socio-economic development of the Russian Federation for the period up to 2020, approved by the Decree of the Government of the Russian Federation of 17.11.2008 No. 1662-r, the development priorities of the country up to 2020 for the transition to a new, post-industrial society require an adjustment to current environmental policy.

The basic strategic document of the Russian Federation in the field of environmental protection and use of nature resource is "Fundamentals of state policy in the field of environmental development of the Russian Federation for the period up to 2030". The document was approved on 30.04.2012 by the President of the Russian Federation. One of the main tasks of state policy in the field of environmental development is to improve the regulatory framework for environmental protection and environmental safety.

It is expected that the situation should be changed by a new environmental policy for the implementation of best available technologies (BAT), contributing to a reduction in the impact on the environment. To this end, the law, prepared by the Ministry of Natural Resources and The environment of the Russian Federation, dated 21.07.2014 No. 219-FZ "On amendments to the Federal Law "On environmental protection" and some legislative acts of the Russian Federation"<sup>506</sup> (hereinafter - the Law), was adopted. The law will take effect from January 1<sup>st</sup>, 2015.

The law is aimed at improving the system for setting norms for impact on the environment.

In accordance with the Law, four categories of objects of economic activity are identified: environmentally

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<sup>506</sup> <http://www.rg.ru/2014/07/25/eco-dok.html>; <http://pravo.gov.ru:8080/page.aspx?112013>.



hazardous objects, objects that have a moderate impact, objects that have a negligible impact, and objects that have a minimal negative impact on the environment (objects of IV category).

With regard to environmentally hazardous objects, it is provided to establish standards for allowable emission limits, discharges of pollutants according to complex permissions instead of the currently valid individual permits, implementation of state environmental control at the federal level, as well as state ecological expertise.

With respect to activities at objects that have a moderate impact, it is provided to submit, according to established procedure, declarations of planned volumes of emissions and discharges of pollutants which include calculations by the approved methods for standards in relation to allowable emissions and discharges.

With respect to activities at objects that have a negligible impact, it is provided to report on the volumes of the actual emissions and pollutants discharged by them according to the established procedure.

It is expected that this system will allow for the elimination of additional approvals and permissions, will reduce administrative barriers for small businesses and, at the same time, strengthen control over large enterprises that are major sources of environmental pollution. Notably, the Law does not specify which objects are deemed to be environmentally hazardous objects, and envisages only that the criteria for objects of economic and other activities related to the category of environmentally hazardous objects, are specified by the Government of the Russian Federation. The Law also gives a temporary reprieve for business structures: the construction and commissioning of any environmentally hazardous objects without technologies reducing anthropogenic impact on the environment is not forbidden, if negotiation on the construction of such a facility is completed prior to January 1, 2019. The Law also allows the construction of environmentally hazardous facilities without applying BAT standards, until such time as the BREFs are published<sup>507</sup>.

In order to reduce the list of pollutants, subject to setting norms, the Government of the Russian Federation is authorized to establish a complete list (numerous clauses) for setting norms for pollutants and substances prohibited for emissions and discharges into the environment. The Law specifies the criteria for developing a list of pollutants.

In order to increase the effectiveness of environmental control, the law provides for the establishment of industrial environmental monitoring requirements depending on the category of the object of economic activity, as well as reporting by business entities about the volume of the impact on the environment. The law intends to equip the individual stationary sources of emission and discharges by automatic measuring and accounting apparatus for emission and discharge volumes and concentrations of contaminants, as well as providing technical means of information submission to a state automated system for ecological monitoring.

The Law clarifies the provisions of Article 16 of the Federal Law of 10.01.2002 No. 7-FZ "On Environmental Protection", introducing additional definitions regarding payers for negative impact on the environment, procedure for determining the payment base, method of payment calculation and adjustment, order and dates of payments.

The measures designed to stimulate a reduction in environmental pollution are the following payment concessions for negative impact under the Law:

establishing the procedure for adjusting the payment for negative impact on the environment, according to which, costs (actually incurred by the payer) are deducted out of the calculated payment amount for negative impact on the environment, for implementing measures related to reducing the impact on the environment.

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<sup>507</sup> <http://www.rg.ru/2014/07/25/eco-dok.html>.

waiver of charges (payment) for negative impact on the environment, when using the best available technology.

At the same time, the Law proposes to tighten economic sanctions on economic entities engaged in economic activity in excess of permissible norms by implementing coefficients to the payment rates for negative impact, in specific terms 25 and 100, instead of the currently used 5 and 25<sup>508</sup>.

In order to economically stimulate the implementation of best available technologies and measures for reducing the negative impact on the environment by business entities, the law envisages amendments to the Tax Code of the Russian Federation in relation to:

ensuring tax concessions in accordance with the legislation of the Russian Federation on taxes and duties (for example, a reduction in the tax base due to assignment of the costs for maintenance and operation of equipment to material costs, which are not subject to income tax);

providing privileges in respect of payment for negative impact on the environment in the order established by this Federal Law and the regulatory legal acts of the Russian Federation adopted in accordance with it;

allocating funds from the federal budget and budgets of the Russian Federation in accordance with the budget legislation of the Russian Federation (for example, provision of investment tax credits with full reimbursement for interest payments);

applying the additional coefficient 2 to the depreciation rate of the equipment.

In order to conform with the proposed provisions of the Federal Law "On environmental protection", the Law provides for amendments to the federal laws of 04.05.1999 No. 96-FZ "On air protection" and of 24.06.1998 No. 89-FZ "On production and consumption wastes" concerning the formation of new system for setting norms; of 23.11.1995 № 174-FZ "On environmental impact assessment" concerning objects for state ecological expertise at the federal level to be added by project documentation for objects, which are in accordance with the relevant legislation on the protection of the environment, deemed as environmentally hazardous facilities, as well as materials regarding complex permits for negative impact on the environment; of 29.12.2004 № 190-FZ of the Town Planning Code of the Russian Federation regarding conforming with new provisions of the Federal Law "On environmental impact assessment"; of 30.12.2001 № 195-FZ of the Russian Federation Code of Administrative Offences with regard to establishing the responsibility for violations in the field of environmental protection based on additional grounds.

The implementation period for the Action Plan on Environmental Protection cannot exceed seven years and shall not be prolonged.

## Environmental audit

Until 2000, environmental audits in the Russian Federation were regulated by the normative and legal acts of the State Committee for Environmental Protection of the Russian Federation (Goskomekologiya), but after the abolition of Goskomekologiya the legal instruments of the agency were abolished too. Currently, a voluntary environmental audit, as a form of entrepreneurial activity, is regulated by the Civil Code of the Russian Federation and other regulatory acts, and legal regulation of the mandatory audit is unavailable.

In order to reduce the negative impact on the environment, the Ministry of Natural Resources and The environment of Russian Federation have prepared a draft law "On environmental audit, environmental auditing activities and amendments to certain legislative acts of the Russian Federation"<sup>509</sup>. The draft has been prepared for submission to the State Duma of the Russian Federation.

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<sup>508</sup> Ibid.

<sup>509</sup> <http://www.mnr.gov.ru/regulatory/detail.php?ID=132262>.

The main purpose of this draft is to reduce the negative impact on the environment. In draft law environmental audit means the evaluation of the economic entity with respect to its compliance with regulatory requirements and international standards in the field of environmental protection, as well as the preparation of recommendations in the field of environmental activities.

According to the framework of the draft law, mandatory auditing should be provided while determining the limits concerning discharges of pollutants into the environment, establishing temporary agreed emission levels for harmful substances into atmosphere, developing and implementing projects on reconstruction works to compensate for damage caused to the environment, confirming environmental activities, introducing the best available technologies and implementing other environmental projects. According to the draft law, the auditing activities shall be performed only by members of the self-regulatory organizations (SRO) of environmental auditors. The major part of the draft law is devoted to the creation and operation of such SROs, stipulating their rights and obligations, and as a result it seems that this sole issue was the main focus of those drafting the law.

The mechanism itself for the regulation of legal relationships in environmental auditing is only superficially detailed. Mandatory environmental audits are established for large businesses once a year, and once every three years for medium sized businesses. However it is not proposed to carry out audits of organizations operating in the extraction of natural resources, even though it is they who are the main polluters.

Environmental audit will be similar to state environmental control (oversight) which is also carried out to ensure compliance with legislation and requirements in the field of environmental protection. The main difference will be the fact that it is performed not using budget funds, but at the expense of business entities, i.e., it will reduce budget expenditures for these activities, partially imposing them on business.

According to the legislation "if the entity (economic or other) on which the regional state environmental oversight is being performed, submits to the appropriate authorized body of the subject of the Russian Federation an environmental audit report, indicating that its activities are in compliance with environmental requirements, routine inspections against such an entity may be performed no earlier than three years from the date of submission of the environmental audit report".

Thus, the mandatory environmental audit and state environmental control (oversight) system are closely related. There is a risk that environmental audit organizations, commercial entities with the aim of attracting clients, will endeavor to issue mostly positive conclusions, and that audit organizations affiliated with state regulatory authorities will appear.

In addition, the lack of a regulatory framework and inspection criteria may lead to the fact that the auditor's report will reflect the subjective opinion of the inspector that, consequently, may lead to strengthen corruption in this sphere. The draft law does not establish the consequences for business entities of having a negative auditors' report. And in general, it seems that the purpose of the draft law is to provide an opportunity to delay the time of routine inspections against the legal entity by submitting a positive auditors' report to public authorities.

This draft law has not been widely understood among entrepreneurs and business entities. According to their perception, economic entities are being proposed to pay twice for ecological supervision - in the form of taxes, transferred through the budget system for financing the activities of state supervision bodies, and in the form of payments for audits. The Russian Union of Industrialists and Entrepreneurs considers the adoption of this law as inexpedient, explaining that the law "will not achieve any visible results that have a positive meaning for society, as a whole" and will create "unacceptable risks of an increase in administrative pressure, corruption, an increase in company's overheads and a reduction in their competitiveness"<sup>510</sup>.

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<sup>510</sup> <http://xn--o1aabe.xn--p1ai/position/view/50>.

## Public participation

The necessary condition for improving environmental legislation should also be legislative provision for effective public participation in environmental decision-making.

The issues related to implementation of citizens' rights for participating in environmental decision-making are regulated by a large number of regulatory legal acts at both international and Russian (federal, regional and local) levels. The forms and mechanisms for public participation may be different.

### *International level*

Pursuant to Part 4 of Article 15 of the Constitution of the Russian Federation, generally recognized principles and norms of international law and international treaties of the Russian Federation are an integral part of its legal system, if an international treaty of the Russian Federation stipulates other rules than those stipulated by law, the rules of international treaty shall be applied. Unfortunately, the most important acts of international law, regulating public participation in environmental decision-making activities, have not been ratified by the Russian Federation.

The emerging role of civil society in significant environmental decision-making will contribute to adherence to the Convention of United Nations Economic Commission for Europe "On access to information, public participation in decision-making and access to justice in environmental matters relating to the environment" (Aarhus Convention), as well as the ratification of the Convention by the United Nations Economic Commission for Europe "On environmental impact assessment in a cross border context" (Espoo Convention) and the Protocol on Strategic Environmental Assessment. Currently, work is underway to harmonize Russian legislation with international law.

### *Russian level*

The right of citizens to participate in decision-making is based on the Constitution of the Russian Federation, among the main items as follows:

Article 32 of the RF Constitution secures the right of citizens to participate in managing state affairs both directly and through their representatives;

Article 33 of the RF Constitution states the right of citizens to apply personally and send individual and collective appeals to state bodies and local self-government authorities;

Article 31 of the RF Constitution guarantees the right of citizens to hold meetings, gatherings, demonstrations, marches and pickets;

Article 42 of the RF Constitution, according to which "everyone has the right to a healthy environment, reliable information about its condition and compensation for damage caused to their health or property by ecological violations";

Article 72 of the RF Constitution, according to which the ownership, use and disposal of land, mineral resources, water and other natural resources belong to the joint competence of the Russian Federation and its subjects.

Moreover, the abovementioned is provided in the Federal Constitutional Law of 28.06.04 No. 4-FKZ "On referendum in the Russian Federation"; Federal Law of 30.03.1999 No. 52-FZ "On sanitary and epidemiological welfare of population" - Article 12; Federal Law of 02.01.2002 No. 7-FZ "On environmental protection" - Articles 11 and 12; Federal Law of 23.11.1995 No. 174-FZ "On environmental impact assessment" - Articles 3, 6, 14; Land Code, Water Code, and so on.

At the regional and local levels its own laws can be adopted.

### *In practice*

Despite the extensive regulatory framework regulating public participation in decision-making, the mechanism for public participation is not clear, and the role of public opinion is minimized. Out of many normative legal acts at federal and regional levels, provisions regulating the consideration of public opinion in economic activities have been removed.

Despite the fact that issues of environmental protection and natural resources are under the joint jurisdiction of the Russian Federation and the subjects of the Russian Federation, the latter do not actively participate in legislative activities. To harmonize Russian legislation in line with international conventions, it is necessary to change more than 40 laws of the Russian Federation<sup>511</sup>.

In order to expand the powers of public participation in Russian legislation, it is necessary to secure the following points:

- Improved access to environmental information;
- Provision of information distribution at an early stage;
- Ensuring public participation in the drafting of regulatory acts;
- Developing mechanisms for considering the proposals, recommendations and public remarks made during public debates.

## AFTERWORD

Russian areas of the Barents Region are and, in prospect, will remain the mineral raw material base for Russian industry. According to the program for development of the Russian North, the further development of natural resources in the Russian part of the Barents region and the economic development of these areas are a key priority.

Currently, the economy of the Russian regions of the Barents region is mainly based on the extraction and processing of natural resources. This predetermines the structure of the industry, where energy-intensive industries are dominating, namely mining, metallurgical, pulp and paper and the extraction of hydrocarbons.

During the Soviet era, the intensive development of industry (along with minor attention to the rational use of natural resources and environmental protection) has led to an extremely unfavorable ecological situation in these regions today.

An analysis of the environmental situation showed that Russian regions of the Barents region are characterized by a high level of technogenic impact, caused by the production activities of industrial enterprises. A high anthropogenic load, combined with the vulnerability of northern ecosystems, has a negative impact on the environment. The main environmental problem is pollution of air, water bodies and soil by harmful substances.

The scale and nature of contamination are conditioned by several factors: the composition of raw materials, the technological processes used and companies' formal compliance with environmental legislation.

In addition, most industrial companies, located in the Russian part of the Barents region, are characterized by the disrepair of equipment and use of obsolete technologies that do not allow the companies to achieve better economic results and are one of the main reasons for the negative impact on the environment and human health.

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<sup>511</sup> Поправко N. B. Rossiyskoe zakonodatelstvo i trebovaniya mezhdunarodnykh konventsiy v oblasti uchastiya obshchestvennosti v prinyatii ekologicheskikh resheniy. Obschestvennoe uchastie v prinyatii resheniy, vliyayuschih na okruzhayushchuyu sredu: Sbornik materialov vsrossiyskoy konferentsii [Russian legislation and the requirements of international conventions in the field of public participation in environmental decision-making. Public participation in decision-making that affects the environment: Proceedings of the national conference]. SPb, 2013 ([http://bellona.ru/filearchive/fil\\_Bellonaconference\\_18-19\\_04\\_2013.pdf](http://bellona.ru/filearchive/fil_Bellonaconference_18-19_04_2013.pdf)).



The modernization of production should be the main task of industrial enterprises. Today, the modernization level of the production process and extent of the application of advanced technologies at industrial companies in the Russian part of the Barents region are very low.

The results of inspections indicate numerous violations of environmental legislation by industrial companies, but often environmental violations go unpunished.

It is necessary to provide an objective assessment of the risks related to industrial pollution for the environment and human health which should serve as a basis for the formulation and adoption of effective technological, environmental and management decisions.

The situation is complicated not only by the extremely imperfect environmental legislation of the Russian Federation, but also by the economic profitability of non-compliance: it is much cheaper for polluters to pay environmental fines than to invest in the modernization of production.

However, only the improvement and modernization of the production process, the phasing out of "dirty" technologies, the tightening of and strict compliance with environmental legislation, which it will be in the economic interests of industrial enterprises to follow, and the implementation of "clean" technologies are fundamental factors in reducing the anthropogenic impact on the environment and health of people residing in the Russian territories of the Barents Region.

The greening of industry has become an urgent requirement for today.

The planned further industrial development of Russian territories of the Barents region on the one hand will accelerate the economic development of the region and on the other hand, will lead to a significant increase in the already existing huge anthropogenic impact on the environment, and, consequently, have an adverse impact on human health. Economic decisions must therefore be made with a consideration of potential environmental risks and the long-term consequences both for the environment and public health in the region.

The sustainable development of the Russian provinces of the Barents region, the quality of life and public health can be ensured only if natural systems are preserved and a satisfactory quality of the environment is maintained.

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