Arctic’s Environment Safety

Vladimir Masloboev, Professor, Dr. of Sc.(Eng.)

Kola Science Center of the Russian Academy of Sciences
What is the Arctic for us?

Russian Arctic:
Population - 1.7%
Share in GDP - 12%

For Russia, the Arctic is a strategically important region and the richest storehouse of mineral resources.

Reserves of the Russian Arctic:
nickel, antimony, cobalt, tin, tungsten, mercury, apatite 50%, gold 40% chromium and manganese 90% platinumides 47%, diamonds 100% vermiculite 100% phlogopite (60-90%).
Forecast coal resources of 780 billion tons.
Oil Field "Victory". Resources are about 1.3 billion tons of o.e. In total, more than 30 structures were found at three East-Prinovozemelskih sections of the Kara See.
Marine transport routes in the Arctic (existing and expected)
Mining industry is the driving force for social-economic development of the Barents region

Three pillars of sustainable development in the Arctic

Profitability
- Profitable and solid capital base;
- Confident presence in the market and competitiveness;
- Profitableness for investors.

Social responsibility
- Safe working conditions for workers and attention to environment;
- The obligation to workers on maintenance of conditions for professional development, training, a recognition and self-esteem;
- Recognition of the human factor and communication with a society.

Ecological responsibility
- Influence minimisation on the environment;
- Liquidation of a waste and using of resource effective technologies;
- Secondary processing as the important component of the concept of a sustainable development.
The role of the Arctic has three aspects:

- **Economic:** the Arctic is one of the most important source of strategic power, petroleum, gas, minerals, fresh water, and sea transport routes.

- **Environmental:** The Arctic is the most important climate-region, with the active role of solar-terrestrial relationships, unique marine and terrestrial biota.

- **Socio-cultural:** The Arctic has a universal cultural heritage, language and adapted to the extreme conditions of life practices of indigenous peoples, a unique centuries-old experience of ethno-cultural interaction between the peoples of Arctic states as a prerequisite for a stable geopolitical development.
Kola Science Center of RAS: Arctic research
The Arctic characteristics

- Extreme climate conditions;
- Focal nature of economic and industrial development of the areas with the low population density;
- Farness from the industrial centers;
- High energy costs for the production and infrastructure;
- Vulnerability of the ecological systems;
- Low rate of the renewable natural resources recovery;
- Low rate of the natural bio-geochemical cycles, low primary production of the ecosystems and low efficiency of the energy transfer to higher trophic levels, low species diversity.

All these factors reduce the self-cleaning capacity and resilience of the Arctic ecosystems.
Megatrends in the Arctic

1. Increased urbanisation – a global trend also including the Arctic
2. Demographic challenges – the old stay while the young leave
3. Continued dependency on transfers and the exploitation of natural resources will continue to dominate the arctic economies
4. Continued pollution and ongoing climate change will have a significant impact on the nature and environment of the Arctic
5. The Arctic needs to generate more Human Capital by investing more in its people
6. Changes in the nature of interaction between the public and private spheres will impact development
7. Renewable energy will contribute to a “greening” of the economy
8. Increased accessibility provide opportunities as well as new risks
9. The Arctic as a new player in the global game

Kari Laine,
Thule Institute, University of Oulu
The Kola Science Centre of the Russian Academy of Sciences was originated from the Khibiny mountain station of the USSR Academy of Sciences (Tietta) in 1930 and was transformed into the Kola base of the USSR Academy of Sciences in 1934. It made possible to start permanent integrated researches of the regional productive forces for needs of different branches of national economy. At present, the KSC RAS comprises 6 research institutes and 3 scientific centers incorporated to the FRC KSC RAS.
Kola Science Center of the Russian Academy of Sciences

Total staff – 1490, Researches – 577, Dr.Sci. 105, Ph.D. – 317.
Kola Science Center of Russian Academy of Sciences
<table>
<thead>
<tr>
<th>Geological Institute</th>
<th>Mining Institute</th>
<th>Institute of Chemistry and Technology of Rare Elements and Mineral Raw Materials</th>
<th>Polar Geophysical Institute</th>
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<th>Murmansk Marine Biological Institute</th>
<th>Polar Alpine Botanical Garden – Institute</th>
<th>Institute of North Industrial Ecology Problems</th>
<th>Center for Humanitarian Problems of the Barents Region</th>
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<td>112</td>
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<th>Institute of Economic Problems</th>
<th>Institute of Informatics and Mathematical Modelling of Technological Processes</th>
<th>Center of Physical and Technical Problems of the Northern Energetics</th>
<th>Center of Nanomaterials</th>
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<th>Center of Adaptation of Human in Arctic</th>
<th>Center of Nanomaterials</th>
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<td><strong>Technical and Experimental Infrastructure</strong></td>
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<tr>
<td>Experimental production works and pilot plants</td>
<td>Research base «Barentsburg»</td>
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<td></td>
<td>Technopark «Apatity»</td>
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<td></td>
<td>Comprehensive monitoring test site «TIETTA»</td>
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<td>Comprehensive monitoring test site «ECOVIT»</td>
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<td><strong>Logistic Infrastructure</strong></td>
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<td>Scientific Library</td>
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**Operating and maintenance and social infrastructure**

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<tr>
<th>Motor depot</th>
<th>Technical and community services</th>
<th>Hospital</th>
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Mission

Performing scientific research and scientific and technological support for the implementation of the objectives of achieving strategic goals and priorities for sustainable development and security of the Arctic zone of the Russian Federation (Russian Arctic)

Areas of competence

Geology  Mining  Chemistry and Chemical Technology
Materials Sciences  Ecology  Information Technologies

Medicine  Economics  History and Culture
MAIN RESEARCH DIRECTIONS

• **ARCTIC NATURE: STATE AND EVOLUTION**
  Research of properties and parameters of the Arctic natural systems, evaluation of their place and roles in global geosphere processes; study of temporary and space variability of natural systems aiming to reveal a natural evolution trends and forecast an expected change under technogenic effect.

• **RATIONAL NATURE USING AND DEVELOPMENT OF ECOLOGICALLY SAFE TECHNOSPHERE IN THE NORTH**
  Exploration of natural resources in the Euro-Arctic region, development of the scientific bases for a harmless nature-using, creation ecologically safe technologies for rational utilization of natural and technogenic raw materials and for maintenance of an environment quality and life-support system in the North; development of monitoring systems and tools for stabilization of a balance between technosphere and environment.

• **SOCIAL SPHERE AND ECONOMY OF THE NORTH**
  Study of a social and ethnic structure of the northern community, evaluation of a migration dynamics as well as formation and distribution of labour resources, a level and quality of life in cold climate regions; development of scientific bases for a sustainable development and social stability in the northern regions.

• **INFORMATIZATION OF THE NORTH**
  Development of regional information networks and systems for training and education.
Development Program of FRC KSC RAS

Key landmarks and directions of development

- Sustainable development of the Arctic
- Circular economy 3R (Reduce, Reuse and Recycle)
- Nanomaterials and nanotechnologies
- Artificial Intelligence
- Big Data Technologies
- Biotechnologies
- Economy of the Northern Dimension
- Socio-humanitarian and NBIC-technologies
- Complex Systems Study
Apatity - the city of scientists and students

Apatity branch of the Murmansk State Technical University

Apatity branch of the Murmansk Arctic State University

KSC campus
The humanitarian aspects of the Arctic development: current challenges and science tasks
Priority directions of social and economic development of Murmansk Region

Development of human potential, increasing of the population life level and quality.

Increasing of the regional economy competitiveness

Formation of effective institutes for the sustainable development of Murmansk Region.
THE SCENARIOS OF MURMANSK REGION DEVELOPMENT

The inertial scenario
Preservation of traditional structure of economy and the industry (mining, fishing, transport complexes); low level of technological changes in branches. Well-being and of the population life quality grow low rates.

“Energy-Raw Materials” scenario
Active formation of oil-and-gas sector of the industry and necessary infrastructure, preservation of transit functions of region on transportation of fuel and energy resources; absence of new hi-tech processing capacities. Well-being and of the population life quality grow the moderate rates.

The innovative scenario
Increase of the diversification level; creation of industrial clusters; increase of competitiveness of the Region on the basis of use of innovative potential; formation of the hi-tech processing enterprises and infrastructures of the high level. Well-being and of the population life quality at the level of standards of the Northern Europe countries.
The basic parameters 2025 under scenarios of social and economic development of Murmansk region

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<th>Parameters</th>
<th>The Inertial</th>
<th>“Energy-Raw Materials”</th>
<th>Innovative</th>
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<tr>
<td>Growth GDP in times by 2007</td>
<td>1,5</td>
<td>2,2</td>
<td>3,5</td>
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<tr>
<td>Growth of labor productivity, in times</td>
<td>1,6</td>
<td>2,6</td>
<td>4,0</td>
</tr>
<tr>
<td>Growth of real wages, in times</td>
<td>2,4</td>
<td>4,0</td>
<td>6,0</td>
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<td>Level of poverty, %</td>
<td>11-13</td>
<td>9-10</td>
<td>5-6</td>
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<tr>
<td>Expected lifetime, years</td>
<td>70-71</td>
<td>72-73</td>
<td>75-77</td>
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<tr>
<td>Population, thousand people</td>
<td>690-710</td>
<td>770-790</td>
<td>835-850</td>
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<td>Share of the innovative-active enterprises, %</td>
<td>20</td>
<td>25</td>
<td>40-50</td>
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<tr>
<td>Volume of the natural gas production on the shelf, billion cubic meters per year</td>
<td>30</td>
<td>70</td>
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The target scenario of the regional development

The innovative scenario

"Energy-Raw Materials" scenario (as Catalyst)

The Target Scenario INNOVATIVE

Priority directions of activity and system of measures by bodies of the government

Achievement of the general purpose

Murmansk area - competitive region, with the life quality at the level of standards of the Northern Europe countries
NATIONAL PUBLIC STANDARD
"ENVIRONMENTAL SAFETY OF THE ARCTIC"

Developed by Institute of Industrial Ecology Problems in the North on behalf of the Public Commission on the Direction "Ecology" of Association of Polar Explorers

www.ekoarctic.com (Russian version)
THE MAIN IDEAS OF THE NATIONAL PUBLIC STANDARD "ENVIRONMENTAL SAFETY OF THE ARCTIC"

Creation of Transparent Rules for the Environmental Behavior of Extractive Industries in the Territory of the Arctic;

Development of the system of indicators for ecological behavior, setting benchmarks for existing and new enterprises in the Arctic;

A unified set of best practices and initiatives of scientific public and commercial organizations;

A unified set of local, national and international rules and requirements in the field of environmental protection of the Arctic zone;

Formation of a new "institution" of voluntary adoption of rules for environmental behavior for existing and new enterprises on the Territory of the Arctic.

The document was approved for adoption by representatives of government bodies, large business, expert community, public and scientific organizations.
KEY EVENTS

International Arctic Forum "ARCTIC - TERRITORY OF DIALOGUE"
Session "ENVIRONMENTAL RESPONSIBILITY IN THE ARCTIC: STANDARDS OF BEHAVIOR AND BUSINESS MANAGEMENT“, March 30, 2017

Goals (Roadmap):
1. Submission of the Standard for consideration by the Arctic Council and at public hearings under the Ministry of Natural Resources of Russia, the Russian Chamber of Commerce and Industry, the Russian Union of Industrialists and Entrepreneurs.
2. Approval and accession to the Greenpeace Standard of Russia
3. Development and consolidation of instruments for the voluntary regulation of environmental standards, similar to the experience of Finland, Canada, Iceland, etc.
The future of the mining industry in the Arctic zone of the RF in the conditions of global climate change

Analysis of Russian and foreign sources shows that in the future, the intensive development of mining projects in the Arctic are the following challenges:

1. Integration of indigenous and minority peoples of the North. The preservation of traditional nature use practices. The involvement of indigenous communities to ensure food security for mining projects in the Arctic along the Northern See Route (NSR);

2. The training of sufficient numbers of qualified and motivated personnel for mining projects in the Arctic;

3. The needs to develop new technologies for environmental safety and low resource and energy intensity of mining projects in the Arctic.
The Arctic at the crossroads: cooperation or competition?
International Conference in Whitehorse, Canada, 9-11 June, 2017
Ditchley Foundation, United Kindom

Scientific and environmental recommendations:

1. More work is needed on possible futures for the Arctic and their implications.
2. Arctic science needs also to professionalize its communications and to be less insular.
3. Science needs to encompass traditional knowledge by working much more closely with local communities.
The Arctic at the crossroads: cooperation or competition?

Cultural, educational and societal recommendations:

1. Sustaining families and communities should be at the heart of all policies.
2. Northern models for education have to be developed and adopted that take account of the physical and cultural landscape rather than a southern model imposed.
3. More recognition is needed for the role of northern cities, town and villages, where most of the people live.
Welcome to Khibiny Mountains!

Modern “TIETTA” – House of Scientists at the Imandra Lake coast.
Thanks a lot for Your attention!