

**MURMANSK STATE TECHNICAL UNIVERSITY**

Chair of environmental engineering

# ENVIRONMENTAL PROBLEMS OF MURMANSK REGION

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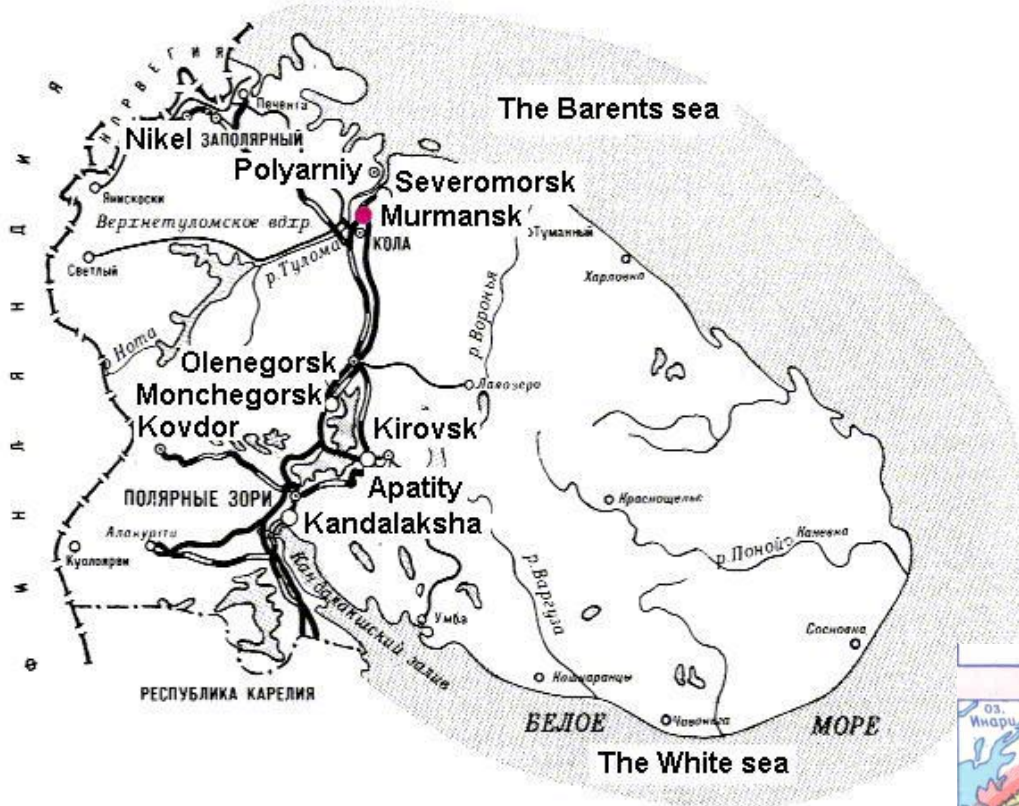
The greatest property of the Murmansk area is a rich, unique wonderful north nature.



## Short description of the Murmansk region

- It was created by Presidium of Supreme Soviet of the USSR 28 of May 1938.

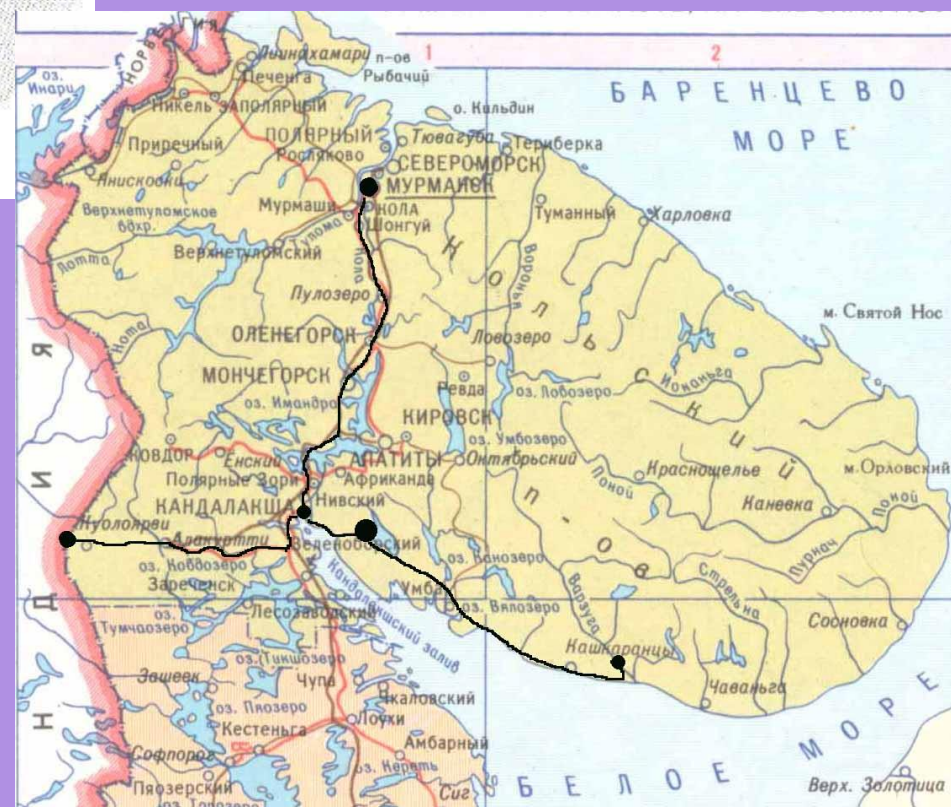




90% lies on the Kola peninsula beyond the Polar Circle

Total area is 144,9 thousand km<sup>2</sup>

Relief is hilly with terraces, plateaus. Plains are full of swamps and lakes. Physiographic areas are tundra and taiga

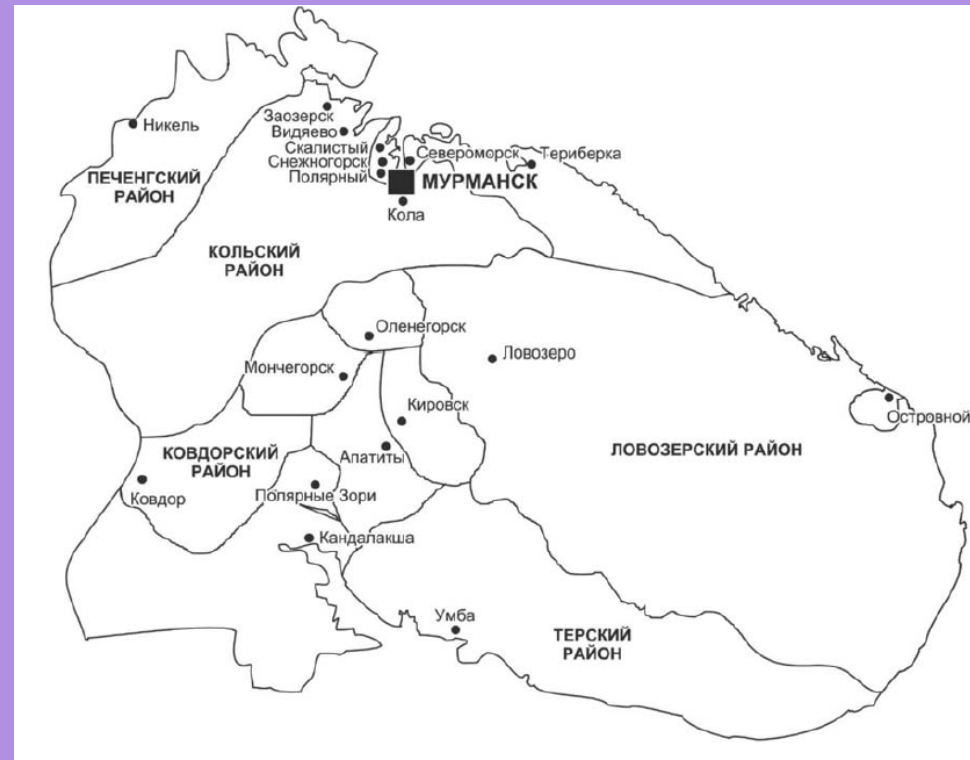


# Climate

- Temperate Arctic with the influence of warm Atlantic current Gulf Stream in the coastal part
- There is strong cyclonic activity here, the weather is not steady
- There is phenomena of polar day (31.05-11.07) and polar night (02.12 – 11.01) and mostly cloudy weather
- Absolute minimum of air temperature vary from - 27° on a Barents sea coast to the - 50° in central districts
- The average temperature of the most warm month (July) changes from 9 to 12° on the coasts of the Kola peninsula, to 12-15° - in central districts.

- The monsoon type of wind. The direction of wind during the year remains unsteady.

- The amount of days with a snow-cover is about 180-190 on the coast of the White sea, about 200 days in the north of peninsula, 200-210 days in central districts, in mountains proceeds to 270 days.



# Background radiation

Murmansk region subjects to the potential hazard of radioactive contamination

- There are more than 200 nuclear reactors on the territory of the region
- Nuclear Navy,
- Kolskaya atomic power station,
- a lot of exhaust nuclear fuel,
- solid and liquid radio-active wastes,
- basic contribution to forming of radiation background in region belongs the natural radio-active elements

Reliable and operative control of radiation environment in ordinary conditions and in the case of radiation incidents provides automatically by Murmansk territorial system of radiation background control

Last years the radioactive contamination of environment of the Murmansk region did not substantially changed and still remains satisfactory.

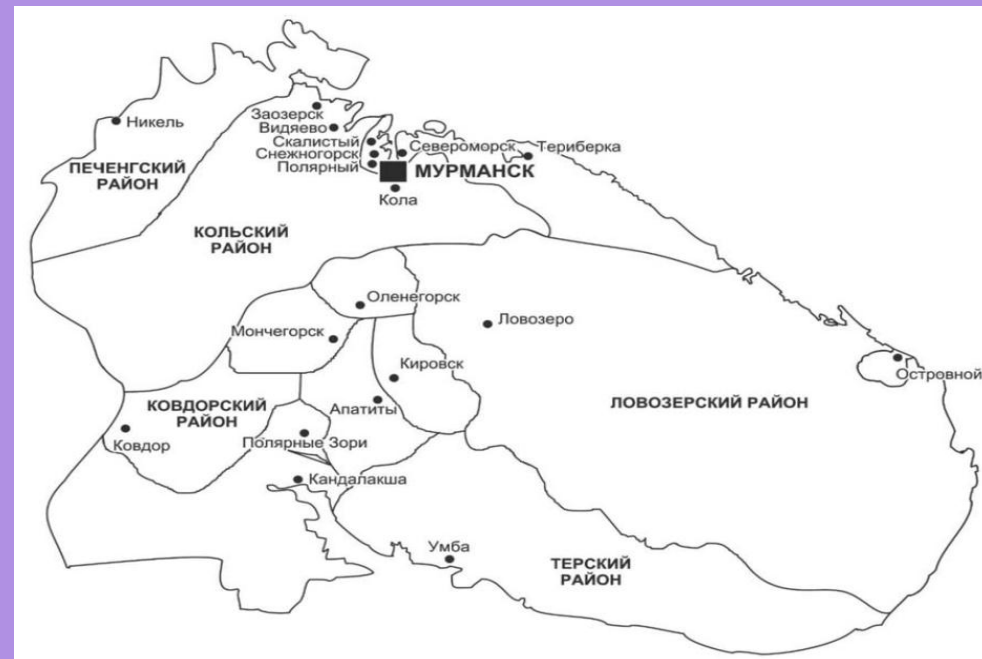
# The minerals

- phosphates,
- vermiculite,
- zircon
- nickel,
- copper,
- cobalt,
- nepheline and ceramic raw material,
- ferrous and chromic ores
- apatite ores



In Murmansk region there is a number of city-forming enterprises

- Kirovsk ( "Apatite enterprise" )
- Zapolyarnij, Nickel, Monchegorsk ( "Kola mining and smelting enterprise " )
- Olenegorsk ( "Olkon" )
- Kovdor ( " Kovdor mining and processing enterprise" )



# Forest

The general area is about 9817,6 thousand ha

The forests of region have specific features.

The forests of the Murmansk region mainly have a protective value:

- water protection
- regulation of water regime
- soil protection
- sanitary, health, recreation
- other useful properties



## Water resources

There are more than 127 thousand water objects, 20,6 thousand of them are water streams and 107 thousand of reservoirs.

Lakes are rarely used or not used for fish breeding because of their remoteness from settlements, large spreadness and absence of entrance roads. The biggest of them are Imandra, Umbozero, Lovozero and Seidozero lakes



The Rivers of the Kola peninsula are of mountain type. They are filled up mainly due to fallouts. More than 95 % of all rivers has length less than 10 kilometers, The main rivers of the Murmansk region are Tuloma, Kola, Varzuga, Umba, Teriberka, Ponoï, Kovda

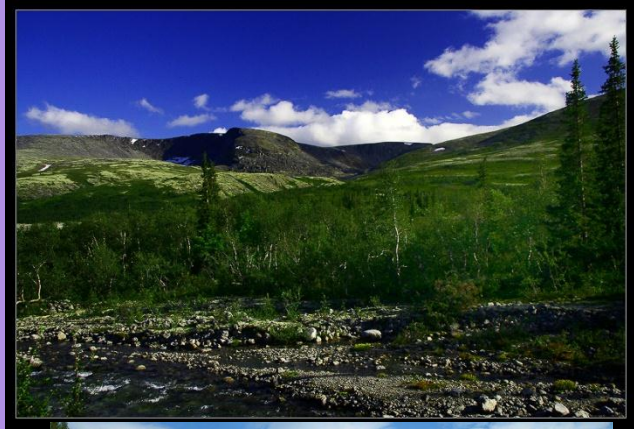
The typical feature of natural waters in Murmansk region is presence of ions of metals, such as a copper, iron, manganese.



# Recreation resources

The Murmansk region has an unique potential of recreation resources of different character and maintenance:

- various and rare landscape complexes
- a various Northern Europe fauna and flora;
- nature monuments;
- 466 cultural and historical monuments
- There are 3 state natural reserves with total area is about 363,7 thousand hectares



Мурман Фишинг



Мурман Фишинг

# Population

To the beginning of 2012 there live about 787,6 thousands inhabitants in Murmansk region.

92,7 % of them are an urban population, and 7,3 % - rural.

# Science

12 scientific establishments, specialized mainly on the study of resources of peninsula

- Kola research center is the part of Russian Academy of sciences.
- Arctic research institute of marine fish industry and oceanography.
- Murmansk biological institution of marine culture



## Foreign trade connections

77 countries of the world are Partners of Murmansk region.

The basis of export are:

- metals (66 % - Ni, Cu, Al)
- fish and marine products (21 %)
- apatite concentrate (7,5 %)

The basis of import are:

- equipment (31 %),
- facilities of transport (20 %),
- food stuffs and agricultural raw material (12,5 %).

# Economy

On territory of Murmansk region are located 3 marine trade port, 2 airports.

An atomic icebreaker fleet, allowing to do permanent navigation in Arctic, is also based in Murmansk.

Ships of a transport fleet provide the more than 1/5 of all Russian marine transportations.



Roads and railway connect Murmansk with different parts of Russia and the whole world.

The climatic terms of region limit possibilities of agrarian sector development. Sowing areas make only 0,1 % of all territory of region, 73 % of them are used for green crops.

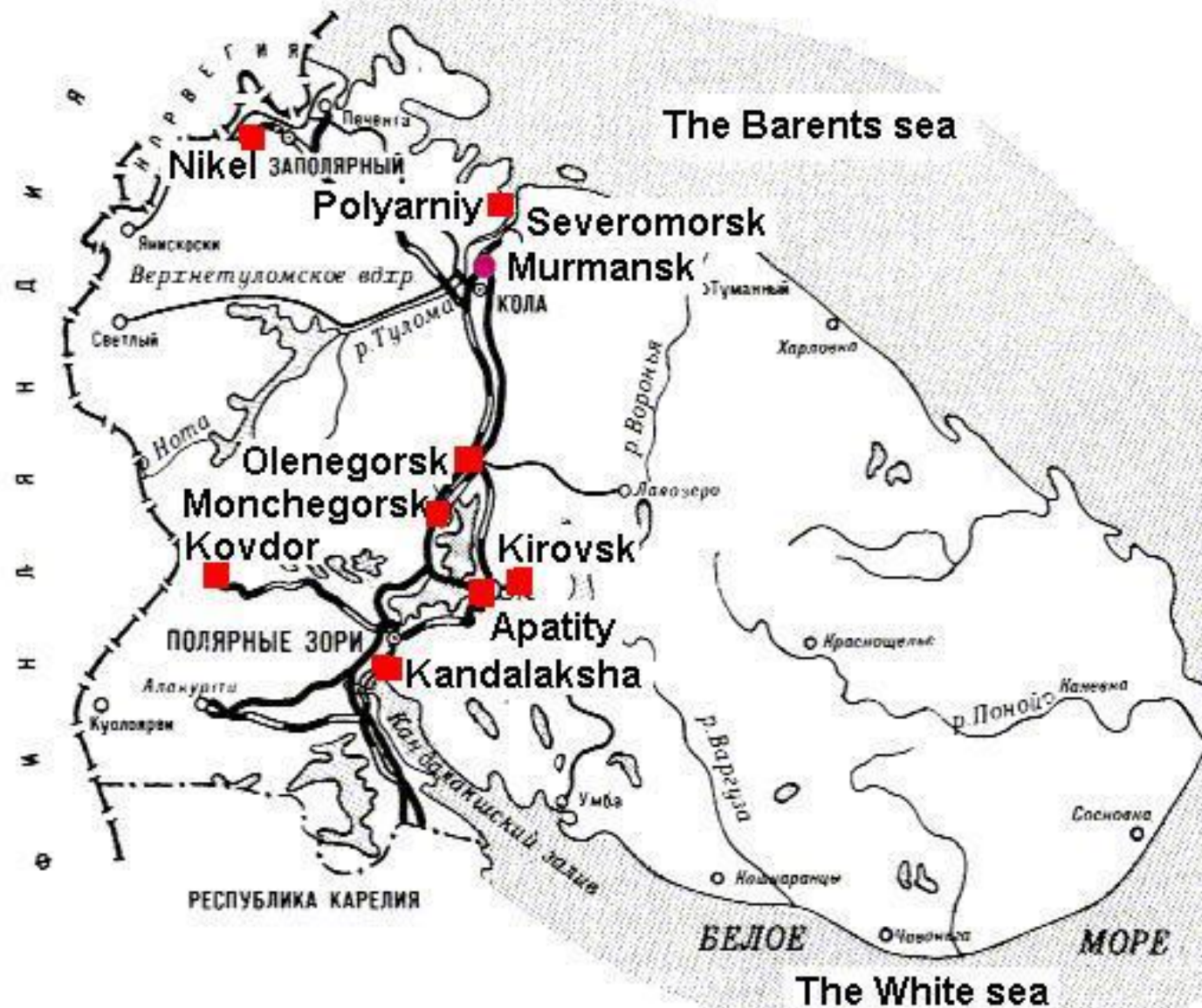
Basic directions of agricultural sector are breeding of cattle, reindeers, pigs and bird.



# Contamination of Atmosphere

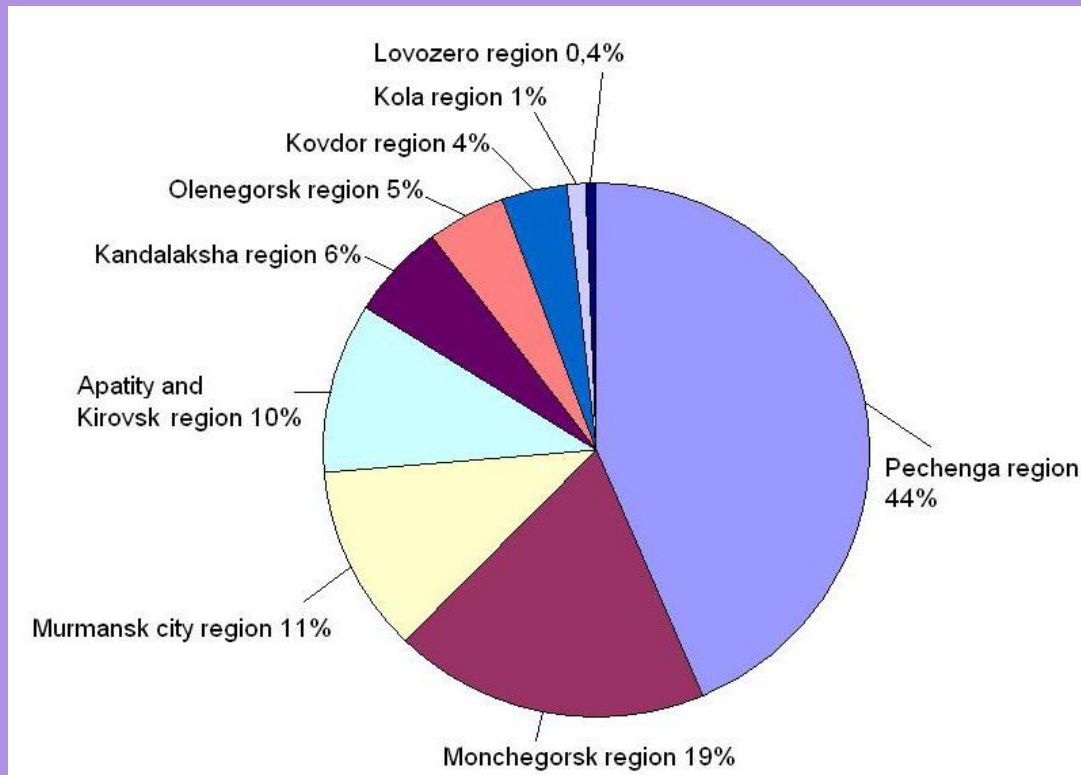
Main industrial enterprises which mostly impact atmosphere are:

Source	Town / settlement	Emissions, thousand t
“Pechenganickel”	Zapolyarniy Nickel	115,8
“Severonickel”	Monchegorsk	39,1
Aluminum plant	Kandalaksha	12,6
Heat power plant	Apatity	18,4
Heat power plant	Murmansk	19,1
Heat power plant	Murmansk region	9,8
“OLKON”	Olenegorsk	3,4
Kovdor mining and processing enterprise	Kovdor	8,9
“Apatit”	Kirovsk	14,7



# Contribution of regions to the air pollution

In the Murmansk region there are about 4,827 thousand sources of atmosphere pollution. 4,141 thousand of them are specially organized and just 1,17 thousand of them are equipped by the treatment systems.



the basic sources of air pollution of the inhabited places In the Murmansk region are:

- Industrial enterprises

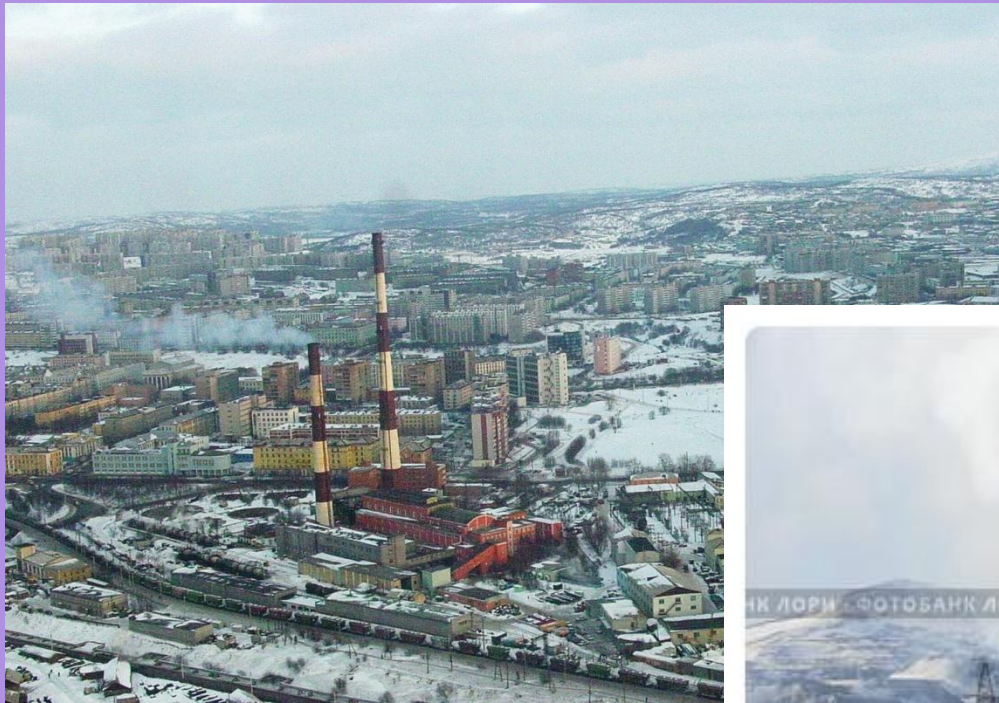
**Pollutants** : sulphur dioxide, carbon oxide and oxides of metals (copper, nickel, cobalt), fluorine compounds

-heat station

**Pollutants:** sulphur compounds, nitrogen oxides, black carbon

-transport emissions.

**Pollutants:** of carbon oxide, nitrogen oxides, lead and hydrocarbons.



ы комбината "Печенганикель"  
ий Матонин / Фотобанк Лори



For control of environmental quality in 9 towns of the Murmansk region daily work 18 stations of Murmansk center hydrometeorology and environmental monitoring  
They have more then 100 points of monitoring around all region and hold monthly monitoring of atmosphere, soil, water, snow cover and bio resources.



# Water pollution

In 2010 the total volume of waste waters was about 1725,6 million m<sup>3</sup>.

79,3 %, of sewages were normatively-clean,  
3,7 % were poured down without cleaning  
16,6% were not enough cleaned.

The most large sources of contamination of are:

- "Kola mining and smelting enterprise",
- "Apatite enterprise",
- Municipal services of Murmansk, Apatity, kandalaksha, Severomorsk, Polyarnij.

In the Murmansk region there are 13 agricultural enterprises

The general volume of waste waters from agriculture industry is about 0,96 million m<sup>3</sup>.

The treatment plants of most these enterprises are contained in the unsatisfactory conditions, overloaded, does not provide the sufficient cleaning of water and require of reconstruction and expansion.

## **Tuloma river**

Tuloma river last years was polluted by copper and iron. Concentrations of contaminants was 5 times higher, than permit.

## **Kola river.**

The quality of upper flow water of Kola river depends on dumping of waste water from "Olkon enterprise". The average concentration of copper in the river can be 3-4 times bigger than maximum permissible concentration.

Downstream is usually contaminated by ammonium contained in storm flow and leakage water from agricultural enterprises.

## **Teriberka River**

On quality of water of Teriberka river have influence of highway Murmansk Tumanniy. There are high concentrations of metals, mineral oil, copper, zinc, iron, manganese and nickel.

## **Kola bay.**

The Varnichniy stream flows through central part of Murmansk to the Kola bay, collecting storm flow, and also sewages of Murmansk heat station.

The Rosta stream brings to the Kola bay contaminants from Murmansk bakery enterprise, from Murmansk heat station and Murmansk incineration plant.

In a Ledovoe lake damaged by activity of haulage enterprise “Avtokolonna 1118”

# Production and consumption Wastes

The sources of wastes are different enterprises including military one, and consumers.

The biggest sources are

"Kola mining and smelting enterprise",

"Pechenganickel",

"Severonickel",

"Olkon enterprise", in Olenegorsk,

"Ore-dressing enterprise" in Kovdor and Lovozero,

"aluminium processing plant" in Kandalaksha.

Mining industry contributes 99,5 % of all generated wastes

# Actual amounts of waste generation, processing and landfilling

Вид отходов	Образование	Использование, обезвреживание	Захоронение
1 класс	105,398	75,027	0,000
2 класс	45 251,609	45 174,108	0,000
3 класс	48 996,192	18 001,590	1 115,412
4 класс	143 902,104	147 968,304	222 810,254
5 класс	196 606 741,167	18 356 860,371	178 256 058,682
Всего отходов	196 844 996,470	18 568 079,400	178 479 984,348

# Municipal waste management

Last year 271,6 thousand tones of municipal solid wastes were generated

They include household wastes, garbage from the apartments of organizations, wastes from cleaning up of territories.

the Waste incineration plant, processes a 1/3 of wastes Murmansk, Kola and Severomorsk . Other wastes are transported to landfills.

# REGIONAL PROBLEMS OF ENVIRONMENTAL CONTAMINATION

1. Reconstruction of the Mining and processing enterprises to reduce harmful emissions.
2. Utilization of industrial wastes, including ships and nuclear power submarines, which are off from exploitation.
3. Remediation of soil, suffering from anthropogenic factors
4. Utilization and processing of municipal solid wastes, including hazardous wastes.

5. Renewal of forests which were damaged due to activity of mining and smelting enterprises.
6. Prevention of contamination of natural waters (rivers, lakes, bays and seas) by waste waters of fleets and coastal enterprises and domestic waste water.
7. Development of special protected natural territories and national parks and reserves.
8. Development of the ecological monitoring system
9. Organization of radio-active wastes proper management.



**THANKS  
FOR ATTENTION**

