ENVIRONMENTAL STRATEGY FOR THE BARENTS REGION

BARENTS 2010
The Interreg III B Baltic Sea

The WP4 Water and Biodiversity Groups

Picture on cover page: Aarno Torvinen, Lapland Regional Environment Centre.

FOREWORD

The main goal of WP4 in the Barents 2010 Project was to develop a strategy and action plan for future environmental collaboration within the Barents Region. This report includes the strategy for waters and biodiversity in the Barents Region. The report was prepared with the assistance of regional experts and specialists in 2004-2005. We would like to thank the Barents Regional Working Group on Environment, which was the reference group for this environmental portion of the Barents 2010 Project, other partners and financial contributors, and project groups of WP4.

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Environmental Strategy for the Barents Region 1

1 PROJECT DESCRIPTION

The project was initiated by the Barents Regional Council and follows up an evaluation of regional collaboration in the Barents Region 1993-2000. The Barents Region consists of thirteen regions and many different ethnic groups in four countries, which share a lot of common problems. Differences in culture, legal framework, etc. create problems and hamper fruitful collaboration. Almost all parts of the Region are losing population and it is alarming that the young generation is leaving the Region. There are many organised collaboration activities and several programmes financed by the EU (Interreg and Tacis), the Nordic Council of Ministers and national aid organisations. However, all of them lack sufficient data for preparing long-term programmes for collaboration.

The main goal of this project is to develop a strategy and action plan for future collaboration within the Barents Region. Parallel with the development of the strategy and action plan, a number of work packages will be undertaken. These work packages will interact and serve as input to the plan. Successful work packages will also be given priority in the next phase of the Barents Cooperation. The project activities are organised in the following five work packages:

Development of a strategy and action plan, to which all the other work packages will contribute. A special focus in this work package will be on information and the youth perspective.
Work package on industrial development; specific problems for the development of the industry in the Region with special focus on forestry, minerals and offshore fishing.
Work package on higher education and research with the aim to create networks and projects.
Work package on the environment with special focus on water quality and biodiversity.
Work package on transport and infrastructure, with special attention to co-ordinating with the Interreg Project on a sustainable transport system in the Barents Region.

1.1 Results

The expected outcomes of the five work packages are:

A strategy and action plan for the Barents Region up to 2010, including elements from the other work packages as well as the information strategy and youth perspective.
The creation of cross-border industrial collaboration projects in key economic sectors, such as forestry, minerals and offshore fishing.
Suggestions on how to improve education and research collaboration in the Barents Region for selected areas, and how to present at least five new collaboration projects.
Action plan based on analysis of the environmental situation in the Barents Region regarding water quality and biodiversity as a basis for future improvement.
New operational networks in the area of transport and infrastructure.

1.2 Implementation

The Barents Region consists of 13 member regions. Each of the Nordic regions will have responsibility for one work package and will create project teams with members from two other Nordic regions and two Russian regions. Each work package has its own plan and activities. The co-ordination will be made in work package 1.

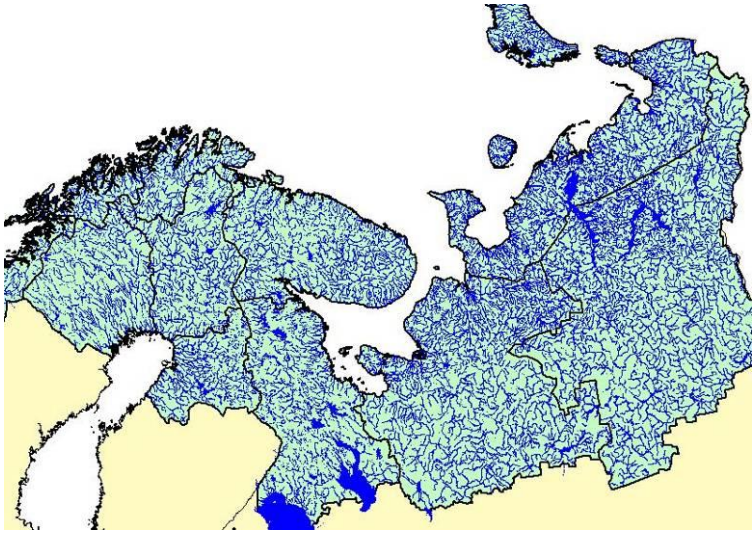
1.3 Partners and financial contributors

The counties of Västerbotten (lead partner) and Norrbotten; Regional Councils of Lapland, Northern Ostrobothnia and Kainuu; Regional Administrations of the Counties of Nordland, Troms and Finnmark; The Republics of Karelia and Komi, Murmansk and Arkhangelsk Regions, and Nenets Autonomous District. The project is financed in part by Interreg III B Baltic Sea.

2 MISSION FOR WP4

2.1 Water Group

The main target in WP4 (Water Group) is to improve the environmental situation of surface and groundwaters in the Barents Region. Sustainable use of waters is important with industry and drinking water issues for keeping of the good status of waters.



2.1.1 Background for water strategy work

2.1.1.1 Barents Euro-Arctic Regional Council, Regional Working Group on Environment. Action Programme: Water Chapter, updated 2005

2.1.1.2 Background

The most important environmental issues in the state of natural waters are acidification, heavy metals and POPs in the Russian Barents Region. All these threats are connected with industrial emissions. Because of insufficient purification of municipal wastewaters, eutrophication and hygienic pollution are also causing severe problems. In the Nordic part of the Barents Region, purification of wastewaters and industrial emissions is quite effective, and the environmental problems are usually local. In practice, non-point loading is the most challenging problem the area. The state of the waters is considered mostly good or excellent. In some small areas, the state can be worse. Also, the drinking water systems are in a good and safe state.

There have been several studies and publications in the AMAP process concerning acidification (AMAP Assessment Report: Arctic Pollution Issues, 1998), heavy metals and POPs (Arctic Pollution, 2002). A number of northern research projects were also accomplished in the late 1990s. The result of the monitoring and research carried out in 1980s and in the early 1990s in freshwater ecosystems showed that the pollution, leading to biological damage, would continue if the emissions were not reduced. However, a decrease in the emissions of sulphur

and heavy metals has been noticed in the Barents Region and in Europe in 1990s. The acidification process has been reduced and even stopped in some areas (e.g., Finnish Lapland) during recent years, but there are still acidified lakes in the Barents Region and episodic acidic pulses during the spring flood period.

Sulphur compounds are particularly troublesome as they are the most important pollutants and, in addition, are mainly released by human activities, e.g. heavy industry and energy production. Likewise, nitrogen compounds (from combustion and agriculture) greatly contribute to acidification, even though their influence here in the North is more limited. Both sulphur and nitrogen build up compounds that have the greatest environmental effect near the source of emission, but even pollutants that are found further away are important for the total environmental burden.

The heavy metal pressure on the environment is also often connected with sulphur dioxide emissions. In general, heavy metals and alkaline pollutants contaminate areas around the sources of pollution (mainly within 200 kilometres), while acid sulphates can be spread to long distances. The main heavy metal pollutants in the Barents Region are nickel and copper, but other metals are also emitted. Mercury, removed from the atmosphere, is the latest known threat to the Arctic environment.

The group of persistent organic pollutants (POPs) includes a large number of organic chemicals with potential environmental hazards. Examples of POP chemicals are PCB and DDT. POPs can drift great distances and reach the Barents Region from far away. So far, there have been few studies of the POP levels in the freshwater ecosystem in the Barents Region, which is why it is difficult to define the trends. But the existence of POPs can be measured, especially in the Russian Barents Region.

There is evidence to confirm that the inhabitants are exposed to hazardous pollutants in the drinking water in many Russian parts of the Barents Region. An important factor is the availability of good drinking water. In the Russian part of the Barents Region, drinking water is usually taken from the surface water, and purification is often limited to chlorination. Many surface water supplies are clearly influenced by air- and water-borne and pollution. An improved quality of drinking water would quickly improve health conditions of a greater part of the population. The most vulnerable are the infants.

Because of the evident climate change that is taking place, the risks of severe flooding are increasing in the entire Barents Region. River valleys are traditional places for settlements in all northern regions. Thus, the risks for flood damage, especially in the future, are increasingly obvious. The benchmarking and harmonising of hydrological monitoring and forecasting methods could be very fruitful. Also, the exchange of information about flood-control practices and prevention will be important.

2.1.1.3 Activities

Considering that environmental pollution is connected with a heath risk for the population in the Russian Barents Region, it is necessary to reduce emissions to a level below the critical levels and continue the positive progress of decreasing the emissions, which is the only way to improve the state of the environment. Reducing acidifying emissions will help several other

environmental problems, e.g. heavy metal pollution, and the influence would be at the safe level, when considering the actual rate of acidification.

The current groundwater project must be enlarged to a full-scale study, comprising a drinking water supply to a small town. The first part of the study should include a technical and financial survey and a recommendation for a suitable site. The second phase should be aimed at the full-scale implementation of the groundwater-based drinking water project and an assessment of its effects.

The most important areas of regional collaboration are:

- Harmonising water quality and water ecological monitoring programmes, especially in the trans-boundary areas;
- Harmonising and developing common hydrological monitoring and flood forecasting methods in the Barents Region;
- Implementing of groundwater-based, small- and medium-scale drinking water projects in the Russian Barents Region;
- Increasing the quality assurance level of the water quality monitoring laboratories in the Russian Barents Region;
- Transferring knowledge on small-scale municipal wastewater purification techniques to the Russian part of Barents Region.

2.1.2 State of water environment in the Barents Region

2.1.2.1 The condition of water resources in Arkhangelsk Oblast.

Arkhangelsk Oblast has considerable water resources: the specific water supply is over 600,000 m^3/km^2, and there are about 240,000 m^3 per capita annually. The main source of water supply is the Northern Dvina River. The river's annual runoff is 110 km^3 and ranks fourth in Europe after the Volga. A considerable amount of the river runoff comes from other constituents of the Russian Federation: the Komi Republic, Vologda Oblast and Kirovsk Oblast.

Water supply. A specific feature of the water supply system in Arkhangelsk Oblast is its general orientation to superficial water resources. This also refers to the water supply of the population. The specific draw-off volume from underground water sources is very low – 4.2 % of the total volume of draw-off, whereas the proportion of total underground water use for household and drinking in Russia is 45 %. The structure of water consumption in the basin of the Northern Dvina is as follows: The main part of all drawn-off water is used for industrial purposes, or 76 %; household use and consumption in the home and industrial buildings consume 17 %; agriculture water supply totals 0.7 %. The major water consumers, which largely shape the water management situation, are traditionally pulp and paper plants, heat and power engineering, and housing and communal utilities.

The drawbacks of the water supply in Arkhangelsk Oblast are: the quality of the superficial water sources does not meet the sanitary and hygiene requirements; the plumbing system is severely run-down; and there is a great amount of leakage while transported to the consumers (at a rate of 30 %)

The drainage system and the quality of the river water. One of the most negative anthropogenic impacts on the environment of Arkhangelsk Oblast is pollution by permanent sewage of enterprises, with rainwater and unapproved accumulations of industrial and household waste. The maximum amount of sewage water to the Northern Dvina – 72 % or 430 million m^3 – is polluted wastewater, 60 % of which comes from the pulp and paper plants in the Oblast, i.e. in Kotlas, Arkhangelsk and Solombal. The total capacity of the sewage treatment system exceeds the amount of wastewater to be treated. However, the quality of treatment does not meet the ecological standard norms. Only 6.0 % of sewage is treated satisfactorily, which is similar to the situation in the whole country: according to the State Report: "On the condition of water resources in RF" in 2002, only slightly more than 10 % of all sewage was treated satisfactorily.

Despite the great dilution potential due to the amount of the river runoff, the assimilation of an enormous amount of homogeneous polluted wastes from the pulp and paper plants, mainly organic, is limited by the low potential of self-purification due to low mineralisation, low temperatures and biogenic insufficiency of the river water.

According to the Northern Directorate for Hydrometeorology and Environmental Pollution Monitoring, the level of pollution (in terms of Russian Federation classification) fluctuates from "moderately polluted" in some areas to "polluted" in most areas. The most common pollutants for the Northern Dvina are compounds of iron, copper, zinc, lignin substances, phenols, easily-oxidisable and heavy oxidisable organic substances. The reasons for the current

situation are well-known: the designed treatment technology does not meet the required standards for fishing water reservoirs; the treatment method does not correspond to the nature of the main amount of waste from the pulp and paper plants; a shortage of funding for overhaul and repair of the treatment equipment despite its highly run-down condition; and low efficiency of the existing instruments of environmental monitoring and industrial management.

The water condition in the Northern Dvina not only causes problems for household and drinking water supplies for the population, but also threatens the existing ecological systems. The Northern Dvina is classified as a fishing water reservoir of the highest and first group. Most of the edible fish (silver salmon, white fish and starlet) living in the Northern Dvina, especially in the mouth area, are highly vulnerable to anthropogenic pollution of water and to concentration of dissolved oxygen. The worst situation concerning dissolved oxygen concentrations in the rivers in winter caused by wastewater impact was registered before the 1980s. The gradual decrease of the anthropogenic effect due to a drop in industrial production and environmentally friendly projects at the various plants and businesses considerably improved the situation around the dissolved oxygen concentrations and the environmental condition in general. According to research by the Institute of Environmental Problems of the North done in 1997-1999 in the mouth area of the Northern Dvina, the pulp and paper plants sewage damages phyto- and zooplankton, but does not cause irreversible changes in their structure. It is also noteworthy that the natural factors also influence the condition of the superficial water. Among these important natural factors are: high non-ferrous concentrations and oxidisability, poor micro-element composition, a low level of mineralisation and hardness of water.

According to numerous medical and biological researches, regular consumption of such natural water may cause various pathologies in the population, in particular cardiovascular, and problems of hyperphtorosis. This dangerous situation around the condition of superficial water makes it necessary to address the problem of the population's drinking water supply. Within the framework of the local programmes, pre-discovery and estimation research is being done to provide the populations of Arkhangelsk and Onega with safe and healthy water sources. Three objects of underground water sources (Pachuzhsky, Arkhangelsky and Onezhsky) are being studied.

According to the studies of the underground water condition within the federal monitoring of water reservoirs, the underground water condition in the bigger part of its location meets the requirements of the federal standards for "drinking water". Only in a few areas are there unsuitable concentrations of iron, strontium, manganese and non-ferrous metals due to the natural conditions. At the same time, environmental monitoring data in the Region confirm the negative anthropogenic impact on the quality of underground water that is characterised as local. Few pollution areas of the upper non-productive part of quaternary system are joined to objects of economic activity not related to deposit management in the areas of sludge- and ash disposal and landfills for industrial and household wastes. Such areas are not suitable as water source areas, but in some districts, they are potential pollution sources for the neighbouring water supply systems.

2.1.2.2 The condition of water resources in Komi Republic

The river system of Komi Republic is connected to the basins of four seas: the White Sea (the rivers Vychegda, Luza and Mezen), the Barents Sea (the Pechora), the Kara Sea (the Kara River) and the Caspian Sea (the rivers Letka, Kobra and Berezovka). Two large rivers start and in the area and flow through the area of the Republic – the Pechora and the Vychegda. The length of the Pechora within the Republic is 1,570 km; the length of the Vychegda within the Republic is 920 km. In all, there are about 58,000 rivers, streams and temporary streams in the Republic.

There are around 70,000 lakes with a total area of 4.3 thousand km², which amounts to less than 0.5 % of the total area of the Republic. Among the relatively large lakes are: Yamozero (31.1 km²), Sindorskoye (28.5 km²), Kosminskoye (12.6 km²), Bolshoye Mylskoye (8.8 km²), Don-ty (4.6 km²), Kadomskoye (5.2 km²) and Torgovoye (1.2 km²). Marshes and swamplands are very common. The average marshiness of the area is 9.6 %, with high moor marshes amounting to over 60 %. Among them are the largest marshes in Europe – the Okean (1,790 km²) and the Usinskoye (1,570 km²).

Most industries use river flow water resources, which form in the range of 162.7 km³ in the territory of the Komi Republic and 13.4 km³ come from outside of its territory. The Republic has considerable resources of fresh groundwater suitable for a drinking water supply. The potential useful groundwater resources in the Republic suitable for household and drinking water supply are 62.13 million m³ per day. About 0.4 % of the total groundwater resources are used. According to the statistical accounts for 2003, the total water consumption from the natural water reservoirs amounted to 687 million m³, including 42.08 million m³ from underground reservoirs. The groundwater resources are considerably larger than those of surface water due to better protection from the sources of pollution. At the same time, there is a real opportunity to satisfy the current and future demands for water in a number of towns and settlements with the help of the proven resources of groundwaters.

The amount of sewage that was dumped into the natural water reservoirs amounted to 571.9 million m³ per year, including polluted sewage of 144.8 million m³ (25.3 %). The most significant amounts of water consumption are from the basins of the rivers Pechora and Vychegda (the Pechora – 459.98 million m³; the Vychegda – 211.17 million m³). The highest water consumption is in: the electric power industry – 48 %; the timber-, woodworking-, cellulose- and paper industries – 23 %; housing and communal utilities – 21%; and fuel industry – 7 %.

The destructive impact of water is also a serious problem – floods, deluges, flooding and waterlogging of land, settlements and economic objects. The cutback in the number of hydro-meteorological and hydrometric stations resulted in the reduction of the quality and reliability of flood forecasts. Over the last years in the basins of the rivers Pechora and Vychegda, progressive washouts of the banks and landslides threatening the settlements, houses, grounds, bridges and power lines have been observed.

In the cities of Syktyvkar and Pechora, in particular, the current need for household and fresh groundwater for drinking is not satisfied with the proven resources. Besides, in these cities as well as in Ukhta, Inta, Vorkuta and Vukhtyl and in the large urban villages, many groundwater

resources are inadequately protected from pollution, and almost none of the towns have reserve water resources in case of emergencies.

The regional programme "Drinking Water Supply of Komi Republic's Population" has been developed and implemented, and a special programme for use, protection and restoration of water resources for 2004-2015 has been developed. Among the important steps, a number of shore-protecting constructions are planned on the Izhma River (Pechora Basin), on the Lokchim River, as well as shore-protection on the Sysola River near the capital of the Republic – the city of Syktyvkar (Vychegda Basin).

2.1.2.3 The condition of water resources in Nenets Autonomus Okrug (NAO)

The Nenets Autonomous Okrug (NAO) is a region where the considerable natural resources determine the prospects of its development, the concentration of oil and gas industries and the resulting growing need for drinking water. The situation around the population's supply of water of drinking quality is traditionally difficult in this region due to climatic and geographic factors: widespread permafrost layers, large marshy areas, low density of population, small- and medium braided rivers, the influence of the sea in the near-shore areas etc., and the human-caused factors – the impact of industrial and agricultural enterprises on the ground- and surface waters.

Rivers. For the reasons stated above, the river water quality of the territory under analysis sometimes does not meet the sanitary requirements (State Standard) in such indicators as iron, BOD and COD, and more rarely in dredges, oxygen, the pH indicator and in mineralisation in the estuaries of the rives flowing into the White Sea, the Barents Sea and Kara Sea. However, this possibility decreases as the ratio of mountainous areas increases in the river area where water is taken.

Lakes. The concentrations of the standardised forms of nitrogen and phosphorus mineral compounds in lakes do not exceed the maximum permissible concentrations. The general concentrations of toxic substances in lakes in the NAO territory do not exceed the sanitary standards, except sometimes for small water bodies in town areas. As in the rivers, many lakes have high concentrations of iron, which makes them unsuitable for drinking purposes without treatment.

Drinking water. The drinking water supply for the population is a national problem, and its solution requires a comprehensive approach. For the Nenets Autonomous Okrug (national territory), the population's supply of drinking water of the quality satisfying the standard requirements is one of the most important social problems. The existing problem of an insufficient supply of water of drinking quality for NAO's population is caused by two major factors: the low quality of the natural water and poor geological, hydro-geological, hydro-chemical and hydrological studies of the region. The main reason why the region is not thoroughly studied is the low density of population and its uneven distribution. The forecast useful resources and discovered resources of groundwater considering the territorial disposition of settlements in the Okrug in most cases allow for satisfying the population's need for fresh water.

The quality of fresh groundwater in most settlements does not meet the standard requirements for drinking water in the concentration of iron, and in some settlements in the concentrations of

nitrates, nitrites and sulphates. The high concentration of iron is accounted for by natural factors. The high concentrations of other harmful substances are human-caused and can be accounted for, firstly, by poor protection of the first surface water-bearing table, and, secondly, by the lack of sanitary protection zones around water-taking facilities. The useful resources of the large rivers do not limit the nearby settlements' water consumption, but the water quality does not meet the standard sanitary requirements. Surface water in estuaries and near-shore areas is not drinkable due to its high mineralisation, and the water in the small rivers, streams and lakes is not drinkable due to its high concentrations of BOD, iron, dredges and COD. In most cases, ground- and surface water in the Okrug will have to undergo special treatment in order to be used for drinking purposes.

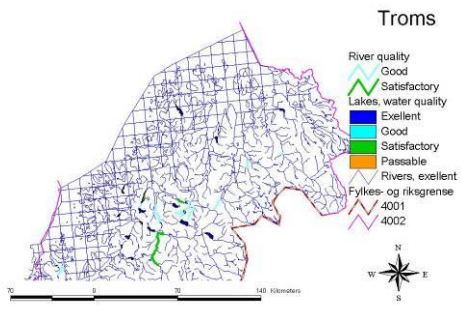
To choose the optimal source of water supply, the location of water-taking facilities, the technology of water supply and water treatment in most settlements, special full-scale (field) work will be necessary, including geological, hydro-geological and ecological research. Special attention must be paid to the current environmental conditions of each object and the actual possibility to take conservation measures while arranging groundwater extraction.

For economic reasons (cost of water supply per capita), the prior settlements for implementation of the programme arrangements aimed at improvement of the water supply system are those with a population over 400 people in which the actual water consumption and water quality do not meet the standard requirements.

2.1.2.4 The condition of water resources in Troms County

Many waters in Troms County are affected by hydropower regulations. Road building has reduced the amount of natural waters. In addition, many larger and smaller constructions along the rivers have been built to protect areas with buildings, etc. and agricultural areas. The main pollution sources in Troms are from agriculture and sewage. No effects of acidification of inland waters are registered. Heavy metals in water from industrial sources seem to be low. The situation concerning POPs is uncertain. Long transported pollutions are as low, as a whole. Even pollution from local industry is low, but detectable.

The main interests for water use are drinking water and water for industry, outdoor- and sporting activities (fishing, rafting). Knowledge about water quality is quite good: there have been a lot of investigations in Troms County. The situation concerning pollution is relatively well-known (AMAP, NIVA, Akvaplan-niva, County Governor of Troms, etc.).



Map 1 is based on the Norwegian water quality classification

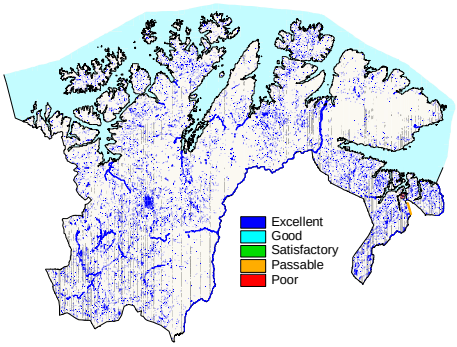
Only a few lakes in Troms are affected by pollution. Two lakes had the classification "Poor" ("IV"), eight had the classification "Satisfactory" ("Less good"), four had "II" ("Good") and the rest were "Good". The main pollution causes are agriculture and sewage. The source of pollution is known for each lake. Four watercourses had stretches with the condition "Strongly polluted". The main pollution causes are agriculture and sewage. The source of pollution is known for each lake.

Very little of the surface water is polluted by industry. In inland waters, very few industries are located near or have their outlet in these waters. The main sources of pollution are from agriculture and sewage. The sources are known in each case. Increasing forestry in birch forests may result in increasing eutrophication and increasing runoff of organic materials.

The quality of drinking water is well-known, and water used in industry is probably well-known. Radioactivity in Troms is monitored at three stations. All stations in Norway had degrees, which were natural variations.

2.1.2.5 The condition of water resources in Finnmark County

Both surface water and groundwater in Finnmark County are either close to or in natural conditions, with a few exceptions. The exceptions are due to local industry in two countries, and include acidification, heavy metals and POPs in the surface water in the eastern part of the county. Dietary advice is given in this region because the dioxin content in the fish from two lakes is too high.



Map 2 is based on the Norwegian water quality classification

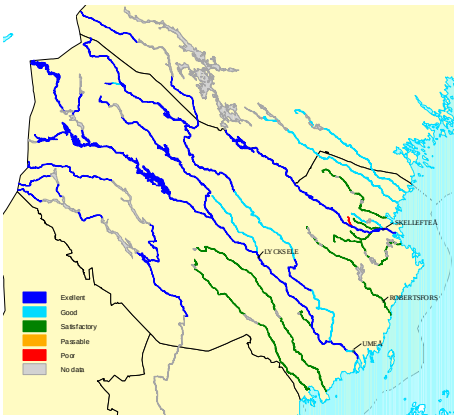
Hydroelectric power plants, roads, industry, buildings and human activity within the county do not affect water quality in such a manner that the condition is threatened. The industry in Northwest Russia affects the watercourses in the eastern part of the county. The neighbouring counties in Norway, Finland and Russia collaborate to detect development from this pollution. Other kinds of long transported pollution are not regarded as a threat to the watercourses in the county.

Large watercourses originating in the inland are often oligotrophic with some humus. Smaller watercourses originating in coastal areas are oligotrophic. Large lakes are oligotrophic, while shallow lakes in the inland often have higher trophic status. The statuses of the watercourses are a result of natural processes such as mineral weathering and conversion of organic materials in the catchment areas. The watercourses are only slightly affected by anthropogenic factors. However, there are some effects due to sewage downstream in some densely populated areas. With a few exceptions, agriculture does not affect the overall status of the watercourses within the county.

The main uses of water are drinking water, water to industry, outdoor- and sporting activities. The quality of the water is well-known.

2.1.2.6 The condition of water resources in Västerbotten County

The larger watercourses in Västerbotten County are relatively oligotrophic and moderately humic. This is particularly true for the watercourses with their sources in the Swedish mountain area. The rivers and the smaller watercourses situated closer to the coast in the forest- and agricultural areas often have a higher level of eutrophication and are more humic.



Map 3 is based on the Swedish water quality classification

The trophic states of the watercourses are primarily a result of natural processes such as mineral weathering and decomposition of organic materials within each of the catchments. However, they are also affected by anthropogenic factors such as forestry, agriculture, industries, hydroelectric power stations, settlements and sewage treatment plants.

Factors affecting the leakage of nutritional components from the soil are forestry and agriculture. Forestry, in particular, is important because of clear-cutting and ditching, which increase the mobility of phosphorus in the soil. Agriculture, on the other hand, is not such a large source of phosphorus leakage in Västerbotten since is not so widespread. For example, in the catchment area of the Ume River, only 2 % of the total area is used as arable land.

Hydroelectric power stations can reduce the amount of total phosphorus in a watercourse. Dams and lakes can have the effect of a sediment trap. This is because a large amount of the total phosphorus is bound to organic and minerogenic particles; when the velocity of the water mass decreases, the particles sink to the bottom. Some severely eutrophicated lakes can function as phosphorus sources under anaerobic conditions; however, no lakes in Västerbotten are so eutrophic.

The largest point sources of phosphorus leading directly into the watercourses of Västerbotten are, in descending order, the sewage treatment plants of Umeå, Skellefteå and Robertsfors. The larger point sources of phosphorus caused by industries are situated along the coastline, and thus do not affect Västerbotten's watercourses.

Before the 1960s, discharges of nutritional components from sewage treatment plants were very extensive. This was due to large amounts of phosphorus in household detergents and washing-up liquid combined with poor wastewater purification. Since then, the discharges have been reduced due to reduced levels of phosphorous in household detergents and washing-up liquids, and with the improvement of wastewater purification technology. An example of this is the change in phosphorus discharges from Umeå sewage treatment plants; in 1969, they were around 100 tonnes/year; in 1985, 35 tonnes/year; and most recently, in 2000, 8.5 tonnes/year.

Watercourses that are considered acidic are rather common in Västerbotten. Most of them are situated in the eastern part of the county. One natural source of acidity is organic acids, formed from the decay of dead vegetation from forests and mires. The eastern coastal area is also rich in marine sulphide-rich sediments formed during the warm Littorina period, when the area was covered with seawater. Today, because of the isostatic uplift after the retreat of the last ice sheet, these sediments are situated above sea level and have the capacity to release large amounts of sulphur when oxidised. In addition to the natural acidity, there is an anthropogenic acidification. The main source of this anthropogenic acidification is the deposition of sulphur and nitrogen. Another source is forestry, which contributes to increased acidity with the removal of alkaline compounds. The anthropogenic deposition of sulphur and nitrogen had its peak during the latter half of the 1970s, and since then, the deposition has been greatly reduced.

However, some problems with acidification are considered to remain. Because of this, 1,600 km of watercourses and 458 lakes (out of 16,799) in Västerbotten are limed.

Previously, there were problems with heavy metal discharges and hazardous substances from industries. The Rönnskär Plant in Skellefteå in particular used to be a large point source for arsenic and zinc. Since the mid-1980s, the discharges from industry have been significantly reduced. Another problem that has been reduced is mercury concentration in predatory fish species. However, some problems remain near some industrial sites.

The groundwater supply is good in Västerbotten, and the water is soft and of relatively good quality. Drinking water is taken both from the 155 groundwater sources and from surface waters. One hundred of these groundwater sources have special security regulations to protect them from contamination.

A study of 42 groundwater sources revealed signs of acidification in large areas, with 69 % of the tested groundwater resources considered as acidified. The same study showed that none of these groundwater sources had nitrite-nitrogen (N_2O^-) levels exceeding the suggested environmental quality standards. However, this does not exclude the possibility that there are localities where the level of nitrite-nitrogen is increased by activities such as forestry, agriculture, sewage, etc. Some of the groundwater sources showed increased levels of chloride. These increased levels could be a result of intrusion of seawater, weathering of sedimentary bedrock, sewage or use of salt on roads in winter.

In some parts of Västerbotten, there is a high risk of radon contamination in the drinking water, owing to uranium-rich minerals in the bedrock. The most highly affected areas are Storuman and Skellefteå. In these two regions, 50 and 42 %, respectively, of the bedrock-drilled wells show a radon content exceeding the threshold value of 500 Bq/l.

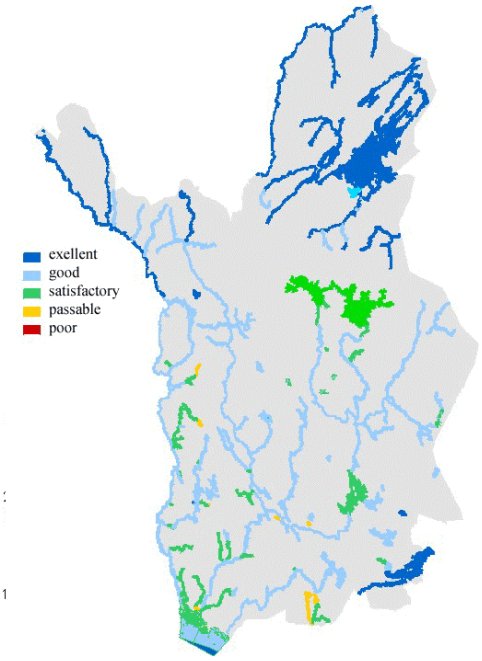
Thorough studies of levels of heavy metals and pesticides in the groundwater in Västerbotten have not yet been carried out.

2.1.2.7 The condition of water resources in Lapland County

As a whole, physical preparation of land- and water environments, like water constructions, regulation and log floating, has affected the situation of Lapland's water system more strongly than wastewater emissions. Point source loading has clearly been reduced, but runoff loading is still a problem. Despite the reduction of wastewater loading, eutrophication is still progressing in small water systems, often in the sphere of human activities, and in shore zones of larger water areas and seacoasts. The acidification of water systems even seemed to stop in 1990s, but the level of critical sulphur deposits is still exceeded in many lakes.

In the sphere of influence of runoff loading, no clear changes were observed in Lapland or in other parts of Finland when compared with the situation at the beginning of 1990s. When compared with the situation in the mid-1980s in sea areas in the immediate vicinity of industrial plants, acute toxic effects and water systems that are free from oxygen have almost disappeared along with the intensified water protection, but in coastal areas, the disadvantages of eutrophication are still found. The focus of water protection lies in reducing runoff loading and in reparation work of water constructions. More than half of Lapland's lake area is

considered excellent by its quality on the basis of the water quality classification in 1994-1997; a quarter is considered good. Water systems regarded as satisfactory form a quarter, and passable lake areas total about 1 %.



Map 4 is based on the Finnish water quality classification

The majority of the air emissions in Lapland (suspended particulates, SO_x and NO_x) are caused by the plants in Kemi and Kemijärvi. However, their emissions are less than 8 % of the corresponding emissions in Finland. The steel factory in Tornio causes the most significant heavy metal emissions in Lapland.

The phosphorus load and oxygen-consuming effluent discharges in waters that the forestry industry and communities are causing have been reduced along with the improvement of wastewater purification technology. The nitrogen load has been increasing since the cleaning methods that are commonly in use today have not been planned to handle soluble nitrogen.

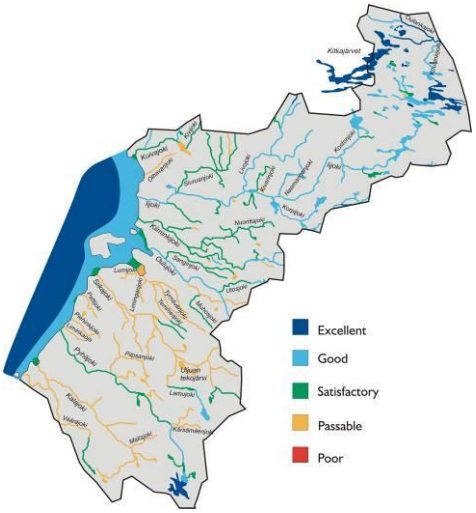
As regards environmental poisons, Lapland is a background area as concerns many of those poisons. In Lapland, the contents are smaller in comparison with areas more in the south and that are more loaded. However, poisons do end up in Lapland's nature from local emission sources and as fallout from the atmosphere. Environmental poisons drift to north along with airflows that carry those poisons from even very distant emission sources. In the north, cold conditions cause condensation of compounds and their landing in nature.

Groundwater areas in Lapland are usually clearly bordered unities. Two thousand two hundred groundwater areas are suited for drinking water sources in Lapland, and 240 of these are classified "Very important". These areas are often virtually uninhabited and thus well protected from dangers caused by human activity. In this respect, less risk factors are directed to the groundwater in Lapland when compared with e.g. more densely inhabited areas in Southern Finland. In Southern Finland, where the acidic loading is greater than in the north, they have received research results showing that the groundwater has also been affected. In Lapland, there have not yet been any clear observations showing that development. Major problems with groundwater usage are naturally occurring iron and manganese. Over 90 % of Lapland's inhabitants get their drinking water based on groundwater sources.

2.1.2.8 The condition of water resources in North Ostrobothnia County

Physical preparation of land has mostly influenced the condition of surface waters in North Ostrobothnia. Water construction, regulation, log floating, earlier declining water level – mostly for agriculture – and later ditching for forestry operations have changed the natural state of waters. The impact of water construction has recently been diminished by different kinds of restoration and development work in collaboration with several organisations. Besides physical preparation, the lack of wastewater treatment and problems in treatment have occasionally

made the condition of waters worse. Point source wastewater loading has been diminished, but non-point loading still seems to be a problem. In the future, instead of restoration work in river channels and lakes, more work has to be done to reduce loading from agriculture, forestry and scattered settlements, as well as from summer houses.



Map 5 is based on the Finnish water quality classification

Typical for river watercourses in the area is that they start from very few lakes and flood very easily. Most of the rivers flow into the Baltic Sea. The proportion of peatland is remarkable and, in addition, watercourses are naturally little acidic and contain a lot of humus that gives them a brown colour. Natural contents of humus and nutrients are higher in watercourses on the coast than inland. Surface waters in Kuusamo are naturally bright, nutrient-poor and well buffered against changes in acidity. The lakes in the area are usually quite shallow.

Atmospheric fallout has caused changes in acidification of the waters, which appears mostly as a decrease of the buffer facility in the 70s and 80s. Waters from drainage of acidic sulphide soils increase acidic loading to watercourses on the coast. Most of them are slightly eutrophicated. The most barren watercourses are situated in the northeast of the area.

In North Ostrobothnia, all cities and villages except the town of Oulu supply drinking water from the groundwater resources. Altogether, 516 groundwater areas are situated in the area; 217 of these are classified “Very important”. Often, these areas are situated unequally and far from the cities. Human activities (e.g., landfills, industry, chemicals, wastewaters) are threatening many groundwater areas. The quality of the groundwaters is reasonably good and the water is very soft and acidic. In most waterworks, the groundwater has to be treated by alkalisation before usage. The biggest problems in the groundwater are quite high contents of iron and manganese. In some areas, high contents of humus and low pH exist.

During the last decades, there have been vast amounts of water management work in the area. Overall, 13,500 km of water networks and 3,400 km of sewage networks have been constructed. As a result, 98 % of the people living in North Ostrobothnia belong to an arranged water supply and 74 % of the people are included in sewer systems. Industrial plants and most of the town of Oulu use surface water. Other towns and municipalities supply the groundwater. All told, 95 % of people in the area supply the groundwater.

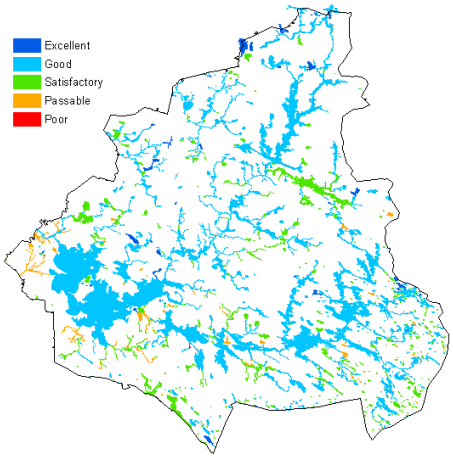
Sewer systems have been constructed to some rivers (Oulujoki, Kiiminkijoki) to pipe the wastewaters from municipalities and scattered settlements along the river to the wastewater plants situated on the coast. Elsewhere, wastewaters are treated in municipal or industrial wastewater plants, which are largely biologically and chemically activated sludge plants. New Finnish legislation relates scattered settlements and consists of renewing their wastewater treatment systems during the next decade – quite a large challenge for wastewater management, especially in sparsely populated areas.

2.1.2.9 The condition of water resources in Kainuu County

In the Kainuu area, there are 1,400 lakes greater than 10 hectares in area. The majority of the lakes are very shallow with an average depth of less than 5 metres. The biggest lake is Lake Oulujärvi (928 km^2). Most of the watercourses in Kainuu are tributaries consisting of chains of lakes and rivers. They provide a network of rich habitats.

Most of the lakes and rivers have humic waters typical of Finland, but there are also small pristine clearwater lakes with very low phosphorus concentrations and low biological production. The waters rich in humus are slightly acidic, and their oxygen content decreases considerably during the ice-bound period. The total phosphorus concentration normally varies within 10-20 µg/l. The acidification of water systems even seemed to stop in 1990s, but in the springtime, the pH level may be below 5, especially in small rivers.

Physical preparation of land and water environments, like water constructions, regulation, ditching and clear cutting, has affected the situation of the Kainuu water systems more strongly than wastewater emissions. The phosphorus load and oxygen-consuming effluent discharges in waters that the forestry industry and the communities are causing have been reduced along with the improvement of wastewater purification technology. Despite the reduction of wastewater loading, eutrophication is still progressing in small water systems. Runoff loading is still a problem. In the future, much work will be necessary to reduce loadings from forestry and scattered settlements and in the restoration of lakes.



Map 6 is based on the Finnish water quality classification

According to the current Finnish water quality usability classification system, most parts of the lakes (85 %) and rivers (72 %) in Kainuu belong to usability class II ("Good"). The high humus content of the water and the significantly lowered oxygen content in the winter period often result in watercourses in a nearly natural state being, categorised into Class III ("Satisfactory"), even when no point-source pollution is present. The passable lake area is only 1 %, but for the rivers, it is 8 %. There were no clear changes observed in Kainuu when compared with the situation at the beginning of 1990s. When comparing it with the situation in the mid80s, the southern part of Paltaselkä in Oulujärvi has changed for the better.

The majority of the air emissions in Kainuu (suspended particulates, SO_x and NO_x) are caused by the plants situated in Kajaani and Sotkamo, and the district heating. Great parts of the nitrogen emissions are caused by the traffic. However, emissions in Kainuu are less than 2 % of the corresponding emissions in Finland. Over 90 % of the sulphur deposits and over 80 % of the nitrogen deposits in Kainuu come from outside. In the eastern part of Kainuu, the deposit of SO_2 caused by the Kostamus combine is about100 mg/m_2 x a (S); in western part, it is about 30 mg/m_2 x a (S).

In Kainuu, all cities and villages supply drinking water from the groundwater resources. Altogether, 260 groundwater areas are situated in the Kainuu area; 53 of these are classified "-Very important". Human activities (e.g., gravel input, traffic) are threatening many groundwater areas; Only 38 areas are natural. The quality of groundwater is reasonably good and the water is very soft and slightly acid. In most waterworks, the groundwater has to be treated by alkalisation before usage. The biggest problems in gully waters are quite high concentrations of iron and manganese. In some areas, there are also high concentrations of arsenic and radon and low pH.

During the last decades, large amounts of water management work have been done in the area. As a result, 80 % of the people living in Kainuu belong to arranged water supplies and 75 % of the people are included in sewer systems. Wastewaters are treated in municipal or industrial wastewater plants, which are mostly biological chemical plants.

2.2 The WP4 Biodiversity Group

The participants of the WP4 Biodiversity Group are the Republics of Komi and Karelia (Russia), Kainuu County (Finland), Norrbotten County (Sweden) and Nordland County (Norway). Nordland County is the leader of the group.

The main target of the WP4 Group is to improve the environmental situation in the Barents Region. The Biodiversity Group is focusing on forest biodiversity and will be preparing a strategy and action plan regarding sustainable use and preservation of the Barents Region's biodiversity and forests.

2.2.1 Background for the biodiversity work

Barents Euro-Arctic Regional Council, Regional Working Group on Environment.
Action Programme: Biodiversity Chapter, adopted in 1997 and updated in 2004.

The Barents Region is a large area with many similarities in the natural ecosystems and composition of species; these are young ecosystems with a limited number of species (although the number of different species can be high) and simple ecological conditions. These factors make the nature vulnerable to ecological changes. This stresses the importance of regionally adjusted and applied, but internationally connected, research and monitoring systems for the Barents Region.

The starting point for conservation of biodiversity is equal for most of the Region. The terrestrial ecosystems include large areas, which are partly without human impact. The most visible exception is near the Nickel Melting Works on the Kola Peninsula, which clearly demonstrates the vulnerability of sub-arctic nature. Another visible and common human impact, especially in the Nordic countries, is the clear cuttings.

There are several reasons for protecting the biodiversity: the first is the direct utility value through hunting, fishing, harvesting, recreation, etc.; the second is the indirect value through life-maintaining processes (photosynthesis, water cleaning, nutrient/particle binding, etc.); the third is the potential value through gene technology; and the fourth is the intrinsic value of the species in the ecosystems.

The most important issues in the conservation of biodiversity are old-growth forests and pristine areas, natural habitat sites, key biotopes, model forest projects and sustainable forestry.

2.2.1.1 Goals

The Barents Region has one of the world's largest forest areas. Unsustainable and illegal forestry is considered one of the largest threats against biodiversity. Through this sub-project, we are hoping to contribute to a better and more complete management of the forest resources while at the same time protecting and preserving the biodiversity. Further, considerations to/collaboration with the local/indigenous peoples is seen as an important issue. Improved

education and increased participation from the local/indigenous inhabitants in environmental and forestry questions will also contribute to a more sustainable forestry in the future.

A sustainable forestry will also help to maintain settlement in the Region. After environmentally adapted forestry, there will still be possibilities for hunting, fishing and other harvesting, recreation, etc. Further, the world's market is increasing the demands of the harvesting methods, and the companies can get better prices for sustainably harvested timber.

2.2.1.2 Strategy and action plan

In order to carry out the necessary environmental considerations, a survey of the vulnerable and endangered natural habitat sites and key biotopes is necessary. Based on this survey, a GAP analysis related to the protected areas should be carried out to generate recommendations for the future conservation work.

Closer collaboration between environmental and forestry authorities is important. In this collaboration, the environmental sector will advise the forestry industry regarding environmental considerations. Further, a collaboration regarding a common certification for the entire Barents Region, hereafter called "the Barents Standard", should be carried out.

2.2.2 State of biodiversity environment in the Barents Region

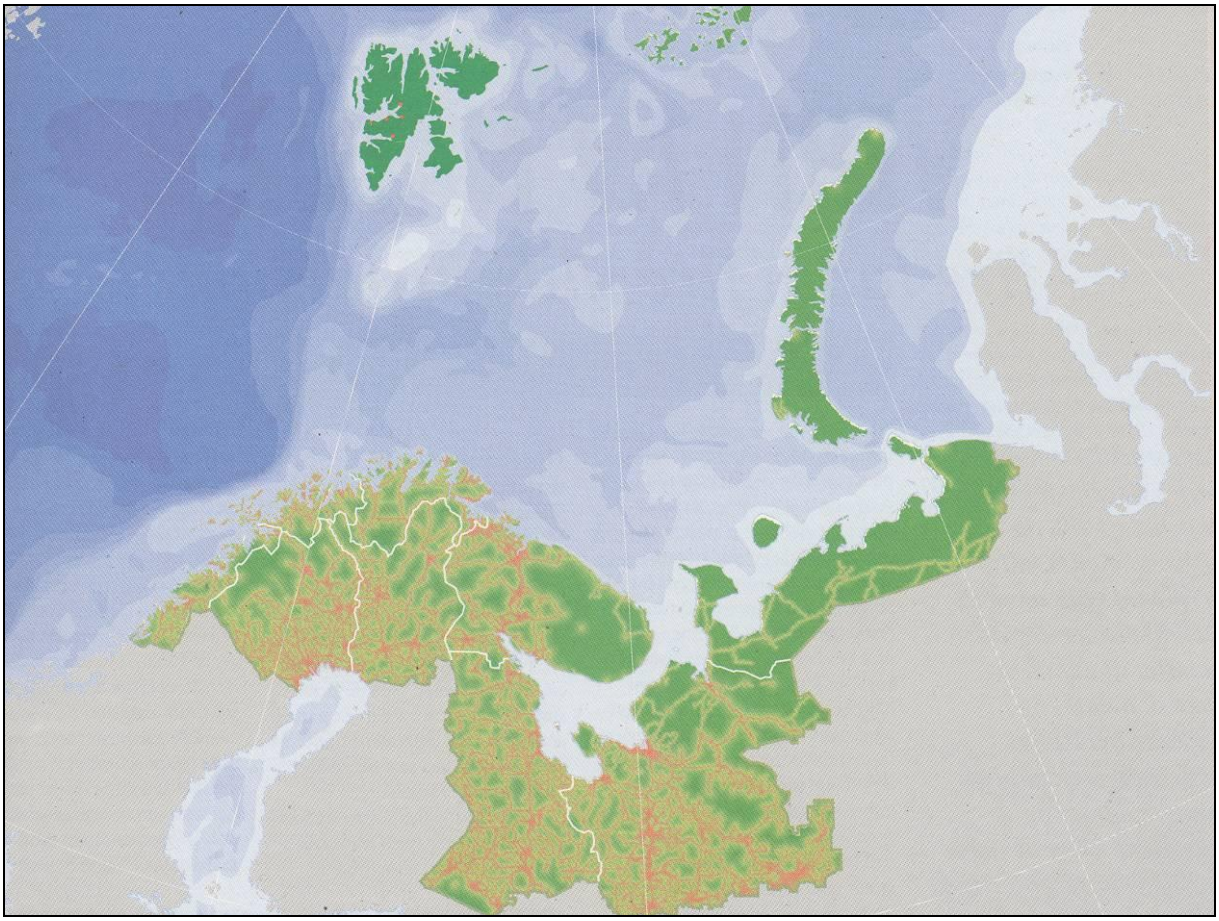


Figure 1 shows the areas without human impact in the Barents Region (except the Republic of Komi). Red indicates roads and railways and dark green indicates pristine areas. Source: Barentswatch 1998.

2.2.2.1 The biodiversity conditions in the Republic of Komi

The Republic of Komi is situated about 1,400 km northwest of Moscow, and the area is 416,000 km^2. The Ural Mountains form a natural border on the east, and the neighbours are Arkhangelsk, Perm, Tyumen and Kirov Oblasts and Nenets Autonomous Okrug. The Republic of Komi has a population of 1.1 million.

The taiga and tundra are the main natural zones in Komi. Further, the taiga ecosystem is divided into Southern, Middle and Northern. Compared with the rest of the Arctic, the biodiversity of the ecosystems is rich: both flora and fauna of the territory are unique. Many species have their eastern or western range here.

The natural resources in the area are extensive: coal, gas, oil and bauxites. Further, forest covers 70 % of the area, and the major part of this is pristine forest. Nevertheless, the last decades have seen an intensive exploitation of the resources, and the old-growth forest areas have been decreasing since the 1950s (Figure 2).

The ecological status is considered good. A system of Nature Protected Areas (NPAs) has been established in the northeast of Europe, in Russia. The first protected area was the Pechora-Ilych Reserve, and 30 years later, a systematic research on establishing a NPA system was carried out. This resulted in the basic rules for foundation of NPAs:

- Conservation in an unchanged state of the unique natural complexes and objects, which are now decreasing under anthropogenic pressure;
- Conservation in a natural state of the natural complexes and objects that are typical for different geographical zones/sub-zones and that are endangered or degrading;
- Conservation of the genetic pools of endangered plants and animals;
- Satisfaction of people's needs to rest and relax in nature.

The network of protected areas was most intensively developed from the late 1970s to the midd-1990s. This has resulted in 287 protected areas with various statuses (national nature parks, nature monuments, preserves, etc.), and protecting botanical, hydrological, geological, etc. values. The largest, the Pechora-Ilych Zapovednik and the "Yugyd-Va" National Parks, are also included in the World Nature Heritage List as "Virgin Forests of Komi. In total, 14.6 % of Komi is protected.

Further, Komi has especially protected areas in its forestry systems: along rivers, 50 to 500 metres of forest are protected; along lakes and swamps, 300 metres are protected; along roads, 100 metres are protected; and around settlements, 1,000 metres are protected.

Komi has worked out a Red Data Book consisting of compilations of information on natural habitats and regional endangered species of flora and fauna. The book presents the scientific grounds for the requirements to protect certain species and natural habitats, and the document became a legal document once the government of the Republic approved it. When approved, officials had to take into account the measures for protecting the endangered species and natural habitats as outlined in the book in the land-use planning.

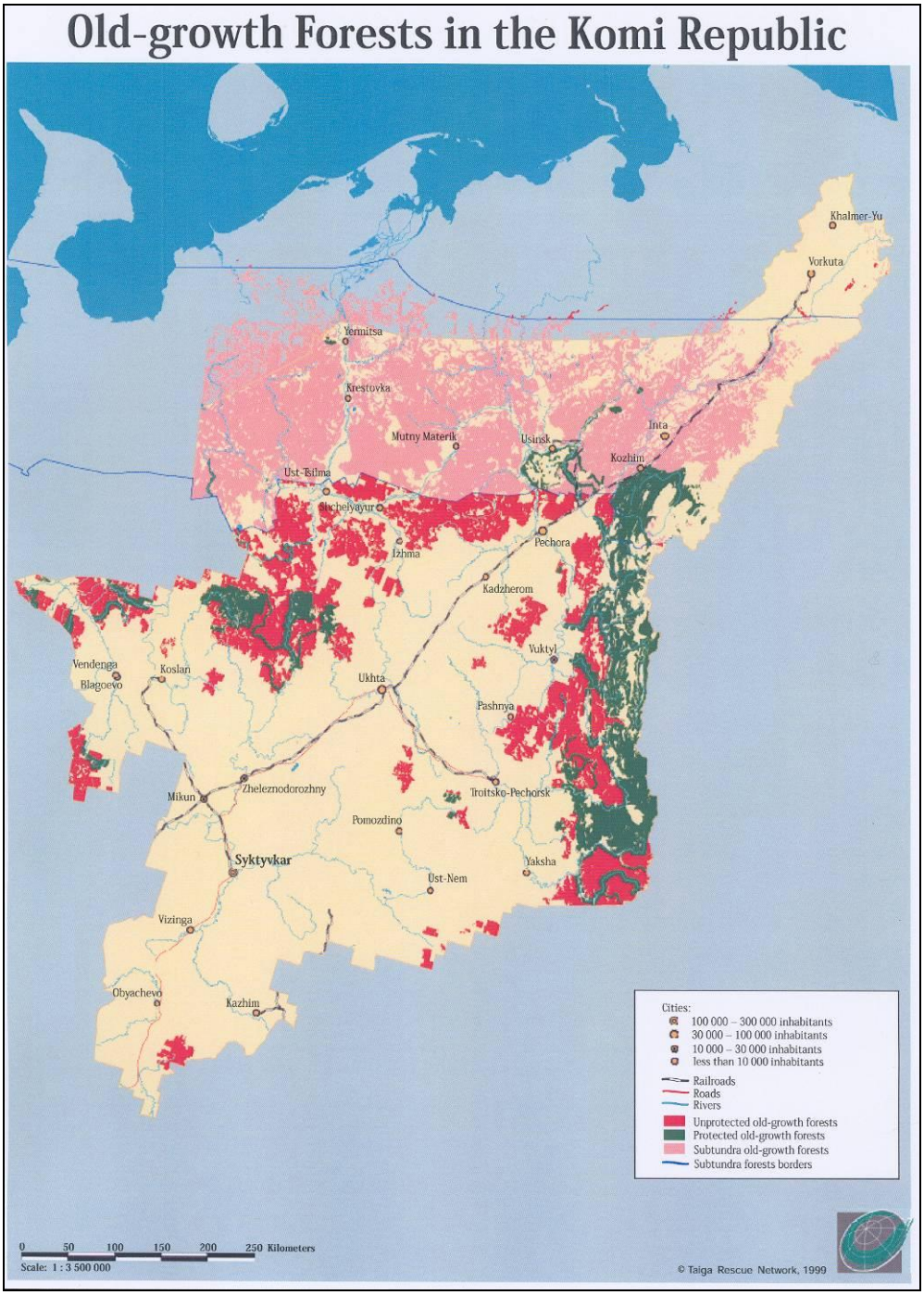


Figure 2 shows the old-growth forests in the Republic of Komi. Source: Taiga Rescue Network.

2.2.2.2 The biodiversity conditions in the Republic of Karelia

The republic of Karelia is situated southwest of the White Sea, along the Finnish border. The Russian neighbours are Murmansk and Archangelsk Oblasts in the north and east, and Vologda and Leningrad Oblasts in south. The area is 180,500 km^2. The Republic of Karelia has a population of 766,400, and about 74 % of the population is urban.

Forest covers over 50 % of the Republic's area, while 25 % of the territory surface is water and over 20 % is wetlands. Taiga is the main natural zone in Karelia, and the taiga is divided into southern, middle and north taiga. The biodiversity of the ecosystems is large: amongst others, there are approximately 1,500 flowering and vascular plants, over 420 species of bryoflora, 250 species of fungal flora, more than 20,000 species of insects, 5 species of reptiles, 5 species of amphibians, 285 species of birds and 63 species of mammals. Karelia has worked out the "Red Data Book of Karelia", and this list contains the 1,714 endangered species, the 210 vulnerable species and the 40 extinct species.

The Red Data Book consists of compilations of information on natural habitats and regional endangered species of flora and fauna. The book presents the scientific grounds for the requirements to protect certain species and natural habitats, and the document became a legal document once the government of the Republic approved it. When approved, officials had to take into account the measures for protecting the endangered species and natural habitats as outlined in the book in the land-use planning.

The ecological status in Karelia is for the most part considered good. The proportion of old-growth forests is smaller than in the Republic of Komi, but there are still large areas left. The largest areas are found in the northwest corner of Karelia and the area close to Kostomuksha, close to the Finnish border. A larger area is also found in the southeast corner of Karelia, east of the city of Pylama. In total, five larger areas of pristine forest are found (Figure 3).

These five larger pristine areas:

1. Are formed in a natural way in the postglacial time;
2. Have not experienced major human impact;
3. Are developed spontaneously and exposed to periodic natural disturbances;
4. Represent a mosaic of forest communities as a whole – from pioneer vegetation groups in burned areas and wind throws, to climax communities in a state of sustainable dynamic equilibrium.

Russia and Finland are collaborating on a project called the "Green Belt" between Russia and Finland. This collaboration incorporates the current and planned protected areas on both sides of the border. This is not a single, unbroken area, but a network of separate areas. Further, there are a lot of protected areas in the rest of Karelia. The status for these areas differs; there are national parks, strict nature reserves and other protected areas. Only minor fractions of the pristine forest are protected.

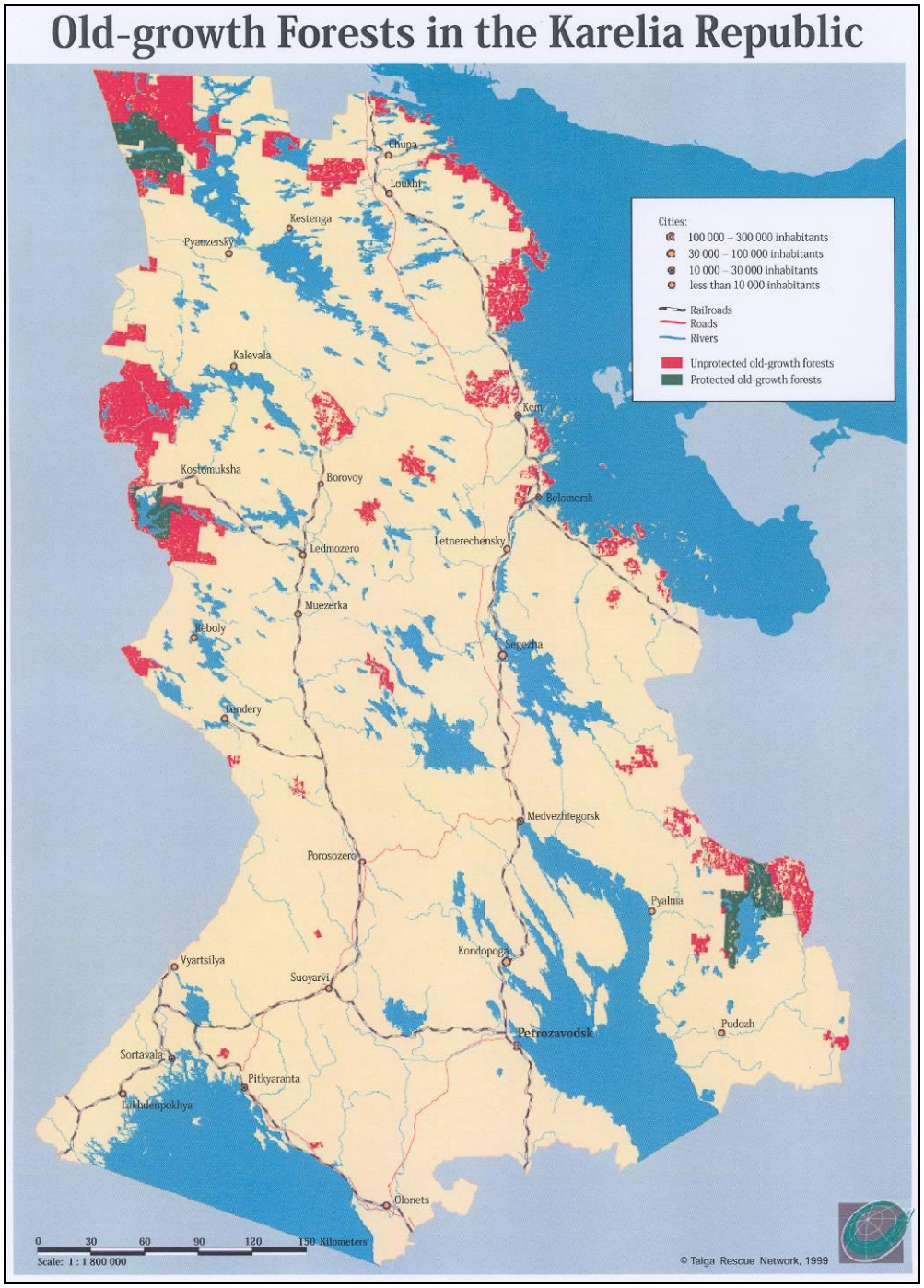


Figure 3 shows the distribution of old-growth forests in the Republic of Karelia. Source: Taiga Rescue Network.

2.2.2.3 The biodiversity conditions in Kainuu County

Kainuu is located east in the central part of Finland. The bordering regions are the Republic of Karelia (Russia) on the east, Northern Ostrobothnia on the north and west, and Northern Karelia on the south. The total area is 24,450 km^2 and the population is 86,000.

Eleven point eight percent (11.8 %) of the region's surface is water. Further, forest covers about 16,600 km^2 (~68 %), and the forests are classified as middle and northern Boreal forests. The county has a large variability of bedrock and soils, which again causes a diverse topography and biotope distribution. The land-use history strongly influences the present state of the forests.

The ecological status generally considered good in Kainuu. However, intensive forestry has caused a decrease and fragmentation in the old-growth forests (Figure 4), and in some situations, large clear cuttings. However, some areas still remain. Numerous east-west orientated eskers and drumlins form the basis for pine forests in Kainuu. The hill ridge in Western Kainuu has fertile forest habitats and rich fens. However, these herb-rich forests and fertile forested mires cover only about 1 % of the region. In the middle of Kainuu, there is a greenstone belt from south to north, and this is a biodiversity hotspot.

Kainuu is the southernmost region in Finland with relatively abundant old-growth forests. In state forests, there are numerous nature reserves of different types, while there are only smaller protected areas in the private forests.

The Metsähallitus (Forest and Park Service) has a detailed forest database containing information about habitat class, age of tree stand, dominating tree species and timber volume. The data covers one-third of Kainuu, and most of the old-growth forests. Further, the Metsähallitus is conducting a mapping of the biotopes and endangered species on all nature reserves owned by the state up to 2007. The biotopes will be evaluated in a Working Group and will end up on a Green List. Until now, only a green list of mires has been prepared (1978, updated 1993), where forested mire types are designated as endangered.

Russia and Finland are collaborating on a project called the "Green Belt" between Russia and Finland. This collaboration incorporates the current and planned protected areas on both sides of the border. This is not a single, unbroken area, but a network of separate areas.

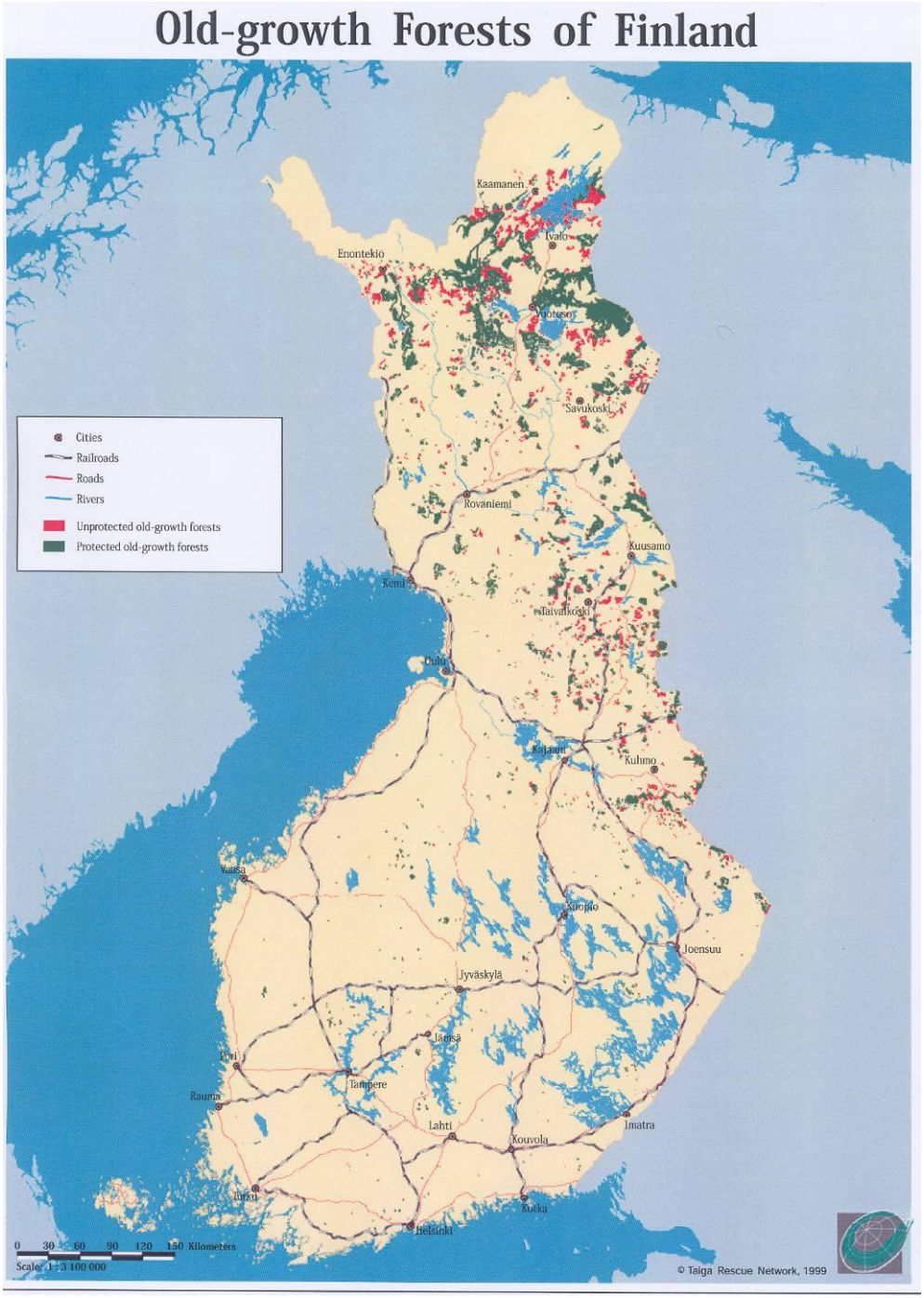


Figure 4 shows the distribution of old-growth forests in Kainuu (and Finland). Source: Taiga Rescue Network.

2.2.2.4 The biodiversity conditions in Lapland County

The administrative Province of Lapland is Finland's largest administrative district. Its total surface area is 98,937 km^2, which is nearly one-third the entire area of the country. There are 22 municipalities in Lapland Administrative Province (as of 1 January 2006, 21 municipalities). The number of inhabitants is 186,443. The Province is bordered on the south by the Province of Oulu, on the west by Sweden, by Norway on the north and Russia on the east.

Lapland's landscape and natural conditions vary considerably in moving from Southern Lapland northwards to Enontekiö and Utsjoki. The lowest-lying land is in Southwest Lapland on the coast in the northern part of the Gulf of Bothnia, where shore-based meadows cover expansive areas. The area was at one time completely under water, which is why the soil is composed of various fine-grade materials, particularly in the valleys. The land surface rises from the sea level towards the north. An exception to this is Lake Inari, which is only 120 metres above sea level. Lapland's highest fells are located in Käsivarsi in Enontekiö's northwest corner, where the Köli mountain range skirts Lapland. Finland's highest mountain is also situated there – Halti – which rises 1,328 metres from sea level. Lapland's largest waters emptying into the northern part of the Gulf of Bothnia are the Kemi River, Tornio River and Simojoki River water systems. The Tenojoki, Nääntämönjoki and Paatsjoki river systems are, on their part, the largest waterways emptying into the Polar Sea.

Virtually all of Lapland belongs to the Boreal Coniferous Forest Zone. The Central Boreal Zone extends along river tributaries to the north of Pello all the way to Rovaniemi, as the river valleys are climatically favourable. Some southern plants by typical distribution grow rather commonly in the Central Boreal Zone, such as the Lily-of-the-Valley. Central and Northern Lapland belong almost entirely to the Northern Boreal Zone. There are mixed and pine forests in areas of rough moraine and graded soils, and in the rocky areas.

Spruce forest is encountered in fine-grain land as well as in areas of slate bedrock. The terrain is flat in many locations, and fens are plentiful. The fens have high strands and hummocks formed by frost, i.e., tussocks. The tree line in Lapland is made up of alpine birch. The alpine birch groves are largely rugged and arid, dominated by twigs and lichen. Above the tree line, bare fell plant communities appear. Particular to the fens are high clumps of permafrost peat, palsa.

The construction and regulation of water systems as well as log floating have decreased the multiplicity of water nature, especially in Southern and Central Lapland. Log-floating routes have totalled an area of approximately 10,000 km in Lapland, the largest part of which has been in the water system area of the Kemi River (7,300 km). With the termination of log floating, the related regulations have been cancelled and the log-floating routes have been rehabilitated. The goal has been a return to the original biological productivity and biodiversity in the rapids regions to a state close to the natural condition. For the most part, river repairs are to be brought to a close during 2005.

The rivers Tornio-Muonionjoki and Simojoki, both of which have their own naturally increasing salmon, are non-built and unregulated, emptying into the northern part of the Gulf of

Bothnia. The Tenojoki River is an important Polar Sea salmon-spawning river. The salmon of the Baltic Sea and of the Polar Sea have been classified in Finland as endangered species.

The industrial utilisation of Lapland's forests has had considerable impact on their age structure towards making them more youthful and in breaking up the uniformity of the forests. These changes have in particular curtailed the living potential of old forest species such as the wood grouse. On the other hand, bird species favouring bushlands and the borders of forests have clearly become more abundant. In modern forestry, there is an attempt to take the multiplicity of woodland nature and landscape protection into consideration.

The bog drainage carried out for the purpose of lumber production has mostly affected the fen-related nature of Lapland. Bog drainage was undertaken for the most part during the 1960s and 1970s, and was concentrated in Southern and Southwest Lapland, where approximately 40 % of the fens were drained. The detrimental impact of drainage was directed most strongly towards meso- and eutrophic species, since it has not been advantageous to drain the oligotrophic fens under Lapland's climatic conditions. Today, the amount of new drainage in Lapland is minimal. After 1993, no new drainage has been undertaken in Metsähallitus-owned lands.

Compared to the rest of Finland, there are many conservation areas in Lapland. Of all the forest management land in Lapland, 39 % is actually external to forestry practice, or such activity is restricted. The corresponding figure with respect to woodlands is 23 %. The share of forests strictly conserved of the forest management land is 32 %; of the woodland, the figure is 16 %. The largest share of the conservation areas is located in the area of the three northernmost municipalities, by reason of which low productivity and idle forestland is protected much more than woodlands.

2.2.2.5 The biodiversity conditions in Norrbotten County

Norrbotten County is Sweden's largest by area and represents about a quarter of Sweden's total land area. The county has 14 municipalities and covers an area of 98,249 km^2. Norrbotten borders with Västerbotten County on the south, the counties of Nordland and Troms in Norway at the mountain range on the west, and Lapland in Finland at Torne River on the east.

Norrbotten has many different types of nature and landscapes. The county is comprised of mountain areas in the west, large areas of forest in mosaic structures with bogs and marshes in the interior parts, and a coastal area with an extensive archipelago that is characterised by the land uplift. In the Boreal Zone, taiga is the dominating habitat (natural zone), and the coniferous forest is similar to the forests in the other parts of the Barents Region. The taiga in Northern Scandinavia, however, is characterised by a more maritime climate. About 60 % of the land area is covered by forest and 20 % by wetlands. If areas with mountain birch forests, forests bordering with mires and areas that are sparsely tree-vegetated are excluded, then approximately 38 % of the total land area can be utilised for forestry when production and climate conditions are taken in consideration.

The county also has considerable amounts of various natural resources. These resources, ranging from several decades up to centuries, have been extracted chiefly in hydropower plants, forestry and ore mining. The mean annual production of electricity from hydropower plants in Norrbotten is approximately 11 % of the total electricity production in Sweden. This

is a result of an extensive damming programme, mainly in Luleå River. Economically, forests have been of central importance to the development of the county throughout the 20th century. The forest provides a base for pulp and paper industries by the coast. Forestry and industry directly based on lumber employ over 4 000 persons in the county.

Ore mining and refining have been carried out in Norrbotten County since at least the 17th century. Three mines are active today, and these represent the majority of mining production in Sweden. At present, there are extensive programmes for mineral exploration that are being implemented mainly by foreign companies.

At present, there are 169 nature reserves located throughout the county and eight national parks. The total protected area, in the form of nature reserves and national parks, is about 24 500 km^2, or 25 % of the county's area. The UN organisation UNESCO has declared the national parks Sarek, Padjelanta, Stora Sjöfallet and Muddus, together with the nature reserves Sjaunja and Stubba, a World Heritage Site called Laponia.

The first protected areas that were founded were the national parks Abisko, Sarek, Pieljekaise and Stora Sjöfallet in 1909. Vadvetjokka was declared a national park 1920, Muddus in 1942, Padjelanta in1962, and most recently Haparanda Skärgård (archipelago) in 1995. The government makes the decision to institute national parks. The total area of national parks in Norrbotten is 6,100 km^2.

Sweden's first real Environmental Protection Act was constituted in 1965, enabling the County Administrative Boards to establish nature reserves. Together, the nature reserves cover an area of 18,400 km^2.

The general ecological status, at least in a national perspective, is quite good because large areas are primarily protected as natural reserves and national parks. The majority of protected forests are located in the mountain areas where the productivity is generally low and forestry has been of less interest (Figure 5). Only small portions of productive forests are protected below the sub-mountain coniferous forest zone. Few areas of forest below this zone have been spared from anthropogenic influence during the last century.

One of the consequences of extensive forestry, apart from the direct effects of clear cuttings and road constructions, is the fragmentation of biologically sensitive and important forests. Since the Swedish taiga forest differs amongst the coast, inland and the mountain area, representative forest habitats from different areas are unequally represented in the protected areas. Due to human activities, vast areas of forest in productive areas lack the amount of biodiversity commonly found in virgin areas. However, some unprotected forests in the interior parts of the county still have unique biological values.

In 1999, the Swedish Parliament adopted 15 national environmental quality objectives, for the most part to be attained by year 2020. The environmental quality objectives create a transparent and stable framework for environmental programmes and initiatives, and serve to guide such efforts at various levels in society.

Between 2001 and 2003, in a series of decisions, the Swedish Parliament laid down 71 interim targets. These targets bring to life the environmental quality objectives by describing the situation in a given year, usually 2010.

One of the environmental quality objectives, “Sustainable forests”, has four interim targets. The objective is to protect the value of forests and forest land for biological production, while simultaneously safeguarding biological diversity, cultural heritage and recreational assets. The intention is to achieve this objective within one generation. The four interim targets stipulate on a national and regional level:

- A further 900,000 hectares of forest land of high conservation value will be excluded from forest production by year 2010;
- By 2010, the amount of dead wood, the area of mature forest with a large deciduous element and the area of old-growth forest will be maintained and increased.
- By 2010, forest land will be managed in such a way as to avoid damage to ancient monuments and to ensure that damage to other known valuable cultural remains is negligible.
- By 2005, action programmes will have been prepared and introduced for threatened species that are in need of targeted measures.

The forest industry has large responsibility for the first interim target. At national level the owners of forests, by free will and without financial compensation, are expected to save an additional 500,000 hectares of productive forests. The first interim target does not include the sub-mountain coniferous forest area. At the regional level, the first interim target has not yet been transformed to an exact area. At present, negotiations are underway concerning the amount of investigated virgin forest areas that is going to be protected.

Figure 5 shows the distribution of old-growth forests in Norrbotten (and Sweden). Source: Taiga Rescue Network.

2.2.2.6 The biodiversity conditions in Nordland County

Nordland County is the westernmost region in this project. Nord-Trøndelag County is the neighbour to the south, while Troms County is the neighbour to the north. The county has a long coastline to the west, and to the east are mountain areas and the border with Sweden. The area is about 38,460 km^2, and the population is about 238,000.

Compared with the other regions, Nordland has larger topographic differences over small distances. Here, you can find sea and coastal landscapes, long, lowland valleys, mountain valleys, mountain plateaux and alpine mountains with and without glaciers.

Forest covers about 18 % of Nordland County, and 2/3 of these are deciduous forests. There are 15-20 tree species, of which birch (*Betula pubescens*) is the most common. Wild spruce is present north to Saltfjellet, a highland plateau forming a natural barrier near the Arctic Circle. Further, there are a lot of introduced spruce trees north of Saltfjellet; both Norwegian spruce (*Picea ábies*) and Sitka spruce (*P. sitchensis*) are common. This intensive introduction of spruce has caused a large change in forest stands and biodiversity, and is sometimes seen as a threat against the biodiversity.

In 1998, the Norwegian Directorate for Nature Management presented a reviewed Norwegian Red List. This list consists of just over 3,000 species, close to 50 % of which live in forest habitats. The categories used in the list are the IUCN categories for national use, and are Extinct, Endangered, Vulnerable, Rare, Declining, Care Demanding and Declining monitor species. Consideration to these species should be taken, and the list is implemented into land-use planning.

The Norwegian Red List does not cover vulnerable and endangered natural habitat sites and key biotopes. However, there is a Parliamentary requirement that the municipalities shall do a mapping of the biodiversity, and the Norwegian Directorate for Nature Management has developed guiding instructions. In this instruction, all natural habitat sites evaluated as vulnerable or endangered are described. The municipalities identify and valuate the sites based on flora, fauna, abundance, Red List species, etc., and considerations to these habitat sites shall be taken in land-use planning.

The ecological status is considered mainly good in Nordland County. However, compared with the Russian republics in particular, there are small areas with old-growth forest (estimated less than 1 %, (Figure 6) and small areas without human impact. Forestry, road establishing and hydroelectric power plants are considered the main reasons for these losses. As an example, periodically flooded forests are considered an endangered natural habitat site in Norway. Due to logging and hydroelectric power plants, this natural habitat site has been and is decreasing.

For Norway as a whole, about 12 % of the land area is considered wilderness areas today. Most of this is mountain areas with small forest resources. There has been a large decrease the last decade: in 1900, wilderness areas were estimated to cover almost 50 % of the land area. This decrease has been greatest in the south. Today, a political aim is to take care of the last wilderness areas, and this shall be implemented into land-use planning.

In Nordland, there are 201 protected areas, which are national parks, nature reserves, protected landscapes and wildlife and flora refuges (nature reserves). In addition, more are planned and being designated today. The existing protected areas consist of coniferous and deciduous forests, mires, wetlands and coastal areas. Most of the vulnerable and endangered habitats are partly preserved through the existing protected areas, but both our GAP analysis (protected areas and vulnerable/endangered habitats) and the scientists' advice recommend more protected forest areas.

Figure 6 shows the distribution of old-growth forests in Nordland (and Norway). Source: Taiga Rescue Network.

3 SWOT ANALYSIS AND STRATEGIES/ACTIONS: WATER

3.1 SWOT analysis for surface water

Strengths

- Good ecological status of the waters in most parts of the Barents Region
- Positive trend of decreasing emissions in recent years
- AMAP has produced and will produce information and reports on the state of the environment in the Barents Region; this is known as the "Hot Spot" list.
- The Region has a shared history in environmental issues and an existing environmental network (WGE).
- Existing commissions for international border rivers and transregional rivers (Russia)
- Many problems related to the state of surface waters are already known and have been studied
- Existing collaboration in many water projects in the Barents Region
- Knowledge of river basin management systems in certain areas
- There is an interest in water issues because of natural resources in the Barents Region
- National standard methods for water quality monitoring
- National monitoring systems for water data collection as a base for decision-making
- National legislation on water issues and regulation governing water use and requiring improvements
- Supervising of emission loads and emission limit procedures in environmental permits

Weaknesses

- Sensitivity of the environment in the North
- Heavily polluted areas in the Barents Region
- Industrial emissions
- Financing for improvement measures is difficult in international projects
- Implementation of improvement measures on the international level; national funding in particular is a problem with financing tools
- Lack of information for the general public
- Different labelling systems for water quality
- Lack of money for monitoring activities in the participating regions
- Information on water quality is spread over too many databases
- AMAP does not produce information on the whole Barents Region
- Differences in legislation and standardisation between countries
- Lack of harmonisation in emission limits, monitoring systems, etc. internationally
- Dams and hydropower activities on rivers affect biodiversity

Threats

- Sensitivity of the environment in the North
- Emission loads
  - Long-range pollutants
    - Heavy metals
    - POPs
    - Acidic pollution
  - Wastewater from agriculture, peat production and municipalities
  - Expansion of the forestry industry, increased runoff and emissions
  - Expansion of the oil industry
  - The mining industry
  - Radioactivity
- Increasing use of land along rivers
- Reduction of wilderness
- Uncontrolled ecotourism can cause threats to water bodies
- Too little cross-border collaboration on controlling *Gyrodactylus salaries* and other parasites
- Rainbow trout hatchery and escape of salmon from farming nets; species moving between different areas
- EU financing tools are changing, which can make project implementation much more difficult
- Overexploitation
- Climate change
- Floods

Opportunities

- Good ecological status of the Barents Region
- Harmonised joint management and monitoring systems for water basins
- "Cleaner production" work decreases industrial emissions
- New financing tools for project implementation
- Public knowledge and awareness of the state of the waters
- Water Frame Directive provides a common approach to improvements in the state of the waters in EU countries and EU border areas
- Genuine ecotourism can decrease harmful effects on nature.
- Development and harmonisation of regulations and legislation can help international work.
- Industry has an interest in international progress and environmental standardisation
- Increased ecological efficiency in industrial processes and waste handling
- Environmental information can be spread by a transfer of knowledge and educational activities.
- International Working Groups for environmental questions

3.2 SWOT analysis for groundwater

Strengths

- The state of the groundwater is good in most parts of the Barents Region
- National legislation on water issues and regulation governing water use and requiring improvements
- Good national monitoring systems for groundwater data collection as a base for decision-making
- Supervising of emission loads and emission limits through environmental permits
- National standard methods for groundwater monitoring
- Existing collaboration in many groundwater projects
- Existing information on groundwater areas and ready plans for groundwater usage
- Extensive groundwater resources for drinking water purposes

Weaknesses

- Financing for improvements is difficult in international projects.
- Modernisation and construction of groundwater intake systems and water piping systems is very expensive.
- Measures to ensure pure drinking water will be needed very soon in certain areas
- Low population means higher costs per person in water projects.
- Differences in legislation and standardisation between countries
- Lack of harmonisation in emission limits, monitoring systems etc internationally
- Lack of money for monitoring activities
- Some areas have naturally high concentrations of iron and salts in the groundwater.
- Heavily polluted areas in the Barents Region
- The cold climate causes technical problems in pipelines in the northern part of the Barents Region

Threats

- Emission loads
  - Agricultural and forestry runoff and municipal wastewater
  - Landfills
  - Long-range pollutants
    - Heavy metals
    - POPs
    - Acidic pollution
  - Expansion of the oil industry
  - The mining industry
- Unsustainable use of groundwaters
- Groundwater pollution risks are very high in polluted areas
- EU financing tools are changing, which can make project implementation much more difficult.

Opportunities

- Development actions for groundwater protection, economic environmental policy instruments
- Legislation and protective actions
- "Cleaner production" work decreases industrial emissions
- Good ecological status of the Barents Region
- Water Frame Directive gives common approach to improvements in the state of waters in EU countries and border areas
- New financing tools for project implementation
- International Working Groups for groundwater issues
- Efficient use of groundwater and saving of drinking water

3.3 Actions based on SWOT analysis

3.3.1 What we can do to build on the strengths

- Information exchange on projects and financing tools between regions
- Project planning based on existing studies
- Water basin-based monitoring and management systems for rivers
- BAT in environment permits
- Concrete plans and strategies for project implementation

3.3.2 What we can do to resolve the weaknesses

- Education in the harmonisation of environmental monitoring methods and standardisation
- Standardisation of environmental monitoring
- Use of economic environmental policy instruments
- Implementation of AMAP "Hot Spot" list recommendations, projects mentioned in report
- Modernisation of industrial processes (BAT)
- Cleaning of polluted soils and areas
- Larger international projects to help financing
- Regulation agreements on dams

3.3.3 What we can do to avoid the threats

- Introduce planning tools for project implementation
- Collaboration amongst countries and regions
- Education in cleaner production and environment management systems
- Information exchange on financial tools
- Requirements as to how to use the money allocated for environmental projects
- Ecotourism labelling systems and education
- Increased supervision/management of emissions

3.3.4 What we can do to exploit the opportunities

- Public knowledge and awareness of the state of the waters should be developed in the Barents Region
- Continue the positive progress in reducing emissions
- Educational collaboration in all areas

4 SWOT ANALYSIS AND STRATEGIES/ACTIONS: BIODIVERSITY

4.1 SWOT analysis for biodiversity

The SWOT analysis discusses the strengths, weaknesses, opportunities and threats regarding the (forest) biodiversity in the Barents Region. The analysis is based on participants from the regions, the expert meeting at Svanhovd Environmental Centre in Finnmark, Norway, reports and other known materials.

Strengths

- Mainly good ecological status
- Large pristine areas, especially in the eastern part
- Existing monitoring systems good for some of the regions
- Mapping methods of biodiversity and valuable forests are good
- Good existing knowledge
- Protected areas
- Sustainable forestry projects in Russia[1]

Weaknesses

- Forces towards economical growth (in forestry) at the expense of the environment
- Problems with employment and development in the small settlements. Environment has low priority
- Environmental values have partially low political priority
- Little focus on threatened and vulnerable habitats and areas
- Partial lack of environmental knowledge in forestry
- Partial lack of understanding of the importance of environmental care
- Poor and partial lack of certification
- Partial lack of environmental sound practice
- Different classification systems could be a problem
- Different legislation
- Small monitoring/mapping/coordinating resources
- In spite of existing networks: lack of good network due to language barriers, distances, travelling costs etc
- Little local participation in forestry leads to absence of local knowledge regarding environmental values
- Little knowledge about positive forestry projects (environmental, social and economical consequences)
- Poor communication
- Too little financing

[1] Large differences amongst state and private forests and enterprises.

Opportunities

- Development of certification systems
- Collaboration with other sectors (forestry industry, etc.)
- Better and increased information
- Continued and improved international environmental collaboration
- Increased environmental focus
- Education on all levels
- Model areas – testing new approaches
- Ecotourism based on nature's premises, resulting in increased local income
- Designing and establishing scientific reserves as reference areas
- Collaboration with stakeholders
- Improved sustainable activities in protected areas (eco-tourism, etc.)

Threats

- Unsustainable and illegal forestry
- Change of forest stands by using introduced tree species
- Road construction in pristine areas
- Breach of nature protection
- Absence of joint policy regarding environment, logging, leasing, economy, etc.
- Interference in pristine areas
- Hydroelectric power plants and lines
- Unnatural forest fire situation (preventing fire or introduced fire)
- Industries in vulnerable areas
- Increased tourism without the necessary environmental considerations in vulnerable areas
- Pollution
- Drainage
- Too many reindeer/moose
- Low living standards
- Preparing for ownership
- New forestry legislation
- Climate change

4.2 Strategies and actions based on the SWOT analysis

Based on the SWOT analysis, the Biodiversity Group has tried to develop proposals for actions and strategies for the future work. The actions include both things that the environmentally responsible (RWGE, authorities, etc.) and the different sectors should put on the agenda. The strategies are divided into four:

- What we can do to build on the strengths
- What we can do to resolve the weakness
- What we can do to exploit the opportunities
- What we can do to avoid the threats

4.2.1 What we can do to build on the strengths

Most strategies were connected to the biodiversity strengths. The most important strategies were to develop, improve and carry out mapping and monitoring in virgin forests, improve the education and information access, recommend more protected areas/habitats, model forests and improve the environmental care in the forestry industry.

- Develop and improve mapping and monitoring systems
- Estimate the need for protection and give advice to relevant authorities
- Carry out detailed mapping of the areas, with focus on key habitats and natural habitat sites
- Update and distribute maps of virgin forests
- Red Data Book for the entire Region
- Joint registers/databases for environmental values in the forests, which are accessible to forestry, environmental agencies and NGOs
- Improve the access of information about the environment in the Barents Region, e.g. through use of the Internet, education, press releases on positive results, etc.
- Education regarding environmental values in forestry
- Information on sustainable use of the resources
- Education and information at all levels (from kindergarten to university)
- Public awareness
- Get new information and develop new and improved maps over old-growth forests/virgin areas in the region
- Complete the GAP analysis involving protected areas and (threatened) natural habitat sites
- Rehabilitation of protected areas with interference or alien species
- Recommendation of further steps regarding use of vulnerable forest habitats
- Carry out model forest projects
- Barents Standard

4.2.2 What we can do to resolve the weaknesses

There were also many strategies related to avoiding the weaknesses. The most important strategies were better information, preparation of a Red/Green Book, better collaboration with the forestry industry and implementation of certification.

- Better information and attitude-creating work
- Prepare a Red Book for the species and habitats in the Barents Region
- Recommendation for the future use and management
- GAP analysis resulting in suggestions for possible protected areas and habitats
- Continue and develop existing environmental collaboration
- Language barriers, long distances, expensive travel, etc. lead to a need for alternative additional networks or different people
- Establish and run a website
- Joint meeting amongst forestry and environmental groups in the future

- Better knowledge about environmental care in forestry through information and education
- Development of, demands for and implementation of certification
- Model forest projects
- Key biotope philosophy
- Barents Standard
- Local contribution
- Small resources for monitoring, mapping and coordination: visualise the need through information and lobbying
- Balance between economic growth and ecologically sustainable exploitation through information
- Develop joint legislation to the extent possible
- New suggestions and approaches

4.2.3 What we can do to exploit the opportunities

The Biodiversity Group is proposing just a few strategies related to the options. The potential is most likely greater than this, and additional work is recommended here.

The most important strategies were distribution of knowledge, education and science, improving the existing network and developing a new network.

- Environmental education for people employed in forestry
- Increased environmental focus
- Model forest – testing new approaches
- Scientific reserves
- Distribution of information and knowledge through active use of the Internet
- Continuation of existing work (CAFF, RWGE, Habitat Forum, etc.)
- Expanding existing network
- Collaboration amongst different interests, e.g. environment and industry
- Relate biodiversity in forests to biodiversity in bogs/wetlands, lakes and rivers

4.2.4 What we can do to avoid the threats

Many strategies are also related to reducing the threats. The most important strategies were improving the education/information to reduce the risk of interference, reducing the human-caused fires and letting natural fires run, implementing certification systems and good principles related to the new forestry law.

- Education/information to reduce the risk of for example
    - Non-sustainable forestry
    - Road construction in vulnerable habitats/areas
    - Drainage
    - Hydroelectric power plants in vulnerable and valuable areas/watercourses
    - Industry in environmentally valuable areas
- Human-caused fires/lack of natural fires is a problem for natural succession in some areas – need for natural development in at least some areas

- Reduce the numbers of moose and particularly reindeer in areas with unnaturally high numbers
- Change in forest stands: restriction of alien species
- Develop, improve and implement certification systems, e.g. the “Barents Standard”
- Principles related to introduction of new forestry law
- Principles related to preparing for ownership
- Improve living standards
- A clear policy regarding cutting, environment, economy, leasing, etc.
- Increased inspection and a clear policy regarding illegal cutting and disruption of nature protection

4.2.5 Summary of the main strategies

Finally, here is a summary of the most prioritised and important strategies:

- Continued and improved monitoring (Arctic Council and the nations)
- Continued mapping towards a joint database (industry, environmental authorities, organisations)
- Following up and finishing the work with the GAP analysis
- Barents Standard (consisting of international certification and collaboration with/contributions from/consideration to the local inhabitants)
- Better collaboration amongst forestry, environment, education and health services
- Continued network building
- Further development of model forest projects
- Joint Red Data Book
- Better and improved information

4.2.6 Concrete actions

The Environmental Group would like to propose a joint project. This project includes a model area with participation from industry (forestry), environmental agencies (water and biodiversity) and perhaps people from the health sector.

The purpose of the project is to develop the area. A local development and contribution will hopefully secure a sustainable forestry and the necessary considerations. Further, the use of local inhabitants will secure the development of knowledge, health, environment and industry in the area.

The project should be financed through the Barents Foundation, money from industry/economic life and from the nation.

Other concrete actions:

- Prepare and develop a joint Red Data Book for the Barents Region. This project should include responsible persons from each region and carried out in collaboration with the RWGE and the International Contact Forum of Habitat Conservation
- Develop a “Barents Standard” as certification for forestry

- Develop a “Barents Standard” for eco-tourism with guidelines and recommendations.
- Increased understandable information on projects with links for the more interested public
- Contribute to the work with a GAP analysis (protected areas/endangered natural habitat sites and species)
- Joint work with enterprises to promote the environment as a brand
- Building networks and improving the information through the development of a website with relevant information and links to the different actors and activities.

5 ACTORS IN IMPROVEMENT ACTIONS

5.1 Russia

- Ministries
- Departments of Nature Resources and Environmental Protection
- Regional Departments for Hydrometeorology and Environmental Monitoring
- The Specialised Analytical Control Departments of Federal State Institutions
- The Science Centres
- Sanitary Control Authority
- Fishery Protection Authority
- Geological Survey of Russia
- Industry

5.2 Sweden

- Ministries
- County Governors
- EPA
- Game and Fisheries Research Institute
- Forest Research Institute
- Geological Survey of Sweden
- Communities
- Universities
- Industry

5.3 Norway

- Ministries
- County Governors
- NIVA
- Universities
- Industry

5.4 Finland

- Ministries
- Regional Environment Centres
- Finnish Game and Fisheries Research Institute
- Finnish Forest Research Institute
- Geological Survey of Finland
- Finnish Meteorological Institute
- Universities
- Industry

6 PROJECTS

Water projects are based on the AMAP Report, "Updating of Environmental 'Hot Spots' List in the Russian Part of the Barents Region: Proposal for Environmentally Sound Investment Projects". More detailed information can be found in the report. Projects started since 1995 are listed below. Progress in the implementation of the projects varies.

6.1 Projects in the Murmansk Oblast

- **M 41** Construction of communal wastewater treatment system in the town of Kildinstroy
- **M 61** Improvement of the treatment of municipal wastewaters discharged into the Kola Fjord from Murmansk City, Northern Sewage Treatment Plant
- **M 44** Improvement of the Monchegorsk City water supply system
- **M 51** Establishment of a system for treatment of non-radioactive hazardous waste in the Murmansk Oblast
- **M 52** Treatment of faeces and effluents from the Murmanskaya Poultry Farm (Kola River watershed)

6.2 Projects in the Republic of Karelia

- **K 31** Segezha Pulp and Paper Plant, reduction of gas and dust emissions and wastewater discharges
- **K 32** Nadvoitsy Aluminium Plant, reduction of gas and dust emissions and wastewater discharges
- **K 41** Kostamuksha Iron Pellet Plant, Karelsky Okatysh, reduction of wastewater discharges and industrial gas emissions
- **K 61** Artificial rearing of Atlantic salmon in the Karelian part of the White Sea, in order to increase the stock of salmon in the Karelian rivers

6.3 Projects in the Archangelsk Oblast, including Nenets AO

- **A 42/43** Drinking water supply in the cities of Archangelsk and Novodvinsk
- **A46** Archangelsk Pulp and Paper Plant in Novodvinsk, reduction of wastewater discharges and gas and dust emissions

6.4 Projects concerning indigenous and traditional peoples

- **M 81** Water supply in the village of Lovozero
- **A 82** Drinking water and sewage treatment in the small villages of Kenozero National Park

7 LINK BETWEEN WP2 AND WP4

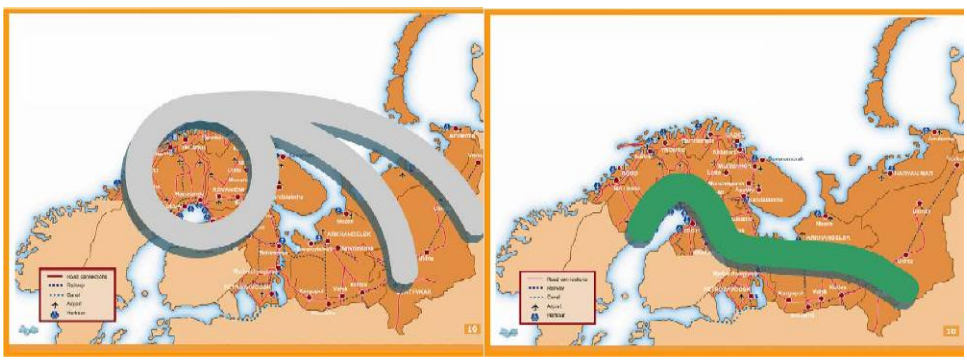
The Barents Region is exceptionally rich in natural resources, including petroleum, metals and forests. These are decisive factors for sustainable development. The most important issues with an environmental point of view (waters) in the strategy work with WP2 are:

- Education and standardisation in the harmonisation of environmental monitoring methods
- "Cleaner production" work for decreasing industrial emissions and modernisation of industrial processes (BAT)
- Progress in national legislation on water issues and regulation governing water use and requiring improvements. Differences in legislation and standardisation amongst countries cause many problems in everyday work.
- Public knowledge and awareness of the state of the environment should be developed in the Barents Region
- Continue the positive progress in reducing emissions
- Increased ecological efficiency in industrial processes and waste handling

One important question for both work packages is that of public knowledge and awareness and how to increase this in the future. This means open information exchanges amongst local inhabitants and actions regarding their needs. Environmental information can be spread by a transfer of knowledge and educational activities. Equal competition is very important for industry, and WP2 presented the idea of a common "Barents Standard" for the Barents Region. The standard would help competition worldwide and present equal demands for industrial installations in the Barents Region. The standard will include environmental questions.

Environmental questions are important with industry today, and markets set certain demands for environmental management. There will be a need to increase the collaboration between environmental authorities and industry in the future. Education and information exchanges will be needed between authorities and industry with the environmental issues.

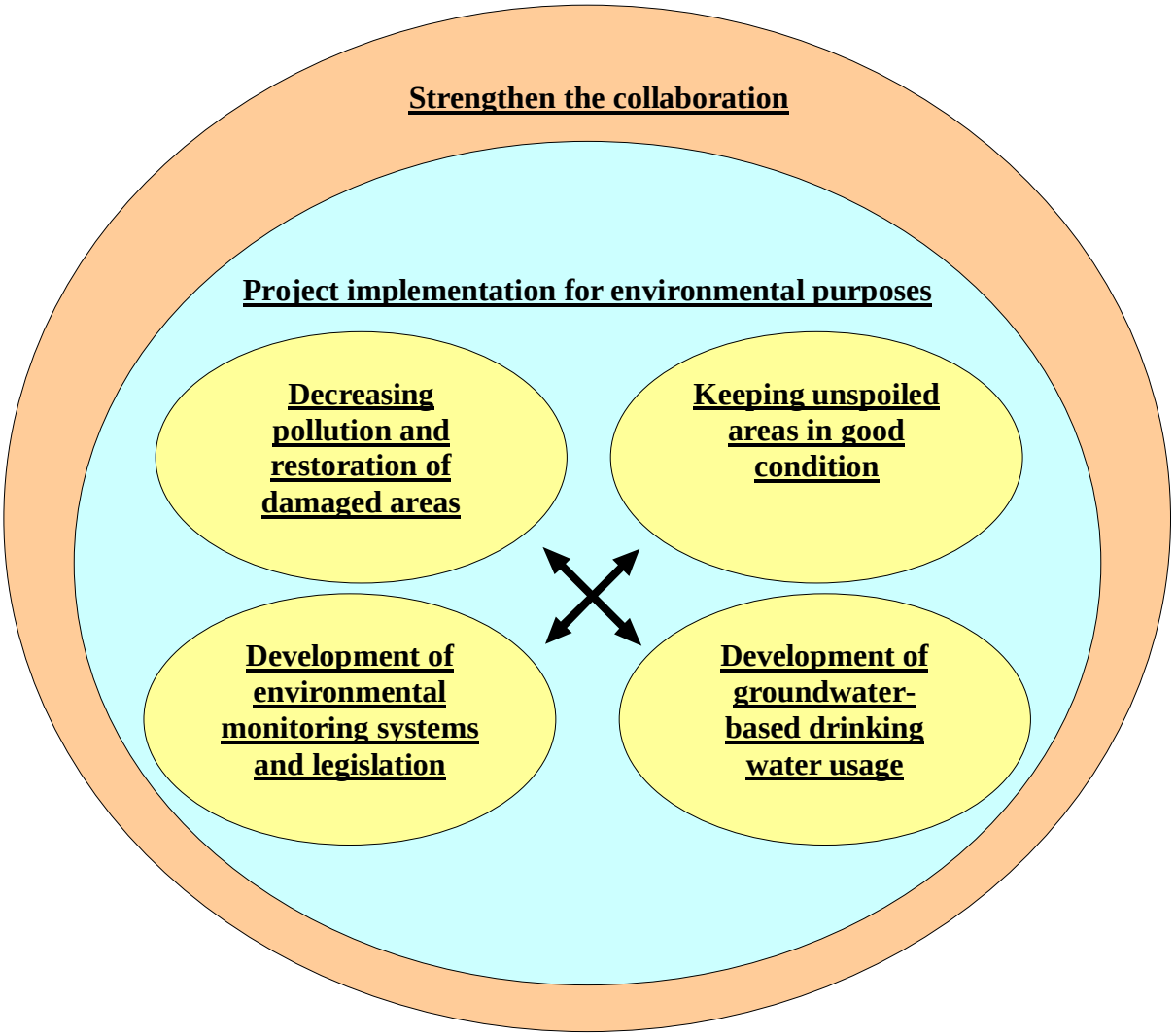
The strategic focus of WP2 is to initiate the use of the most modern production technologies and methods in the sustainable exploitation of the Regions' natural resources. Improvement of the environmental situation by introduction of new technologies is also written down in the goals of WP2.



Barents Region mining and forestry industrial zones presented by WP2.

8 Strategic focus and action plan

8.1 Strategic focus



8.2 Actions for strategy implementation

Decreasing pollution and restoration of damaged areas	**Development of environmental monitoring systems and legislation**	**Keep unspoiled areas in good condition**	**Development of groundwater-based drinking water usage**
• Implementation of the AMAP "Hot Spot" list recommendations • Use and Education of the economic environmental policy instruments • Modernisation of industrial processes (BAT) • Decrease runoff loading • Clean-up of polluted areas	• Education in the harmonisation of environmental monitoring and legislation • Water basin-based monitoring and management systems for rivers (WFD) • Flood protection actions • Information exchange on the state of the environment	• Education in cleaner production and environment management systems • Ecotourism labelling systems and education • Guidance of water construction activities • Fishery and biodiversity • Nature conservation	• Implementation of the AMAP "Hot Spot" list recommendations • Studies for new groundwater areas and delivery systems • Regional plans for water usage

Project implementation for environmental purposes

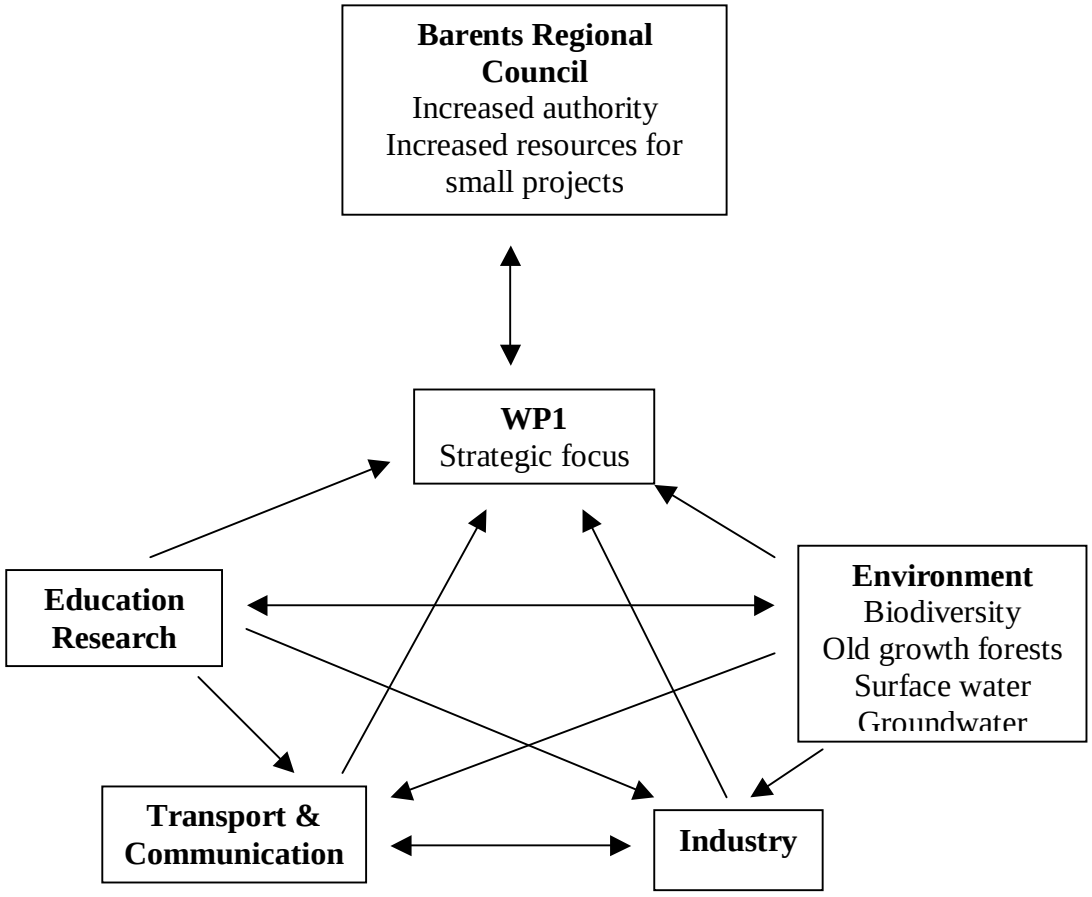
- Information exchange on projects and financing tools amongst regions
- Project planning based on existing studies
- Larger international projects to help financing
- Pilot projects as studies for bigger projects
- Prioritisation of the AMAP "Hot Spot" list

Strengthen the collaboration

- Barents Working Groups and exchange programmes for authorities
- Strengthen collaboration with industry
- Public knowledge and awareness of the state of the waters should be developed in the Barents Region
- International collaboration for project funding

8.3 Strengthen the collaboration

To improve the collaboration, we suggest that the Barents Regional Council becomes more central in the future work. We suggest that they be assigned resources for smaller interregional projects. The different projects can apply for resources, and the Barents Regional Council is responsible for distribution amongst the different lines and for involving other sectors. If necessary, the Council should be able to claim collaboration between the different lines.



8.3.1 RWGE's future tasks

In the future collaboration, we suggest that the Regional Working Group on Environment (RWGE) be responsible for:

1. Consultations for other sector programmes and actions
2. Further development of professional networks
3. Ensure collection/analysis of relevant basic environmental information in the Barents Co-operation
4. Advisory service for the Barents Regional Council