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Environmental aspects of urbanization in the Russian Arctic

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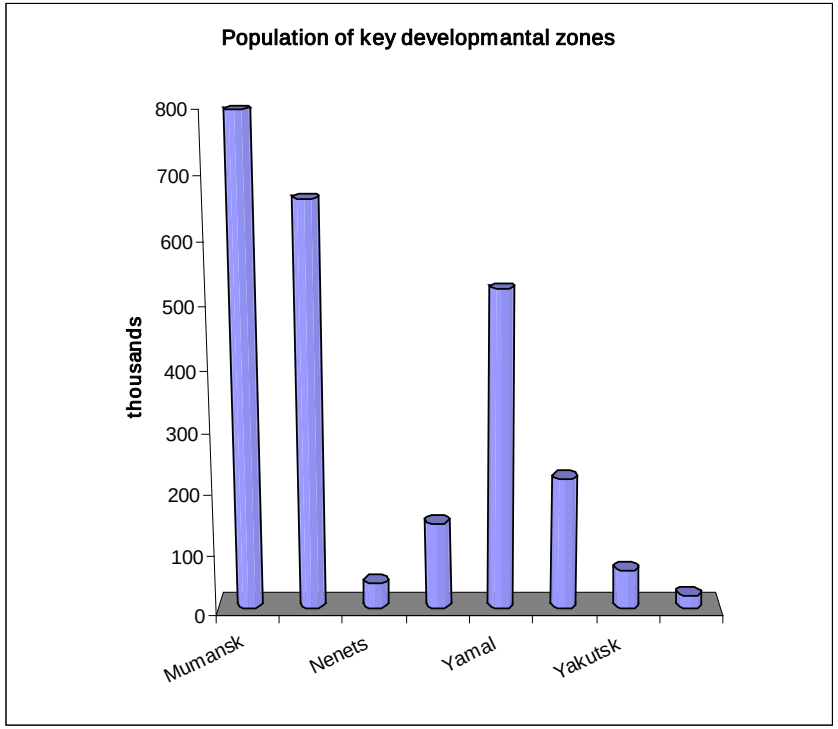
Arctic is about 37 % of Russian territory, but the Cryolithozone is about 54-60 % of total state area

Population of Russian Arctic

Developmental zone	Population, thousands people
Murmansk	796
Arkhangelsk	661
Nenets	42
Vorkuta	143
Yamal	522
Taymyr	217
Yakutsk	65 (not all republic)
Chukotka	52
Total	2498 (involved in to economic activity - 1300)

European part –Siberia - Chukotka

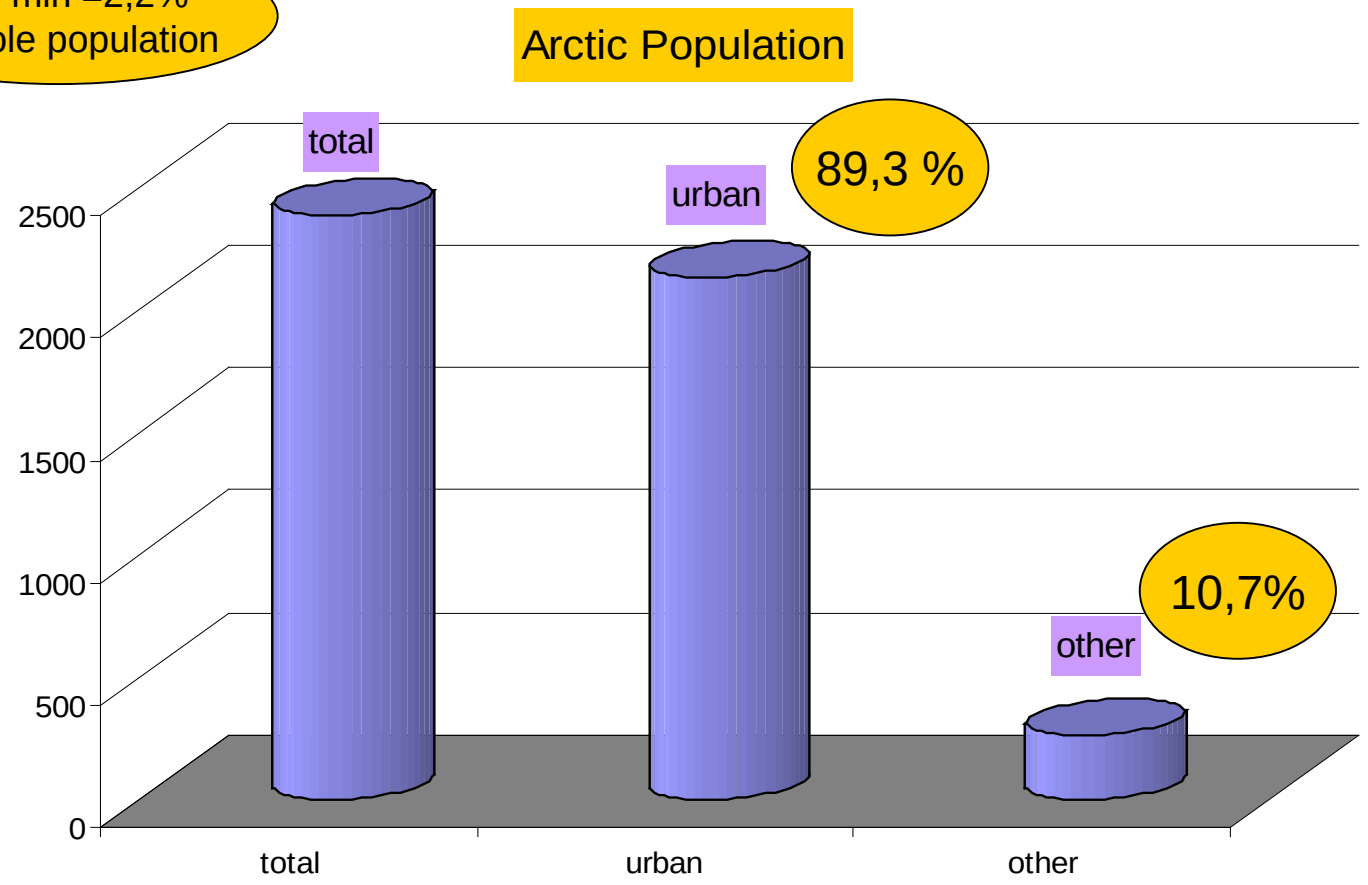


Creation of “Development zones” in the Arctic accodring to Federal program “Development of the Arctic zone of the Russian Federation and the national security up to 2020”

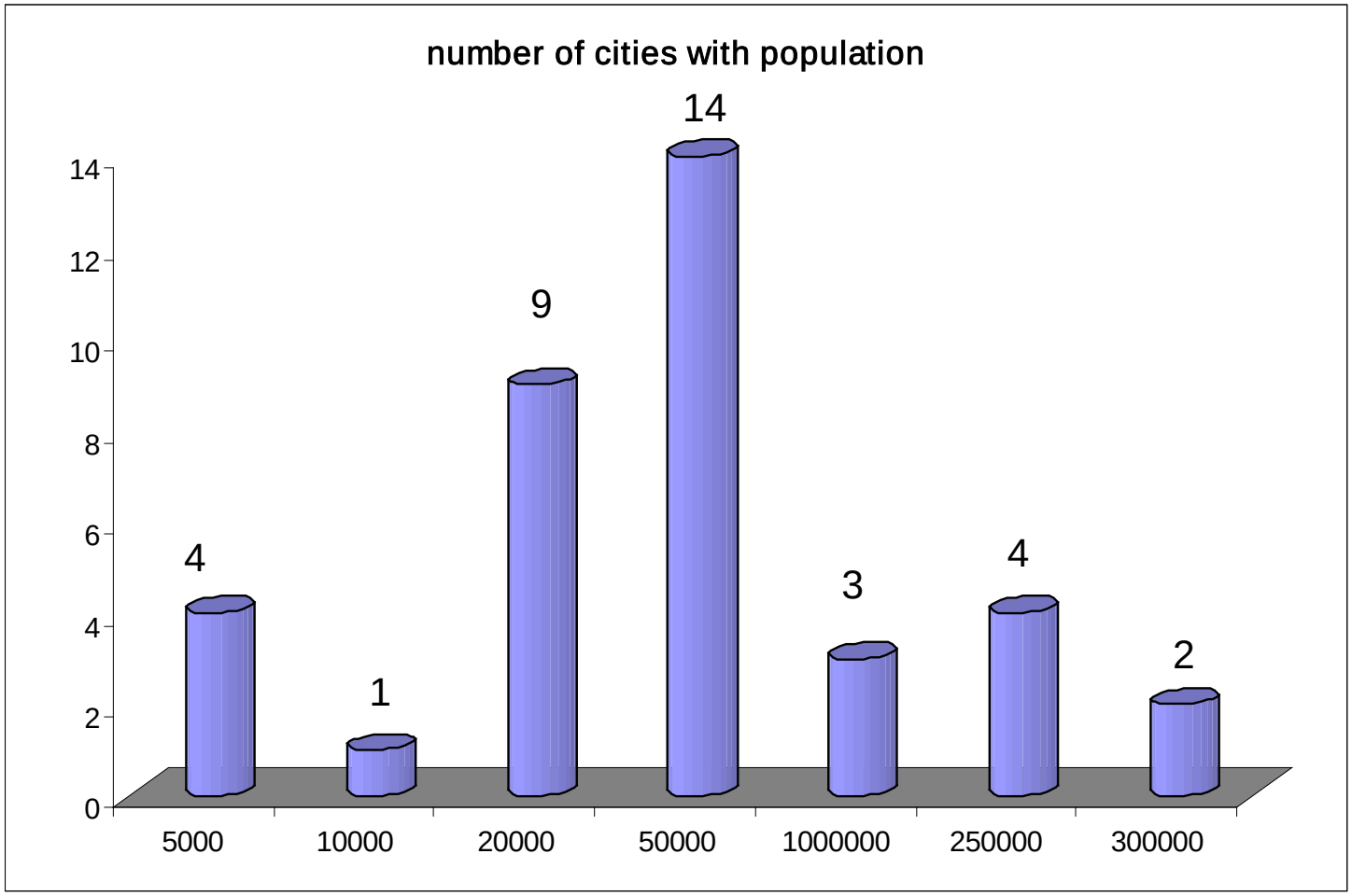
- Development zones: 1 – Kola, 2 –Arkhangelsk, 3 – Nenets, 4 – Vorkuta, 5 Yamal, 6- Taymyr, 7 – North-Yakutks, 8 - Chukotka

Population of the Russian Arctic:

2391 min =2,2%
of whole population



Number of cities with population range



Key Factors, Limiting the Arctic Zone Development

- *a) extreme climatic conditions, including low temperatures, strong winds and the presence of ice in the waters of the Arctic seas;*
- *b) the localized nature of industrial and economic development of the areas and low population density;*
- *c) the distance from the main industrial centers, high resource use and associated economic activities and livelihoods on supplies from other regions of Russia of fuel, food and essential commodities;*
- *d) low stability of ecological systems, defining the biological balance and climate, and their dependence even from minor anthropogenic influences*

Main Environmental Risks of Arctic Zone

- *critical state of the housing and communal services, inadequate supply of clean drinking water*
- *negative demographic trends in most of the Arctic regions of the Russian Federation, the outflow of labor (especially skilled) in the southern regions of Russia and abroad*
- *high energy consumption and low efficiency of extraction of natural resources, the costs of production in the northern no effective compensatory mechanisms, low productivity*
- *in the sphere of nature and the environment stands increase technological and human impact on the environment with increased probability of reaching its limits in some areas adjacent to the Russian*
- *certain regions of the Arctic zone of the Russian Federation particularly characterized by the presence of adverse areas, potential sources of contamination, high levels of accumulated environmental damage*

Pristine ecosystems before urbanization (700 m elevation, Unmanned eqiupement)

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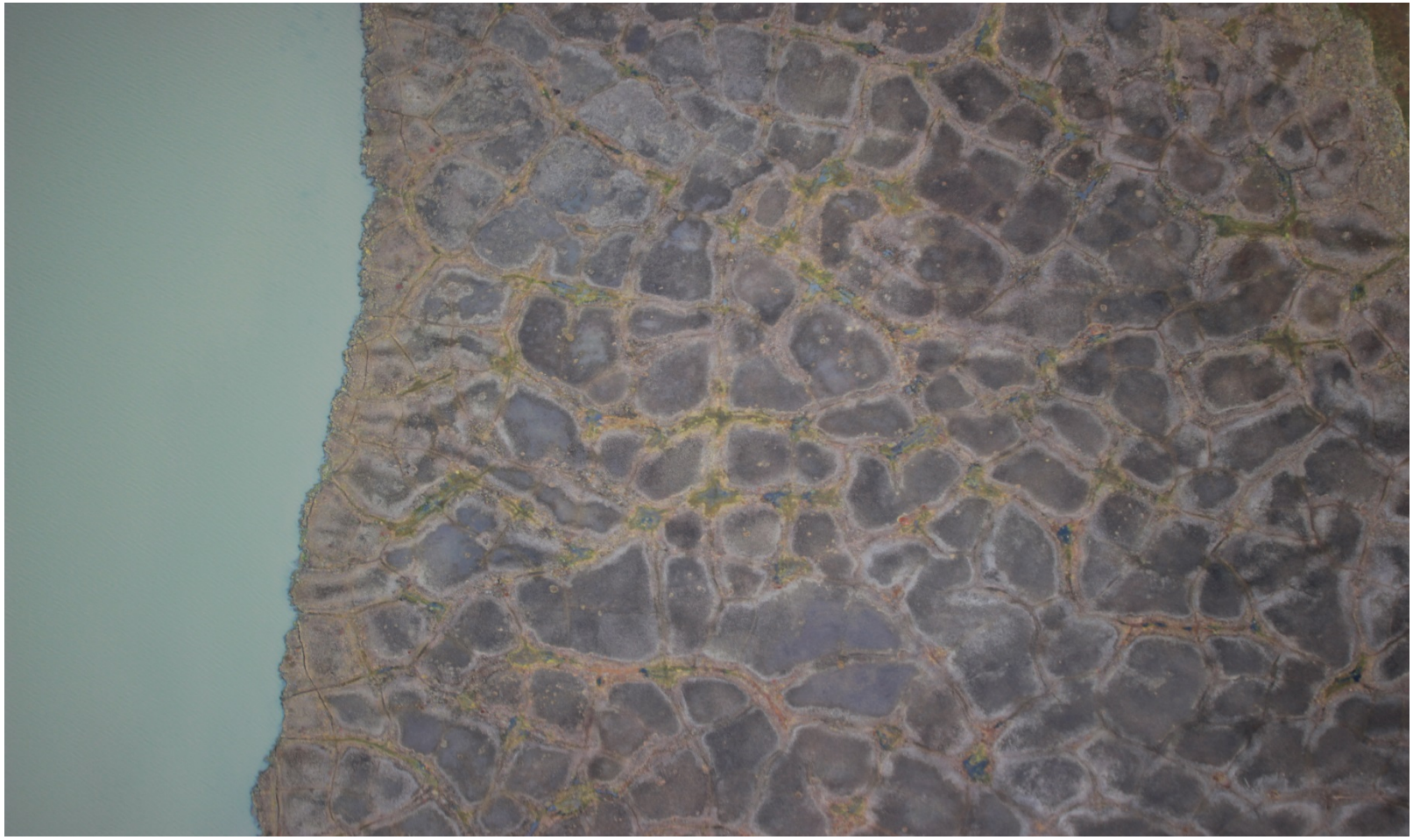
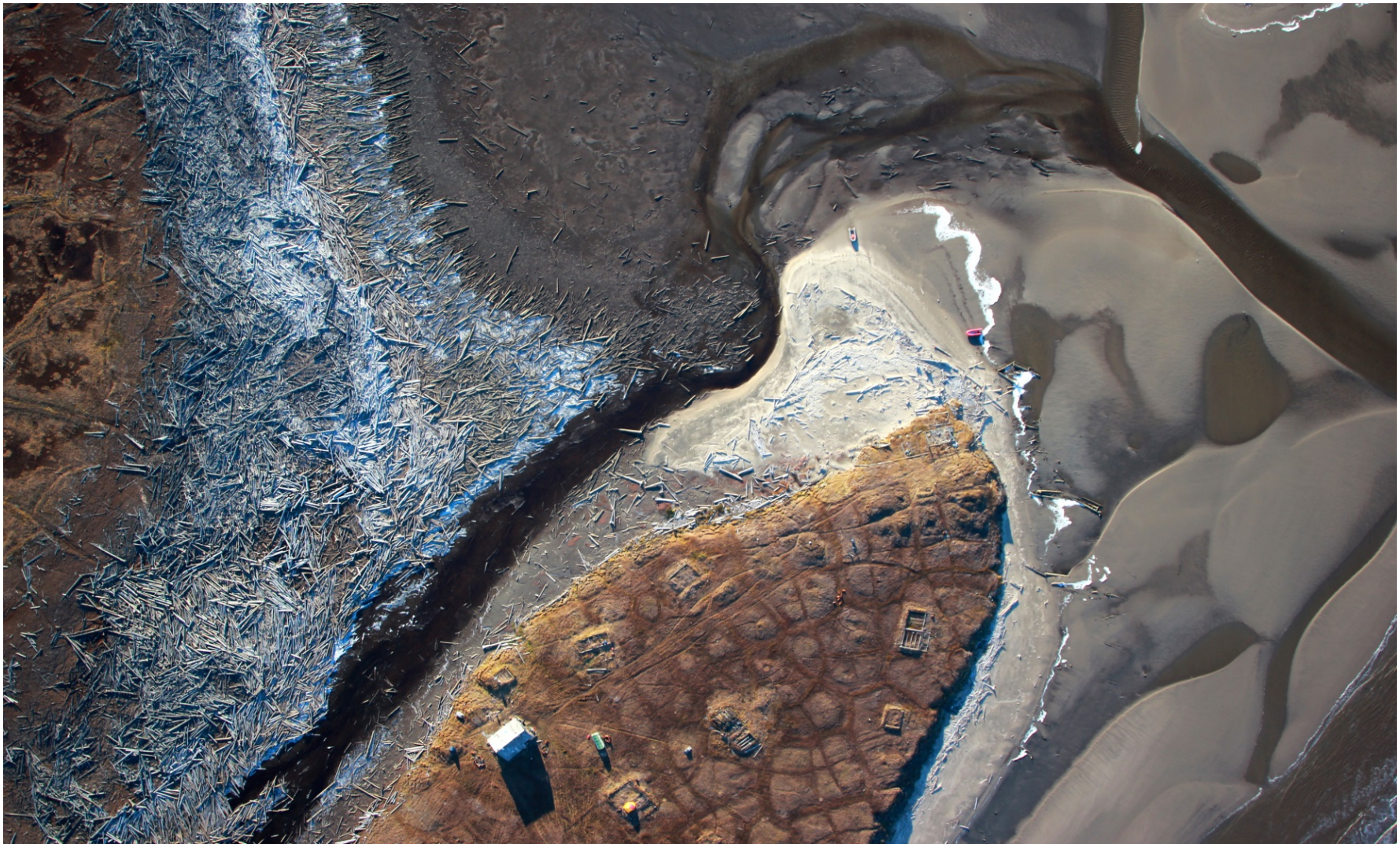


Abandoned post anthropogenic ecosystems of former factoria (700 m elevation, Unmanned eqiupement)



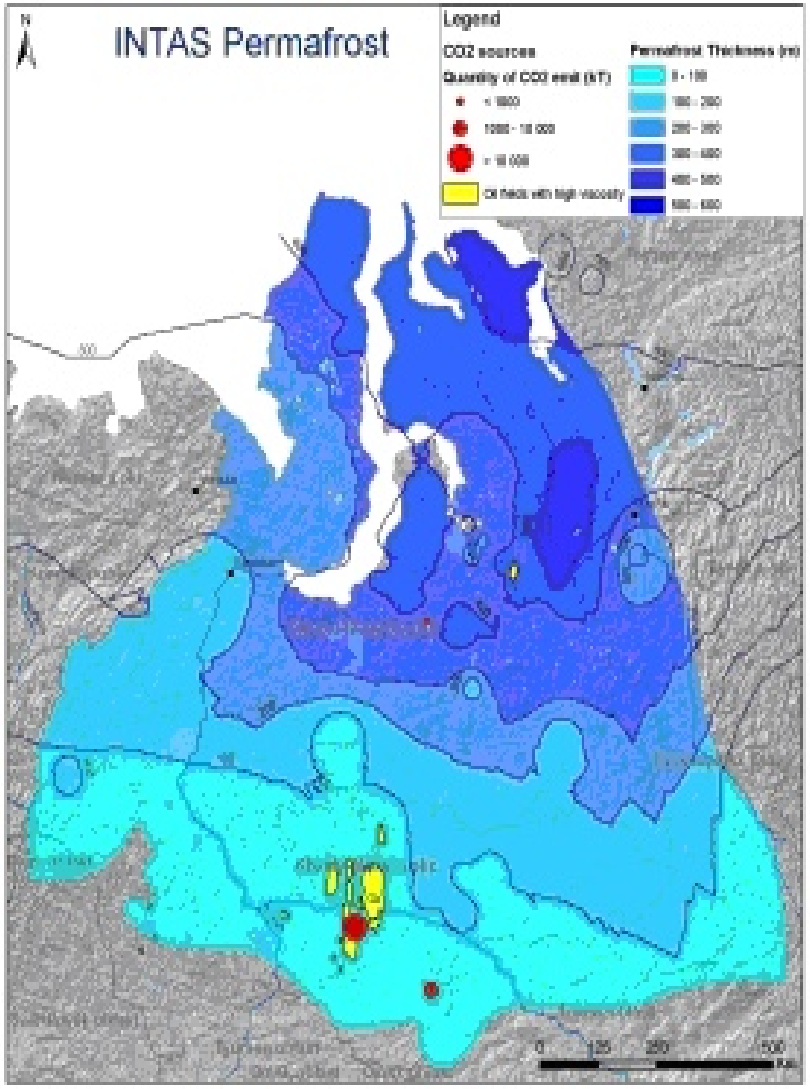
- Urbanization in the Arctic – is a creation and development of new settlements with extremely concentrated fluxes of energy, very high density of population, which is partially isolated from the “Main Russia” and from each other

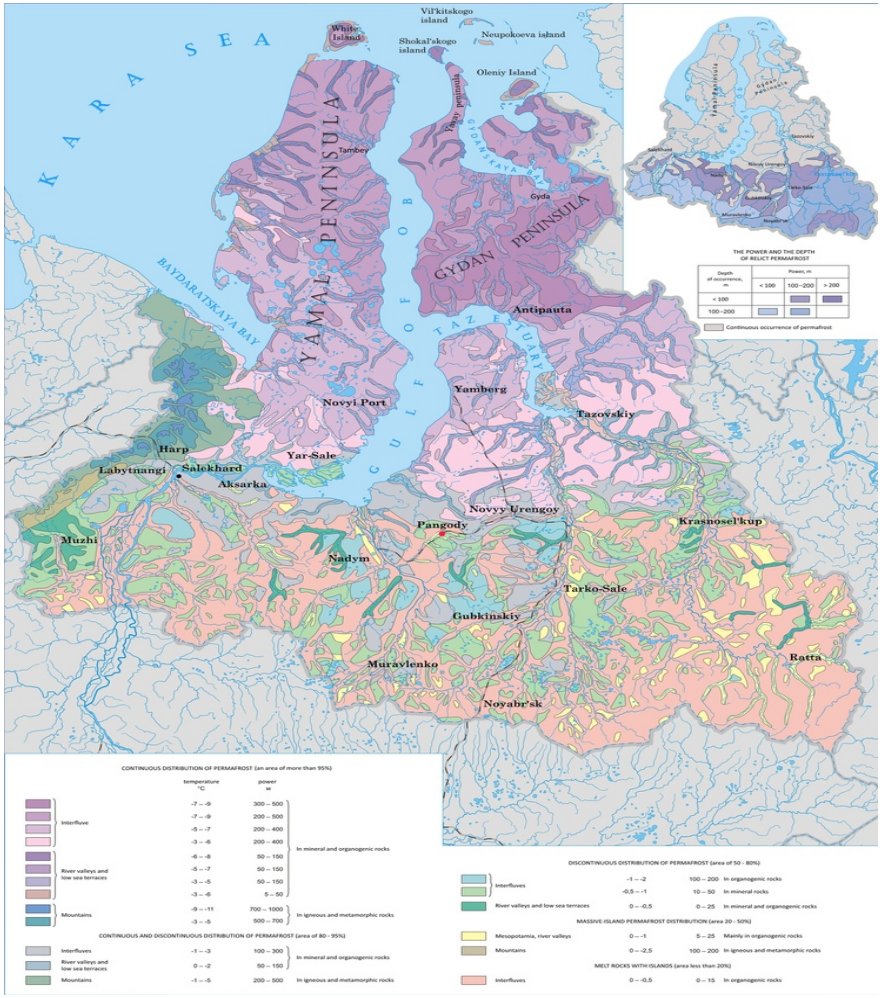
Highly urbanized ecosystem – Salekhard, Yamal: an example of unique social web

tundra

town

The study sites



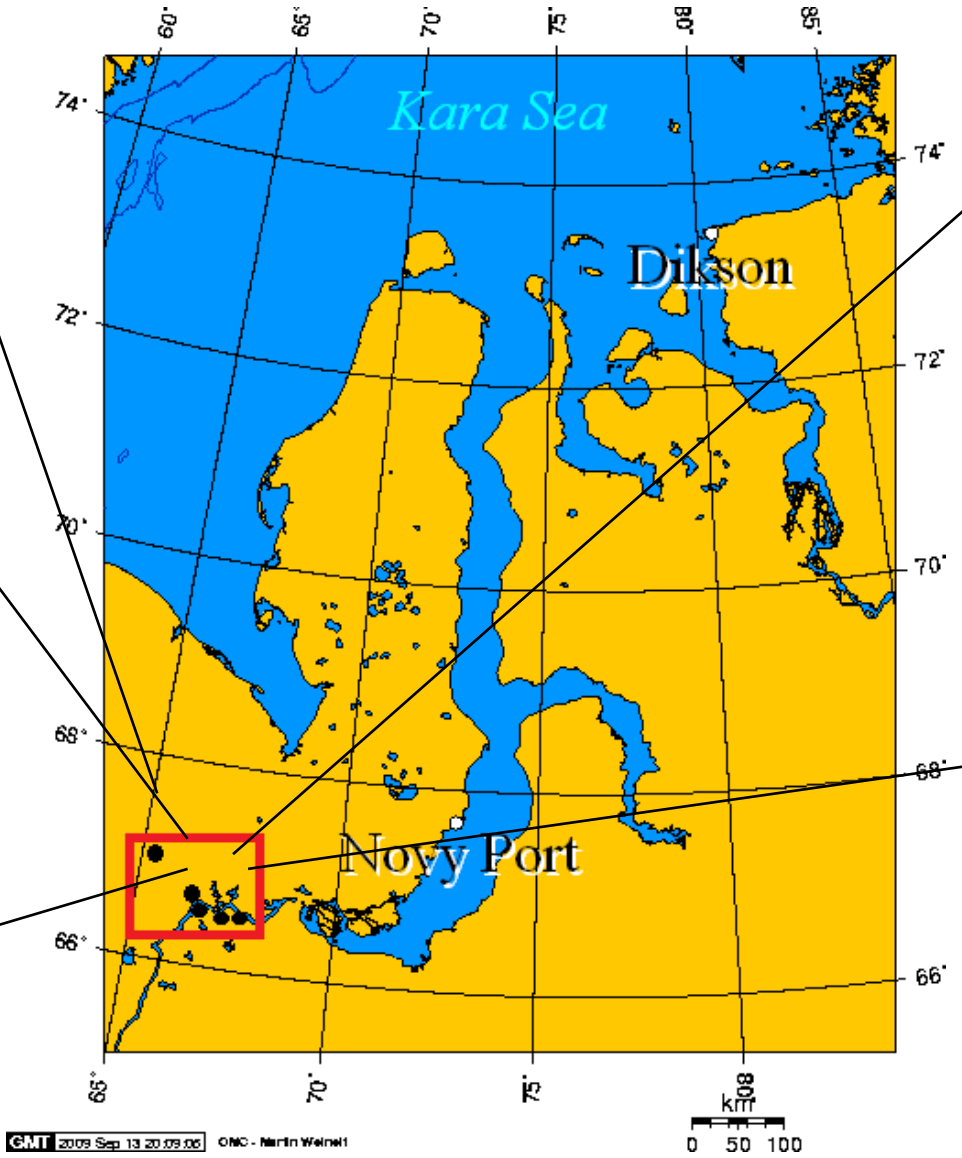


Urbanization and Environmental pollution

Kharp

Labytnangi

Salekhard

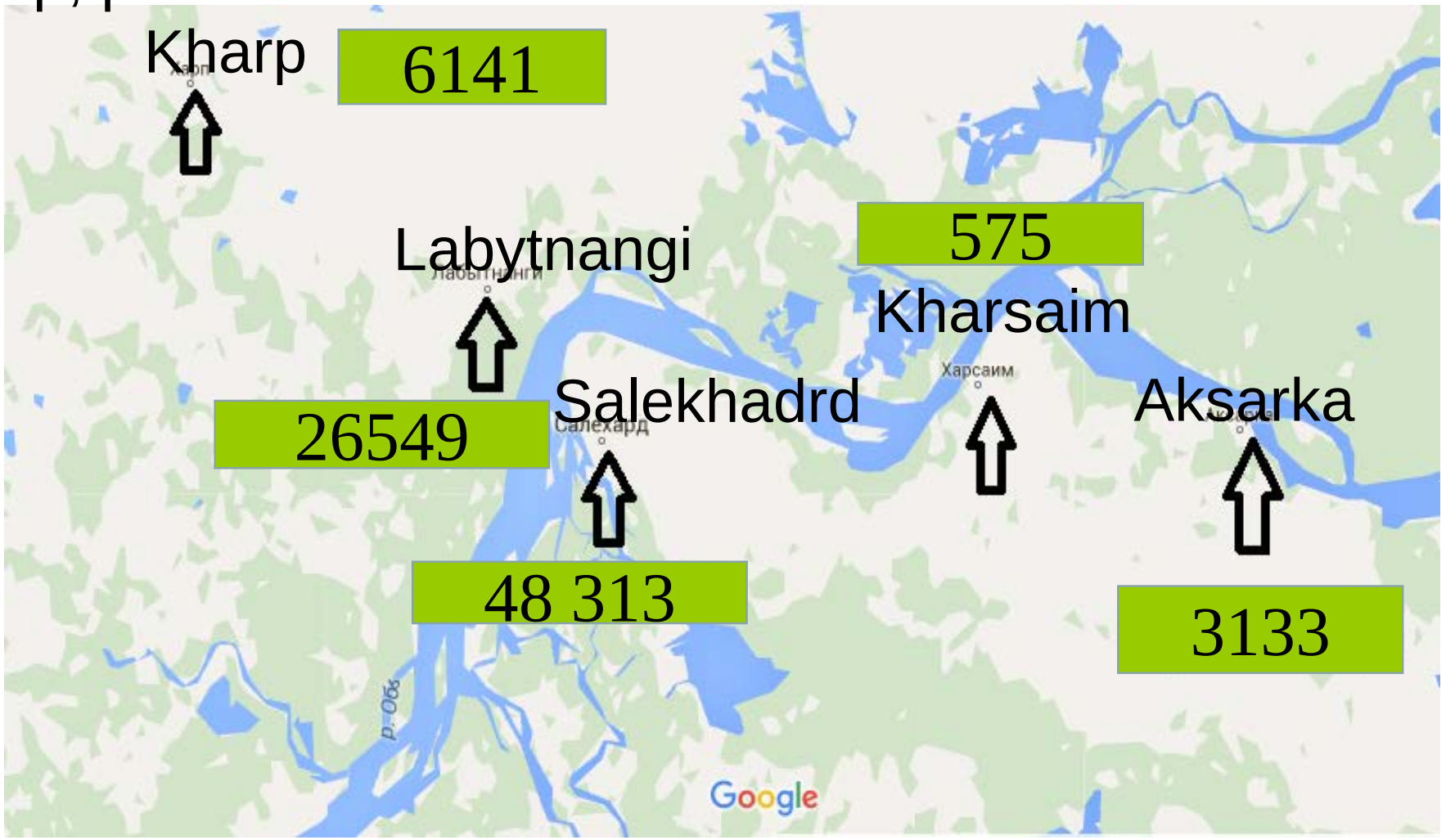


Kharsaim

Aksarka

An example of polar aglomeration, Salekhard

Kharp, prison



Yakutsk – localization of city close to the river transport arteria in forest-tundra

city

Forest tundra

Remote picture of the Nadym city: homogenous social structure in overpopulated environment, surrounded by a forest tundra

Remote picture of the Novy Urengoy: high concentration and tension of population, energy and fluxes in the city

The quality of life: people isolated not only from Main Russia, but even from nearest city block

The quality of life: people have to make an effort to get the main city hospital

The quality of life: local roads in spring and autumn are affected by strong water erosion

The quality of life: local roads – how to force 5 km between two highly developed settlements

So, the quality of life in merged and northernmost areas is quite different from quality of life in Central Siberia or in Main Russia. People live in “Fossil type of Economics” before retiring, after what they use to move themselves to European part or to South Siberia. *The goal of this research is to understand if the quality of their life is regulated by valuation of ecosystem services*.

Introduction

The idea of ‘ecosystem services’ developed from the long-standing recognition that humans depend on the natural world directly and indirectly.

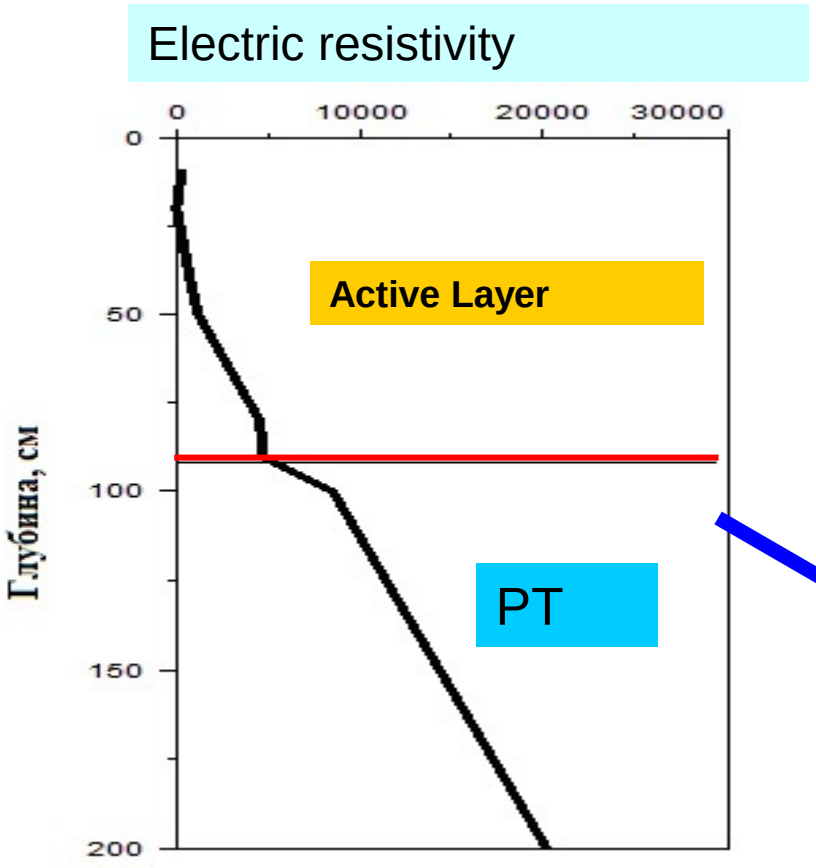
The term is an effort to identify and measure “the benefits that people receive from nature” (Millenium Ecosystem…..2005)

Ecosystem Services Definition

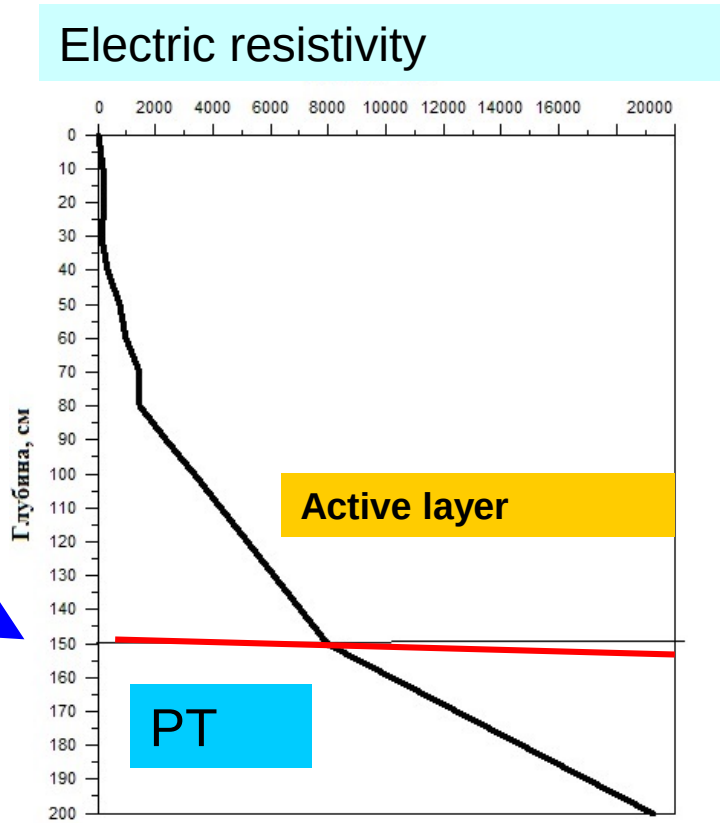
The benefits people obtain from *ecosystems*. These include *provisioning services* such as food and water; *regulating services* such as flood and disease control; *cultural services* such as spiritual, recreational, and cultural benefits; and *supporting services* such as nutrient cycling that maintain the conditions for life on Earth.

The second term which is used in Russian ecology and environmental studies is ecological functions. *Evaluated and measured, or monetized* ecological functions become *ESS*.

Permafrost degradation is more expressed under the urbanized areas – Salekhard city, Yamal- NEGATIVE EXAMPLES – ecosystem services devaluation and degradation



Tundra

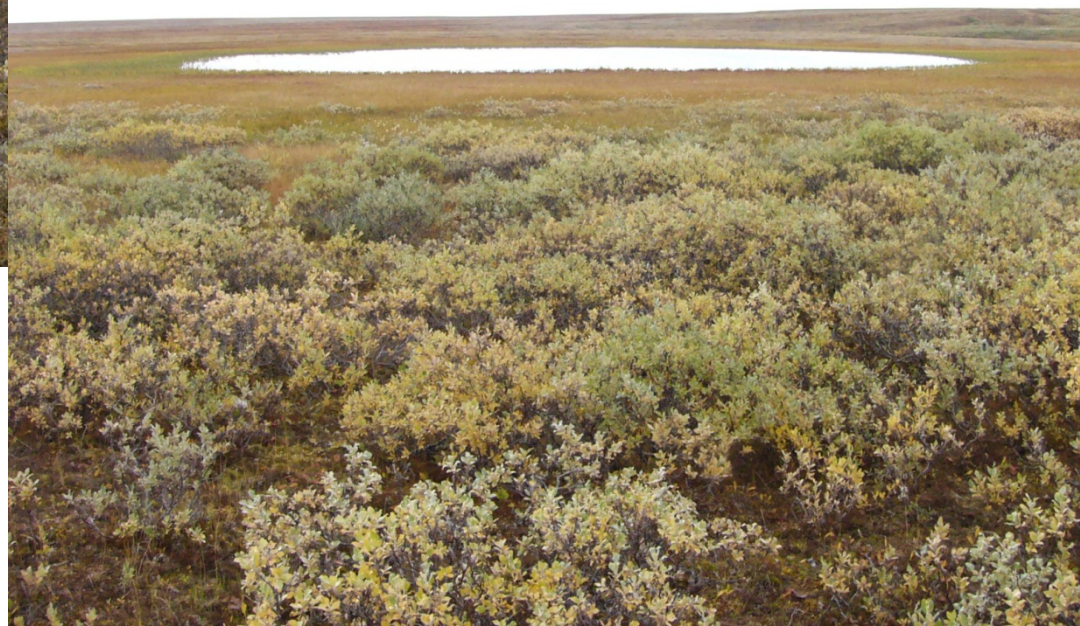


City

Risks of permafrost degradation for linear constructions (Yakutsks)

Agrolandscapes became a LAKEs: alases and related land forms

Pristine tundra transfers to ecosystem, convenient to recreation activity – Positive effect



Urbanized tundra in Salekhard and Labytnangy, center of Yamal region

Salekhard

Labytnangy

Greening practices, introduction and plant adoptation

Successful adaptation of *Physocarpus sp.* In Salekhard

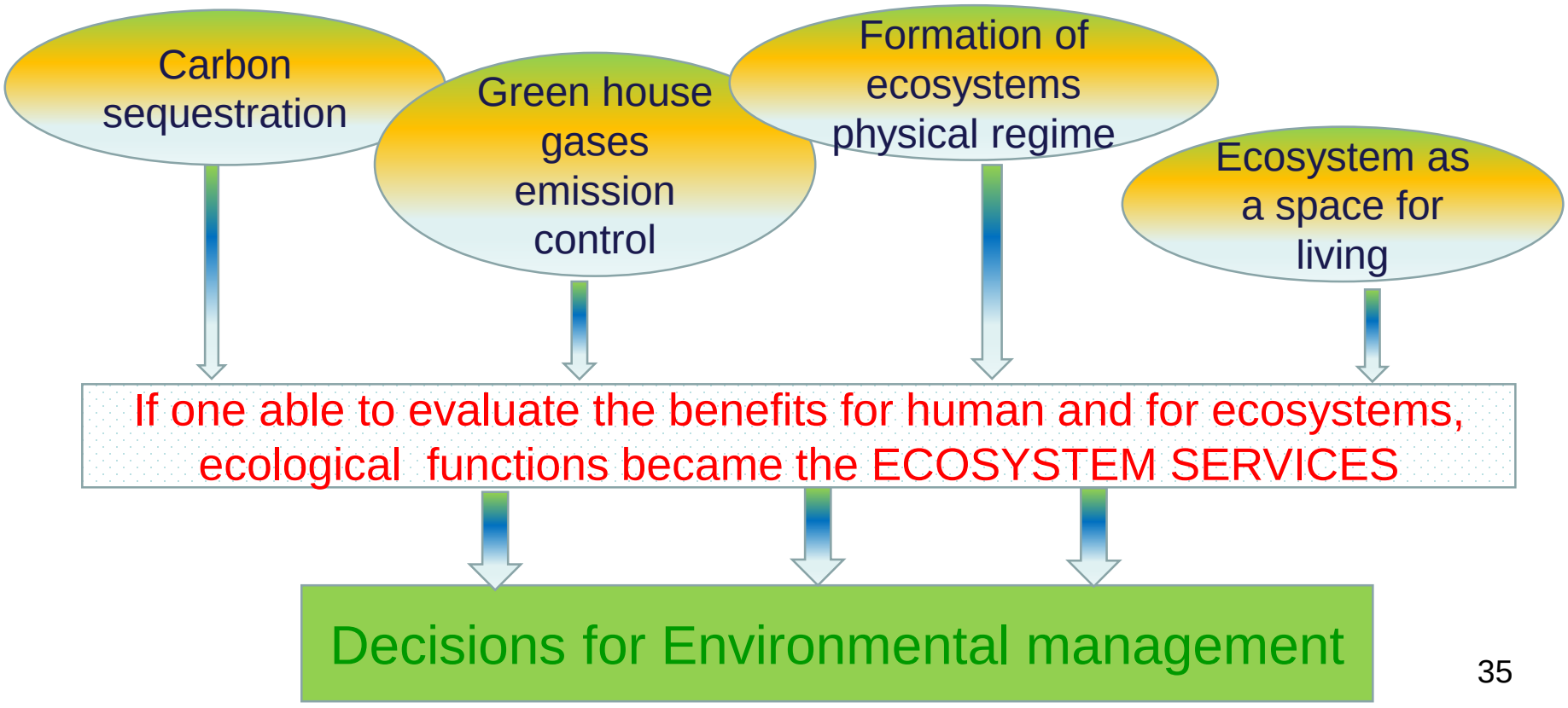
Failure greening within the *Abies sp.*

The playground in 35 km from city of Nadym in tundra:

an example of the budget implementation

Polar Ecology vs Ecosystem Services

Soil Ecology is part of soil science which characterizes the Soil Ecological functions, e.g.:



Monetization of the Ecosystem services

Group of ES	Amenability for economical evaluation	Appropriate method for evaluation	Amenability for Antarctic
Waste management	High	Avoided costs, replacement cost+ logistic	+++
Genetic resources	Low	Production assessment, Market pricing	++
Water quality	High	Avoided costs, replacement cost+ logistic, Market pricing	+
Soil contamination and their buffer capacity	High	Avoided costs, Quality of life	++
Carbon sequestration	Medium	Avioded costs, Indirect effect of the quality of life	+++

Is the concept of Ecosystem services is applicable for local specialists and population? Results of questioning of 50 persons in two groups, rate of positive answers

Question	Scientists	Spontaneous people on the street
What is ESs? Did you heard anything about ESs?	20 %	2 %
Do we have any benefits from the ecosystems?	55 %	10 %
Are the benefits from ESs are comparable with those form fossil fuels benefits?	40 %	5 %
Are the ESs important for local economics development?	45 %	10 %

The results of questioning: the 5 Top-Ecosystem Services in the Arctic City

Scientists	Spontaneous people on the street
Carbon stabilization	Water support
Pollution regulation in terrestrial environments	Recreation
Stability of ecosystem physical properties in permafrost thawing conditions	Profits from touristic activity
Water support	Quality of traffic facilities
Environmental urban design	Green infrastructure

Remaining (future) tasks:

-to evaluate the level of information quality and availability of information about the meaning, diversity and importance of the ecosystems services

-to elaborate the mechanisms of the ESs evaluation and transfer to monetization forms