multiuse plan

Pasvik &
Grense Jakobselv
// Паз и Ворьема

Kolarctic
CBC | CROSS-BORDER COOPERATION

Statsforvalteren i Troms og Finnmark
County Governor of Troms and Finnmark

Centre for Economic Development,
Transport and the Environment

PASVIK
National Nature
Reserve

Vann langs felles grense

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Krever grenseløs omtanke

Vesi yhteisellä rajalla

Iankaikkista voimaa ja elämän lähde

Vaatii rajatonta harkintaa

Воды вдоль общей границы

Вечная сила и источник жизни

Требуют безграничной заботы

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Chapter 1 – Introduction

The Pasvik (Paz/Paatsjoki) and Grense Jakobselv (Vuorjema/Vuoremijoki) river basins are located in the border area of Russia, Norway and Finland. The Pasvik river's thalweg is the border between Norway and Russia for 112 km. The river's sources are in Lake Inari in Finland, it runs through the Pasvik valley and discharges into the Barents Sea in Bøkfjorden. The largest part of the catchment area is in Finland (70 %), and smaller shares in Russia (25%) and Norway (5%).

The Grense Jakobselv is a border-river between Norway and Russia. The last 35 km of the river forms the northernmost border between the two countries.

The catchment areas of both rivers consist of vast natural areas, including nature reserves, along with heavily affected aquatic and terrestrial ecosystems due to human impacts. Since industrialization, the environment in the area has been increasingly affected by industrial activities. The largest industrials are Kola GMK, operating in Russia in the towns of Zapolyarny and Nikel, and Sydvaranger iron mine in Bjørnevatn, (Norway). The smelter in Nikel was closed down in December 2020; as well as dehumidification of concentrate and briquetting were ceased in the town of Zapolyarniy. In Finnish side of Pasvik river catchment there's only gold panning activity, no mining of minerals. Adding to pollution from industries and other anthropogenic activities in the area, are the effects of long distance transported airborne pollution on natural ecosystems, water regulations, invasive alien species and other anthropogenic pressures (gold panning, forestry, agriculture, tourism and other economic activities). Water temperatures are rising, and climate change effects are becoming increasingly prevalent in the area.

The overall objective of this Multi-Use Plan is to sustain and improve the state of the environment within the Pasvik and Grense Jakobselv river basins, to the benefit of local people and to increase the viability of the local economy.

A precondition for solving environmental problems in this area is the understanding of these challenges as partly transboundary. Solutions to environmental problems inevitably need to be sought in cooperation and in common understanding between authorities and stakeholders at a transboundary level. One country, a sole institution or stakeholder will not be able to solve the problems alone. Common solutions to common problems will therefore be largely beneficial to all.

Trilateral cooperation between Russia, Norway and Finland on nature protection, environmental management, monitoring and research in the Pasvik-Inari area started back in the late 1980's. The effects of human pressures on aquatic and terrestrial ecosystems have been studied and documented. Programs for joint monitoring activities have been developed and partly implemented. The process of establishing nature protection areas in the border areas of three countries, started in the 1990's and was concluded well in 2008 by the founding of the Pasvik-Inari Trilateral Park.

Moreover, a joint environmental management plan (Ecological passport/Multi-Use Plan) for the Pasvik river was developed in 1996, after an initiative of the Norwegian- Finnish Transboundary Water Commission, as a trilateral cooperation between Russia, Norway and Finland. The current plan is now outdated and needs to be re-newed, as well as updated according to new planning standards. For the River Grense Jakobselv, no such plan has been developed previously, but there is a need to coordinate management and measures closely also in and along this border river. The Grense Jakobselv catchment has therefore been included along with the Pasvik catchment area as a part of the planning area of this Multi-Use Plan.

Photo by V. Bunzun.

Inari Hiking Area 2019. Photo by Metsähallitus/Kota Collective.

Chapter 2 – The planning area

2.1. Settlement and economy

The municipalities of Inari in Finland, Pechenga in Russia and Sør-Varanger in Norway cover the main parts of the catchment areas of the river Pasvik. The Grense Jakobselv catchment is divided between Pechenga Municipality (Russia) and Sør-Varanger (Norway).

Pechenga municipal district, Russia has the largest population of the three municipalities, 44,100 inhabitants, whereas 11,250 live in the town of Nikel. There were 10 153 inhabitants in Sør-Varanger municipality and 6,899 in Inari municipality in 2019.

The Eastern Sámi (Skolt Sámi) were without doubt the original habitants of the Pasvik river area in prehistoric times. The area is today a meeting place for different peoples: Sámi, Finns, Russians and Norwegians. Different cultures have met and developed through time. Thus, the population of the area today is of a multi-cultural origin and society as such is multi-cultural.

Both Pechenga and Sør-Varanger municipalities have grown from the beginning of the 20th century due to mining. Most of the working population in Pechenga district is currently employed by Kola GMK. In Bjørnevatn close to Kirkenes, the opencast iron mine of Sydvaranger Drift AS has been historically been important for employment. The mine is currently closed, but a re-opening is being planned.

Along with mining activities, services (shops, hotels, transport and other services) are the most important employment sector in Sør-Varanger today, followed by public services (health sector and other public services).

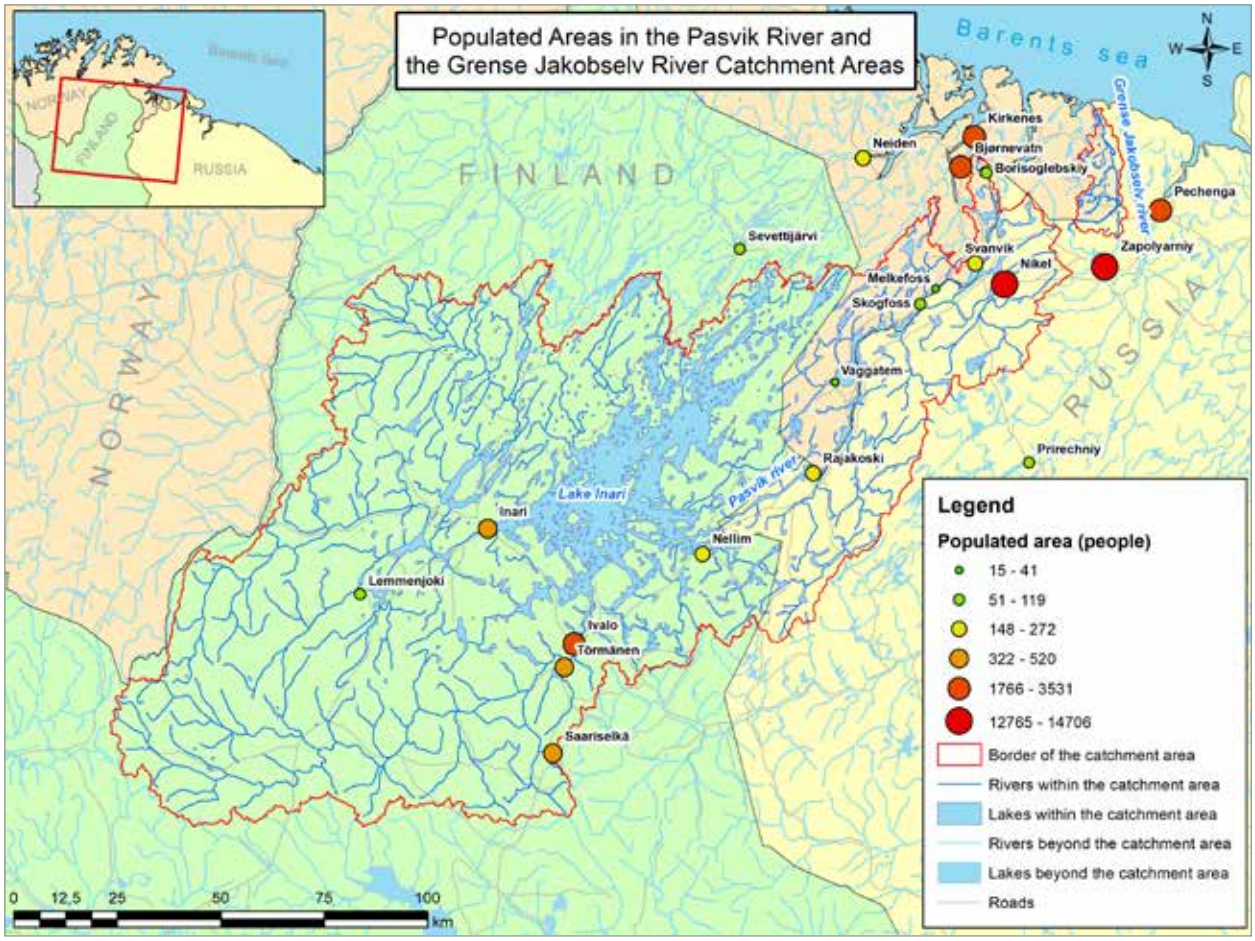

Fig.2.1. Map of the catchments in Finland, Russia and Norway.

In Inari municipality there is no large-scale mining activity. Current claims and mining concessions are for gold panning or for small-scale mechanical gold mining. Services are by far the largest economic group in the employment sector in Inari. Services account for about 85% of jobs.[1] The importance of tourist industry started to increase in the 1970s and is nowadays the most important industry with its related services[2]

A more detailed description of characteristics of the catchment areas of Pasvik and Grense Jakobselv respectively is given below.

2.2. The Pasvik river catchment

The catchment area of the Pasvik river covers an area of 18 309 km2. The largest share of the catchment

Lake Inari is the second largest lake in Finland with an area of 1084 km2. It is also the second largest lake north off the Arctic Circle. Lake Inari is more than 50 kilometers wide from the Juutuanvuono area to the Pasvik river inlet and about 80 kilometers wide in the southwest-northeast direction from Lake Ukonjärvi to the Suolisvuono area. The maximum depth of the lake is 95 meters.

Lake Inari is the central lake of the Pasvik river basin. The waters of the river basin flow down the Pasvik river into the Barents Sea. The largest rivers running into Lake Inari are the Ivalojoki and the Juutuanjoki.

[1] Talousarvio vuodelle 2020 sekä talous-ja toimintasuunnitelma vuosille 2020–2022. 12.12.2019. Inarin kunta. Dnro 208/02.02.00.00/2019

[2] O., Sandström, I., Vaara, P., Heikkuri, M., Jokinen, T., Kokkoniemi, J., Liimatainen, T., Loikkainen, M., Mela, O., Osmonen, J., Salmi, M., Seppänen, A., Siekkinen, J., Sihvo, J., Tolonen, O., Tuohisaari, T., Tynys, M., Vaara, P., Veijola. Ylä-Lapin luonnonvarasuunnitelma. 2000.Metsähallitus.

The river stretch of the Pasvik catchment is situated in Norway and Russia, creating the national border between the two countries over a 112 km distance. From the upper tributaries in Ivalojoki in Lemmenjoki national park, Finland: there is a 380 km distance to the river delta in Bøkfjorden.

The region is characterized by extensive pine forests, which also contain individual, small groups of the European white birch, downy birch and Siberian spruce. Birch, together with the European alder, aspen and willows, forms true forest only in the coastal zone of the Pasvik river. The ground vegetation typically consists of sparse shrubs and dwarf shrubs and extensive stands of reindeer lichens.

Fig. 2.2. Map of the catchments of Pasvik catchment in Finland, Russia and Norway.

There are extensive marshes in the low-lying areas along the banks of the Pasvik river. The area is an important nesting, resting and migration site for many species of ducks and waders, bean geese and whooper swans. In addition to numerous species of birds, large mammals like Eurasian elks and brown bears live in the area.

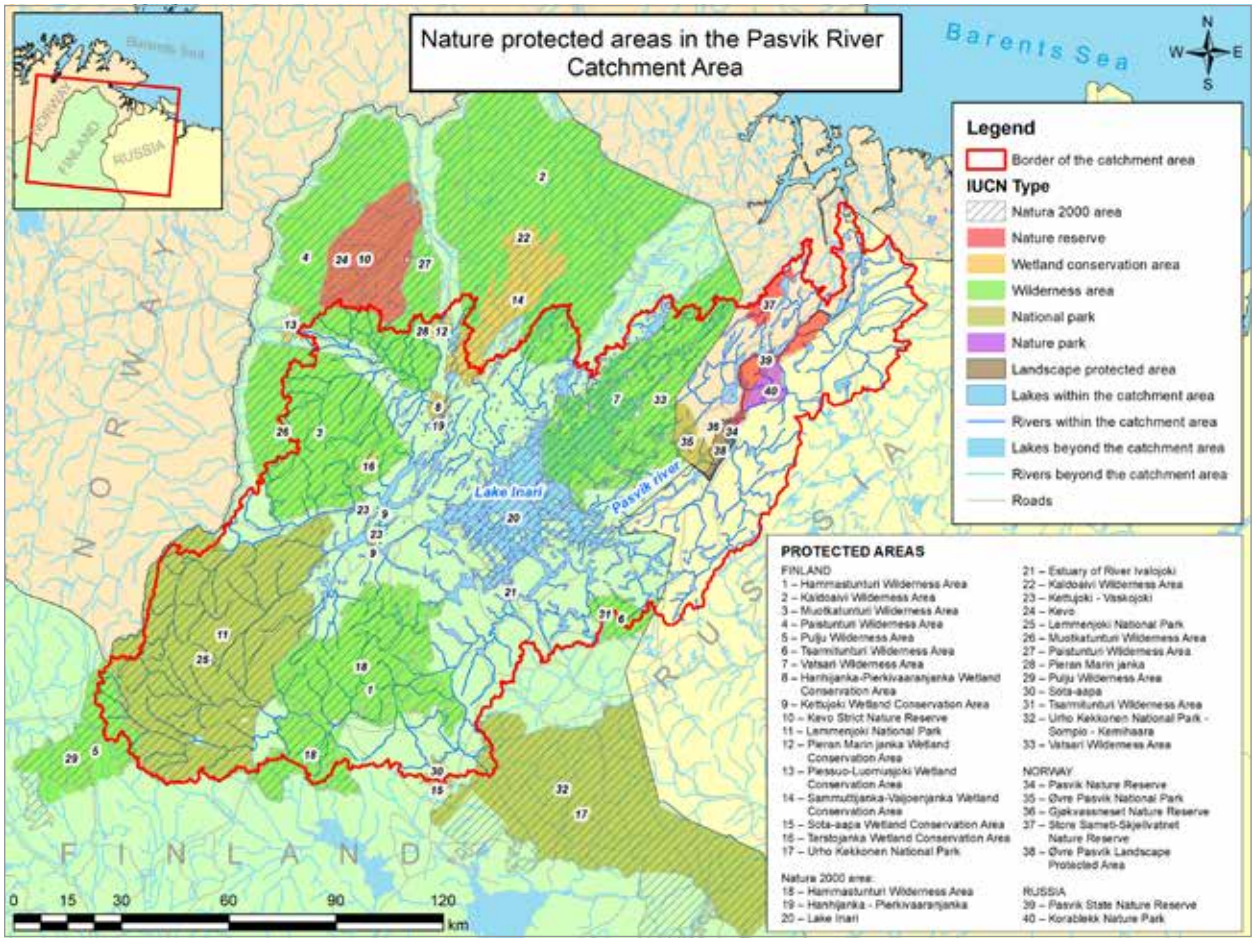

Fig 2.3. Map of the nature protected areas in the Pasvik catchment.

Estuary of Grense Jakobselv. Photo by the County Governor of Troms and Finnmark.

The Pasvik river has a large number of fish species (15 different species): among them are brown trout, whitefish, perch, char, grayling, vendance, burbot, minnow and pike. There is also salmon in the river below Borisoglebskiy.

The main settlements within the planning areas are Ivalo, Inari and Saaiselkä in Finland, Nikel, Jänikoski, Rajakoski and Borisglebskiy in Russia and scattered settlement along the Pasvik valley in Norway (Svanvik, Melkefoss, Skogfoss and Vaggatem). The town of Kirkenes and the municipal center of Sør-Varanger in Norway are in vicinity of the Pasvik catchment but is not part of the planning area.

Nature conservation has highly been prioritized by all the three border countries in the Pasvik catchment.

Seven of these protected areas, two in Russia (Pasvik State Nature Reserve and Korablek Nature Park), two in Finland (Vätsäri Wilderness Area and Lake Inari Natura 2000 site) and three in Norway (Øvre Pasvik National Park, Pasvik Nature Reserve, and Øvre Pasvik Landscape Protection Area), constitute the common Pasvik-Inari Trilateral Park (see chapter 5.2). In addition, in the Pasvik catchment area there are also other nature protected areas that together cover more than half (52,38%) of the Pasvik catchment area.

2.3. The Grense Jakobselv river catchment

The catchment area of the Grense Jakobselv river covers an area of 241 km^2, whereas 35% is in Russia and 65% in Norway. The upper parts have scarce vegetation whereas the lower parts mainly are vegetated by birch. The river valley is an important hatching area for birds of prey and other threatened bird species.

The last 35 km of the river forms the northernmost border between Russia and Norway. The thalweg in the river is the border line. To protect the border, both countries have built erosion control structures along the river's banks. In both countries and thus on both sides of the river, there are approximately 12 km of such structures along the river. Due to the erosion control structures, the river stretch along the border is in practice canalized.

Fig. 2.4. Map of the Grense Jakobselv (Vuorjema) catchment and planning area in Russia and Norway.

Within a Memorandum of Understanding on Green Belt of Fennoscandia (2010), Russian authorities plan to establish a new protected area on the Russian side of Grense Jakobselv's catchment, the new protected area will be one of the northernmost protected territories, which can eventually merge or cluster with Pasvik State Nature Reserve. Its total area is to be 30 thousand hectares, including the sea area of more than 18 thousand hectares.

The following territories are planned to be included in the new protected area (fig. 2.4.): Vuorjema (Grense Jakobselv's) catchments (Russian side), the coastline between Cape Vuorjema (Grense Jakobselv) and the west coast of Dolgaya Shchel Guba (fjord) and the territory to the south of this fjord, a 12 km waterline of the Barents Sea which is parallel to the coastline.

The main goal of establishing a protected area is stating the high environmental values of this territory, which will help to protect a unique biodiversity of its flora and fauna, as well as cultural and historical heritage.

The Russian side has always been called Vuorjema. Here, on the east coast, in the 19th century there were 3 settlements: Vuorjema colony and Filman and Stolbovoe camps. In 1853, the St. Nikolay Chapel was built on the Vuorjema riverbank.

In summer, a significant number of colonists gathered at the mouth of the Vuorjema. In addition to fishing, they kept sheep and cows, as there were good hayfields in the river valley. In winter, fur animals were hunted. There are long traditions for angling Atlantic salmon along the Norwegian side of the river. The river has good salmon fishing sites and fishing rights were rented out to English anglers already in 1865. Fertile soils and salmon fishing resulted in settlers moving to the valley in the 1850's. In 1869, King Oscar II raised a stone chapel close to the river mouth, which is still sporadically in use.

Today, there is no permanent settlement along the river apart from military presence. However, on the Norwegian side there are several other buildings used as summer cottages. The Russian part of the river is a military zone with no settlement.

The river is part of the Norwegian Protection Plan II[3] listing rivers that cannot be exploited for hydropower purposes.

Fig 2.4. Map of the suggested marine and terrestrial areas to be included in the «Vuorjema River Valley» protected area along the Grense Jakobselv river and the Barents Sea coastline.

[3] https://www.nve.no/vann-vassdrag-og-miljo/verneplan-for-vassdrag/finnmark/247-3-grense-jakobselv-vuorjan/

Photo by Silja Wara.

Chapter 3 – The multi use planning process

For our planning work, we have used the multi- use planning concept. A multi-use plan addresses all relevant aspects of river basin management which influences the river's environmental status. This planning concept recognizes that water bodies and their catchment areas are influenced and utilized by different water-users. These stakeholders and key participants need to participate and contribute to the planning process for it to be successful.

The target groups in the planning process includes regional authorities and the municipalities of Pechenga (Russia), Sør-Varanger (Norway) and Inari (Finland), local enterprises and industry, hydropower companies, research- and monitoring institutions, non- governmental organizations (NGO's) as well as other representatives of the local population in the area.

In the project kick-off meeting in March 2019, we stated that the planning process will concentrate on: "joint efforts for transboundary waters, co-operating with our neighbours and the elaboration of different ideas together with different authorities". We have achieved these process goals by organizing a variety of events during the years 2019 and 2020. At the transboundary level, we have organized several workshops to elaborate measures. Each country has also organized their own public meetings and/or stakeholder meetings as a part of the planning process.

Picture from start-up meeting in 2019. Photo by Jan Martin Solstad.

The planning process has been funded by the Kolarctic CBC programme along with national funding from each country. We have organized the planning process as a project: "Cross-border dialogue and Multi-Use Planning in the Pasvik and Grense Jakobselv catchments" (KO1110). The Lead Partner of the project is the County Governor of Troms and Finnmark (SFTF, Norway). The Russian partner is Pasvik State Nature Reserve. Centre for Economic Development, Transport and the Environment (ELY Center) of Lapland is the project partner in Finland.

The representation of regional and local authorities in the project steering group is given in table 3.1. below. The chair of the steering group was Bente Christiansen/Lisa Bjørnsdatter Helgason (County Governor of Troms and Finnmark). Vladimir Chizhov/Natalia Polikarpova (Pasvik State Nature Reserve) was the project vice chair. In addition, several experts from different state and local organizations contributed to the work of the steering- and project group (see table 3.2).

The products from the planning process have been presented to the project steering group throughout the span of the planning period.

Table 3.1. Steering group members of the project planning process.

Organisation	Name of representative	Name of substitute
County Governor of Troms and Finnmark (SFTF)	Lisa Bjørnsdatter Helgason (Bente Christiansen*)	Tiia H. Kalske
Pasvik State Nature Reserve (PZ)	Natalia Polikarpova (Vladimir Chizhov*)	-
Centre for Economic Development, Transport and the Environment, Lapland (ELY)	Jari Pasanen	Annukka Puro-Tahvanainen
Murmansk Regional Duma	Maxim Ivanov	
Pechenga municipality	Andrew Kuznetsov (Eduard Zatona*)	Andrew Ponomarev (Inessa Fomenko*)
Inari municipality	Toni K. Laine	Mari Palolahti
Troms and Finnmark county	Tarjei Bech	Mikkel S. Kvernstuen
Sør-Varanger municipality	Karine Emanuelsen	Trygve Sarajärvi

* Indicates the representatives of organizations at project start. These were succeeded because of job leave/retirement.

Table 3.2. Lists of organizations and experts to the steering group.

Name of organization and country	Name of experts
Murmansk Department of Hydrometeorology and environmental monitoring, Russia	Oxana Chaus
Centre for Laboratory Analysis and Technical Measurements, Russia	Margarita Ryabtseva
Administration for the Dvina-Pechora Water Basin, Russia	Elena Merenkova
Centre for Social Projects, Russia	Vladimir Chizhov
Kola GMK, Russia	Mikhail Shkondin Evgeniy Salakhov
Metsähallitus (MH)	Anna Tammilehto Pauliina Kulmala Lauri Karvonen
Natural Resources Institute Finland (Luke)	Teuvo Niva
The Norwegian Water Resources and Energy Directorate (NVE)	Knut Aune Hoseth Anders Bjordal

Photo by County Governor of Troms and Finnmark.

Chapter 4 – Framework of the trilateral environmental cooperation and the multi-use planning process

The overall basis for the trilateral environmental cooperation in the Russian, Norwegian and Finnish border area is cooperation through the United Nations. All three countries have adopted the UN 2030 Agenda for Sustainable Development, hereunder the Sustainable Development Goals . Our multi-use plan contributes to the following sustainable development goals: Goal 6: Ensure availability and sustainable management of water and sanitation for all

- **Goal 15:** Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and halt **biodiversity** loss
- **Goal 17:** Strengthen the means of implementation and revitalize the global **partnership** for sustainable development.

All three countries have also ratified the UN Convention on *the Protection and Use of Transboundary Watercourses and International Lakes*[5]. This convention requires parties to prevent, control and reduce transboundary impact, use transboundary waters in a reasonable and equitable way and ensure their sustainable management. Parties bordering the same transboundary waters cooperate by entering into specific agreements and establishing joint bodies. As a framework agreement, the Convention does not replace bilateral and multilateral agreements for specific basins or aquifers; instead, it fosters their establishment and implementation, as well as further development. For a more extensive list of relevant international conventions and agreements, see appendix 1.

Norway and the Soviet Union have cooperated on environmental management in the border areas since 1988 when the Norwegian- Soviet (after 1992 Russian) Environmental Commission was established. This commission was created to solve environmental problems and maintain ecological balance and includes investigating pressures on the environment and identifying measures to prevent and mitigate negative impacts. The following pressures were identified in the agreement: air pollution, protection of marine ecosystems, water management, environmental monitoring, exchange of knowledge on best practices and technology, ecological enlightenment and environmental legislation.

[4] www.sustainabledevelopment.un.org

[5] For more information, see: www.unece.org/env/water.html

Fig. 4.1. Map of the Dvina-Pechora River Basin in Russia. The river basin consists of 1) Arkhangelsk region, 2) Vologda region, 3) Murmansk region, 4) Republic of Komi and 5) Nenets Autonomous region.

The current trilateral cooperation is based on the mandate[6] and work of the Norwegian-Russian Commission for the Environment[7], the Norwegian-Finnish Transboundary Water Commission[8] and the Russian-Finnish Working Group on Nature Conservation.

Norway and Finland, moreover, cooperate on the management of the transboundary river basins through the EU's Water Framework Directive (WFD)[9]. There is a bilateral agreement[10] from 2013 between Norway and Finland designating the catchments of Pasvik, Tana, Neiden and Munkelva as an International River Basin District under the WDF. The agreement covers the planning and implementation of River Basin Management Plans (RBMP) and Programmes of Measures.

Russia manages the river basin according to the Russian Water Code. The Russian Water Code and the WFD are compared in appendix 2.

Basin districts are the main unit of management in the field of use and protection of water bodies in Russia. The Murmansk region belongs to the Barents-Belomorsk basin district and is managed by the Department of Water Resources in the Murmansk Region of the Dvina- Pechora Basin Administration of Federal Agency of Water Resources.

The Multi- Use Plan has no formal legal status in either Norway, Russia or Finland. However, it serves as an operational/ practical management tool for the future cooperation on the management of transboundary rivers and their catchments. Relevant actions from this plan's Programme of Measures (hereafter PoM) will need to be added to other international and national planning instruments with formal legal status (i.e., the RBMP for the Pasvik international catchment and national documents). Moreover, the PoM of this plan is also a basis for prioritizing national funding within each country, for project applications to various funding instruments at the national and international level and a basis for use of legal instruments to solve transboundary environmental issues.

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[6] https://www.regjeringen.no/contentassets/66b54513e82d453c88f030135513d582/overenskomst_av_1992_no.pdf

[7] https://www.regjeringen.no/no/tema/svalbard-og-polaromradene/innsiktsartikler-polaromradene/miljovernsamarbeid-med-russland-og-i-barentsregionen/id2343387/

[8] For more information, see https://prosjekt.fylkesmannen.no/GVK/

[9] See more information at https://ec.europa.eu/environment/water/water-framework/index_en.html

[10] https://www.vannportalen.no/english/norway-as-part-of-international-river-basin-districts/

Photo by County Governor of Troms and Finnmark.

Chapter 5 – Success-stories from the 1996 Multi-use Plan for the Pasvik-Inari Catchment

The previous multi-use plan from 1996 comprised the catchment area of the Pasvik river, including Lake Inari. As a part of our evaluation of the previous plan, we have highlighted below three success stories from the transboundary environmental work based on this plan. These success- stories give a picture of how the environmental cooperation in the border area has evolved since the 1990's.

5.1. Trilateral monitoring programmes for air quality, aquatic and terrestrial ecosystem

Trilateral cooperation on monitoring started in the 1990's. The first attempt to implement a joint monitoring program in the transboundary areas of Finland, Norway and Russia areas was developed in 2003-2006 to follow changes in the natural environment in the face of varying levels of emissions and discharges from the smelter in Nikel. Emissions from the smelter included high levels of sulphur dioxide and solids containing a wide range of heavy metals, primarily copper and nickel. The monitoring programme included air quality, deposition by precipitation, water quality, status of terrestrial and aquatic ecosystems.

Later, in 2014, the aquatic part of the monitoring was updated. It covers observations of phyto- and zooplankton, benthic diatoms and macroinvertebrates, aquatic macrophytes and fish communities. When updating the program, we considered the needs to monitor not only the anthropogenic load, but also the impact of climate change on aquatic ecosystems.

The Russian authorities in charge of the monitoring programme are the Federal office for Hydrometeorology and Environmental Monitoring (Roshydromet), Russia. In the territory of Pechenga municipal district monitoring of environmental status and pollution is carried out by the Center for Environmental Pollution Monitoring of the Murmansk Office for Hydrometeorology and environmental Monitoring (MUGMS). Itconducts systematic monitoring of environmental status and pollution, including radioactive pollution in the air, atmospheric precipitation, snow cover, natural waters and bottom sediments. There are two laboratories in their structure: the laboratory for monitoring of surface and sea water and the regional laboratory for atmospheric and radiation monitoring.

In Finland, the Centre for Economic Development, Transport and the Environment of Lapland is the authority for the aquatic part of the monitoring programme. The authority of the air quality monitoring in Finland is the Finnish Meteorological Institute and for terrestrial monitoring is the Natural Resources Institute (Luke). In Norway, the County Governor of Troms and Finnmark (SFTF) is responsible for the terrestrial and aquatic parts of the monitoring

programme while the Norwegian Environmental Agency (NEA) is the authority of the air quality monitoring. The air quality programme in Norway is operated by the Norwegian Institute for Air Research- NILU on behalf of NEA. For other parts of the programme, SFTF buys monitoring consultancies annually.

For the time being, it is possible to implement those parts of the monitoring programme that have state funding. Other parts require particular additional project funding and are implemented when possible. Last joint reports were published in 2013-2015 (see: http://www.pasvikmonitoring.org). According to the manual of the monitoring programme a report on water quality in the Pasvik watercourse and the small lakes should be prepared after every 3 years, and a larger joint report on water quality, sediments and biological studies should be prepared after every 6 years. Joint reports cannot be produced at the moment as a formal agreement on the exchange of data between the countries has not been prepared.

For recommendations on future monitoring, see chapter 8.


Photo by Pasvik State Nature Reserve.

Air quality monitoring

A Norwegian- Russian working group under the Norwegian-Russian Environmental Commission coordinates the air quality monitoring and regular reports are published[11]. Finnish Meteorological Institute monitors air quality at the monitoring station in Sevettijärvi, but this is conducted separately from the Norwegian-Russian working group.

The Norwegian monitoring program in the border area has monitoring stations at Svanvik and in Karpdalen in Jarfjord. These two stations continuously monitor basic meteorology, measure sulphur dioxide (SO_2) in air and heavy metals in air and precipitation[12]. Rainwater is collected for a period of one week, after which the heavy metals contents are analysed. In addition, the concentrations of inorganic components in precipitation are measured at a monitoring station in Karpbukt.

In the Pechenga municipal district, Russia atmospheric air monitoring is carried out by the Murmansk Branch of the Federal Office for Hydrometeorology and monitoring. Air monitoring is carried out by two stations located in the settlement of Nikel and the town of Zapolyarniy.

If adverse weather deteriorates the situation with air pollution, MUGMS immediately informs regional companies, and they change their operating schedule to reduce or prevent a negative impact on environment. Weather reports are available at MUGMS website https://www.kolgimet.ru/.

Within the framework of the Cooperative Program for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP), observations are made at the EMEP station, located in the village of Jäniskoski, Russia. Actions within EMEP program include regular analysis of concentrations of chemicals in atmosphere and precipitation, defining pH. Based on the experimentally obtained data, the real values of concentrations and loads of sulfur and nitrogen compounds in the northwestern and central region of Russia are estimated. Research results are available at https://www.emep.int/.

[11] For more information and reports, see: https://www.miljodirektoratet.no/om-oss/roller/miljoovervaking/overvakingsprogrammer/basisovervaking/norge-russland/

[12] The monitoring results can be followed at: https://luftkvalitet.nilu.no/

Monitoring of aquatic ecosystems

Study of the aquatic ecosystems provides information on changes occurring in the aquatic environment of the border area, both in Lake Inarijärvi the main watercourse of the Pasvik river, and the other small lakes in the catchment areas. The monitored lakes are located in the regions of Jarfjord and Vätsäri and in the Pechenga district area and southwards. The monitoring programme includes annual analysis of water quality and less frequently conducted sediment sampling and biological monitoring.

In Russia, the MUGMS conducts systematic observations of hydrochemical and hydrobiological indicators in the Pasvik river basin: in two sections of the Kolosjoki river and Protoka, (the nameless stream which connects Lake Salmijärvi and Lake Kuetsjärvi), in five sections of the Pasvik river (Kaitakoski dam and below the dams of Jäniskoski, Rajakoski, Hevoskoski, and Borisoglebsk HEP plants). In addition, the Kola Science Centre (INEP) monitors those Russian lakes which are a part of the trilateral programme.

In Norway, monitoring is carried out annually at river stations in Vaggatem, Ruskebukta and Skrukkebukta. Small lakes in the Jarfjord area are also monitored.

In Finland, there is a river station at Virtäniemi and lake stations in the Vätsäri area.


Photo by Helen Andersen.

Terrestrial monitoring

Monitoring of the terrestrial ecosystem parameters provides valuable information on how environmental loading and subsequent changes affect fauna, forests and other vegetation of the area. The monitoring program is especially important after the closure of the smelter in December 2020. Air emissions from production processes have ceased. It is important to trace what processes will take place in ecosystems under conditions of a sharp decrease in industrial pollution after decades of accumulation of pollutants in the environment.

As far as vegetation is concerned, monitoring is based on the abundance ratio and occurrence of undergrowth and epiphyte species of lichens. Some of the dominant species were also monitored using distant surveying. In addition to monitoring the status of the forests, the conditions of pine and birch growth and tree crowns were also estimated. Throughout the entire operation of Kola GMK, heavy metals have accumulated in the soil of the border area and their mobility was monitored from soil samples. Its concentrations were also measured from tissues of birds and small mammals.


Photo by: Pasvik State Nature Reserve.

After the observations of 2003-2006 a small research cycle was conducted in 2011-2013. Heavy metal, sulphur and nitrogen concentrations in moss as well heavy metal and sulphur concentrations in pine foliage were determined. Samples were collected from the same sample plots as in the 2003–2006 sampling. In Norway, studies of heavy metal contents in soil, berries, lichens and pine foliage have been studied again over the years 2019-2020 on some of the same forest plots as in previous studies.

5.2 The Pasvik-Inari Trilateral Park

Establishment background

Pasvik-Inari region is a territory where the borders of Finland, Norway and Russia meet. In terms of environment protection this region is unique because of the protection of continuous area through three countries' national borders.

Trilateral cooperation between environmental authorities already worked in the late 80s. Since then, many joint projects have been implemented and annual meetings have been held.

One of these projects was "Promotion of nature protection and sustainable nature tourism in the Pasvik-Inari area" (which is implemented according to the program of Neighborhood Kolarctic IIIA – North). Within the framework of that project Pasvik-Inari Trilateral Park was established.

Pasvik-Inari Trilateral Park's members since 2008 are (fig. 5.1):

- **Norway:** Øvre Pasvik National Park, Øvre Pasvik Landscape Protection Area and *Pasvik Nature Reserve (*Norwegian part of common Pasvik nature reserve),
- **Russia:** Pasvik State Nature Reserve, since 2019 – Korablekk Nature park,
- **Finland:** Vätsäri Wilderness Area, since 2018 – Inari Lake Natura 2000 area.

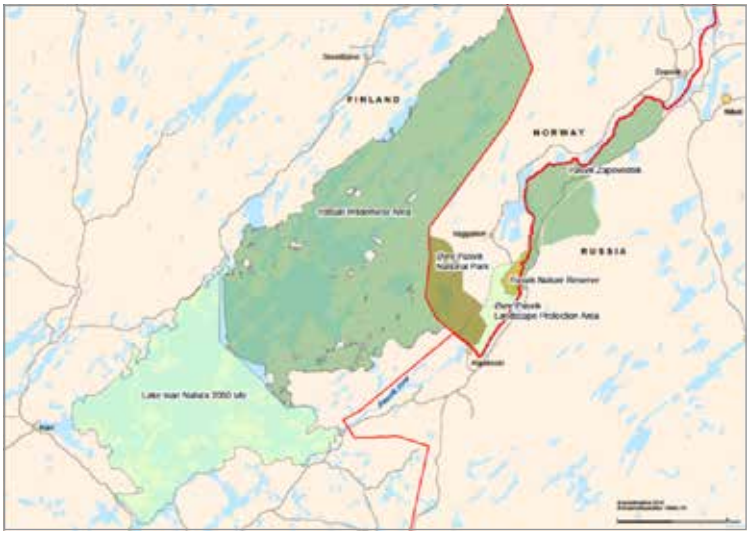


Fig. 5.1. Map of nature protection areas within the Pasvik-Inari Trilateral Park in the border area of Russia, Norway and Finland.

In Finland, Metsähallitus is the administrative authority for the Vätsäri wilderness area and the Inari Lake Natura 2000 area, both of which are located in the Inari municipality in Lapland county.

In Norway, The County Governor in Troms and Finnmark is the administrative authority for the Pasvik nature reserve. Øvre Pasvik National Park Board is the administrative authority for Øvre Pasvik National Park and Øvre Pasvik landscape conservation area. All three protected areas are located in Sør-Varanger municipality in Troms and Finnmark county.

In Russia, Pasvik State Nature Reserve under the Ministry of Natural Resources and the Environment, responsible for the management of and research in Pasvik State Nature Reserve. The Ministry of Natural Resources and Ecology in the Murmansk region is responsible for the management of the Korablekk Nature Park, both protected areas are located in the Pechenga municipal district of the Murmansk region.

The main goals of the Pasvik-Inari Park were increasing of cross-border cooperation, conserving nature and cultural heritage of the Pasvik-Inari region, ecological education, development of nature tourism, making good conditions for economic viability in border area, and also for wellbeing of local people.

In 2008 Pasvik-Inari Trilateral Park cooperation was formalised with a trilateral cooperation agreement between Metsähallitus (FIN), Pasvik State Nature Reserve (RUS) and County Governor of Finnmark (NOR). The same year the Trilateral Park was awarded the EUROPARC Federation Certificate for conformity to European high-level standards of international cooperation in environmental field. The Certificate was verified in 2013 and in 2018.

The unified research and monitoring

Systems of ecological research and monitoring differs in Finland, Norway and Russia. The unification of methods for monitoring and research was needed for productive cooperation, so a new scheme of common database formation was made for collecting, processing and storing research data.

International scientific research is held within the framework of the Pasvik-Inari Trilateral Park: research into brown bear and golden eagle populations, study of waterfowl fauna, fauna of insects, landscape mapping, and creation of the database.

Monitoring of brown bear population and dynamics

Joint brown bear population monitoring in Pasvik-Inari has been held every four years since 2007.

Special monitoring stations are installed to collect hair samples. A Liquid bait is poured in the center of the lure to attract animals. Hair and excrement samples are gathered and sent to DNA-laboratory in NIBIO Svanhovd. This analysis makes it possible to identify separate individuals, to find out their relatedness and get a better picture of the whole brown bear population in the region.

Golden eagle monitoring

Within joint project in 2006–2008 some efforts were made to map golden eagle nests, mainly in Finland because the highest density of this species' population is situated there. The mapping helped to get more exact data about population and estimate costs of damage caused by golden eagle to reindeer husbandry in Norway and Finland.

Waterfowl registration

Annual waterfowl registration in the Pasvik river Basin has been held by the Norwegian Institute of Bioeconomy Research, NIBIO Svanhovd together with Pasvik State Nature Reserve since 1996. The registration is held using standardized methodology. The area of waterfowl registration in Finland covers the Ivalojoki river's outlet.

Monitoring of insects

Invertebrates like ants, butterflies and bugs play the key role in ecosystems' functioning. They are indicators of possible environmental changes, caused by direct or indirect human impact. Therefore, fundamental knowledge about species and their behaviour is needed. In 2007 an ant monitoring method was tested in each country. The first list of ant species for the Pasvik-Inari Park has been made by Pasvik State Nature Reserve.

Nature tourism

Pasvik-Inari region has a great potential for development of sustainable nature tourism. Tourism should be well-planned and competently managed, because subarctic nature is vulnerable and sensitive to human impact. Increasing of international tourism imposes new requirements to management of the territory: that is why general guidelines for nature tourism were made in 2007:

1. Natural resources are preserved, tourism promotes nature protection
2. All the activities are ecologically acceptable
3. Respecting of local culture and heritage
4. Maintaining of local economy
5. Helping to form tourists' estimated opinion, enlarging knowledge about nature and culture
6. Assurance of quality and safety in business

Due to the trilateral cooperation, a possibility for developing nature tourism services appeared, and information materials and ecological paths with signs in each country were made.

Photo by Pasvik State Nature Reserve.

Plans for future

The Action Plan for the Pasvik- Inari Trilateral Park[13] is a manual for the long-term environmental cooperation and management of the protected areas. It contains common views and goals, also specific ideas of cooperation development for the next ten-years period.

5.3. Environmental education and -information

Dissemination of information is an important part of the trilateral cooperation. The main goal of ecological education is in helping people to understand human impact on nature.

In the scope of the Pasvik-Inari Trilateral Park, Russian, Norwegian and Finnish partners arrange ecological camps and expeditions, seminars and discussions; also, they develop cooperation with schools, universities, industrial companies and mass media. Information on their activities is available on the Internet.

The Ecological school in Rajakoski (RUS) organizes annual summer camps for school children and events for locals. School network "Phenology of Northern Calotte", managed by NIBIO Svanhovd, also gathers school children and teachers from three countries for annual ecological camps. Member-countries of the Pasvik-Inari Trilateral Park have been organized annual bird-watching trips for local people since 2010.

The County Governor of Troms and Finnmark has, in cooperation with Sør-Varanger municipality, organized an annual "Pasvik seminar" since 2014. In this seminar, the latest knowledge on air quality and the environmental status of water and land-based ecosystems is presented by scientists and managers. Politicians, local institutions and non-governmental organisations (NGO's) are invited to attend the seminar and get updated information on the environmental status. From each seminar, recommendations for follow-up are made and these are reported on the consecutive year. In addition, other public meetings have been arranged in order to present information on the environment to the public.

[13] Kalske, T., Tervo, R., Kollstrøm, R., Polikarpova, N. and Trusova, M. Action plan Pasvik-Inari Trilateral Park 2019-2028.

Chapter 6 – Pressures on the environment

Environmental impacts of human activity in the Pasvik and Grense Jakobselv catchment include atmospheric deposition directly onto the surface waters, hydropower and other physical alterations of watercourses (including fish migration barriers), alien and invasive species, nutrient loading and discharges of pollutants.

6.1. Overall pressures: Global climate change

The Arctic is warming faster than the rest of the globe and is projected to continue to do so for some time to come. This warming is affiliated with significant climate change that will affect important physical processes, such as precipitation, snow cover, permafrost, extreme weather events, sea ice and ocean currents. These changes will interact with each other and will be subject to large year-to-year variations, making the understanding of future impacts more challenging.

Since mid-1970s, the growth rate of mean annual air temperatures in the border area has been 0.6°C per 10 years. For the period 2071–2100 a temperature increase between 3–4 °C is expected in the border area.[14] The warming is highest in the winter season. Average air temperatures have increased from 1961 to 2018, and there is a distinct, growing, statistically significant trend. Later autumn and an earlier spring are reflected in both water temperatures and ice conditions.

Changes related to global warming can be seen in parameters measuring the hydrological conditions of lakes within the planning area, for instance precipitation, the day of freezing, ice thickness and winter inflow. In Lake Inari, the open water season is now on average 23 days longer than in 1960–1999. In addition, the thickness of the ice has decreased in both early and late winter.

Rise in temperature may increase biological production in water ecosystems affecting plant growth and favouring certain types of plants. As for Lake Inari, for instance, so far nutrient scarcity limits production.

According to current studies[15], winter will be shorter in the Pasvik river basin, winter water flow will increase, and spring floods will occur earlier. This will affect the regulatory practices of the hydro power stations. Problems will occur regarding winter runoff and in reaching the target of the summer water level.

Low water levels and increase nutrient flow will affect fish, birds, plants and other organisms adapted to life in water. Moreover, recreational use of lakes and rivers, for instance, beaches may be affected. Measures to protect lake shores from erosion need to be elaborated.

Photo by Metsähallitus 2019/Kota Collective.

[14] Source: Norsk klimaservicesenter.

[15] Veijalainen, N. et al. 2012. Suomen vesivarat ja ilmastonmuutos – vaikutukset ja muutoksiin sopeutuminen. WaterAdapt-projektin loppuraportti

6.2. Overall pressure: Air pollution from industrial sources

The catchment area is affected by air pollution and atmospheric deposition from local and long-borne sources. The nickel smelter of Kola GMK in Nikel has been a local source of air borne pollutants as sulphur dioxide and heavy metals, affecting aquatic and terrestrial ecosystems in the border area. A status by March 2021 is given below.

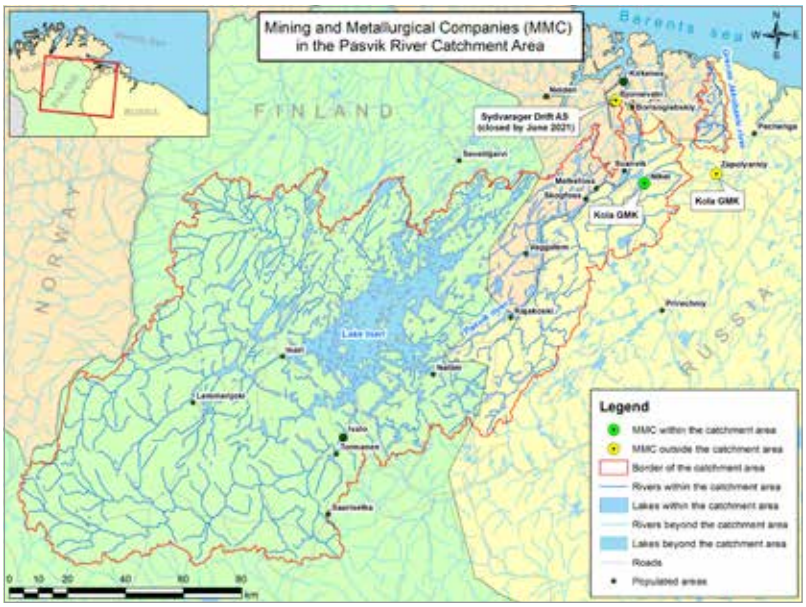


Fig. 6.1. Map that shows Kola GMKs location, as well as iron ore mines outside the catchment area.

Kola GMK, Russia

Petsamo Nikkeli, a Finnish and Canadian company started mining in the area in 1939. Its production facilities were destroyed during WWII. The area was liberated by the Soviet troops in 1944 and it became Soviet. The destroyed company was restored and put into operation in 1946. The then company`s name was Pechenganickel, nowadays it is Kola GMK (subsidiary of Nornickel company). An ore dressing plant, mines and the town of Zapolyarniy were built in the area later.

The environment in Norway and Finland was affected by sulphur dioxide emissions and metal containing dust from the industrial sites in Nikel and Zapolyarniy. Various international investment initiatives to modernize the companies were launched in the settlement of Nikel and the town of Zapolyarniy from 1990. The last agreement on such an investment program was terminated in 2010. During the autumn of 2019, the management of Nornickel announced its intention to close down the outdated smelting plant in Nikel. The smelter was closed down in late 2020 as well as drying of concentrate and briquetting were ceased in the town of Zapolyarniy. Further details about emissions to air from the smelter facilities, monitoring and closing procedures are given below. For information about industrial wastewater discharges from the smelter operation, please refer to chapter 6.3.

Air emissions SO_2 (thousand tonnes/year)

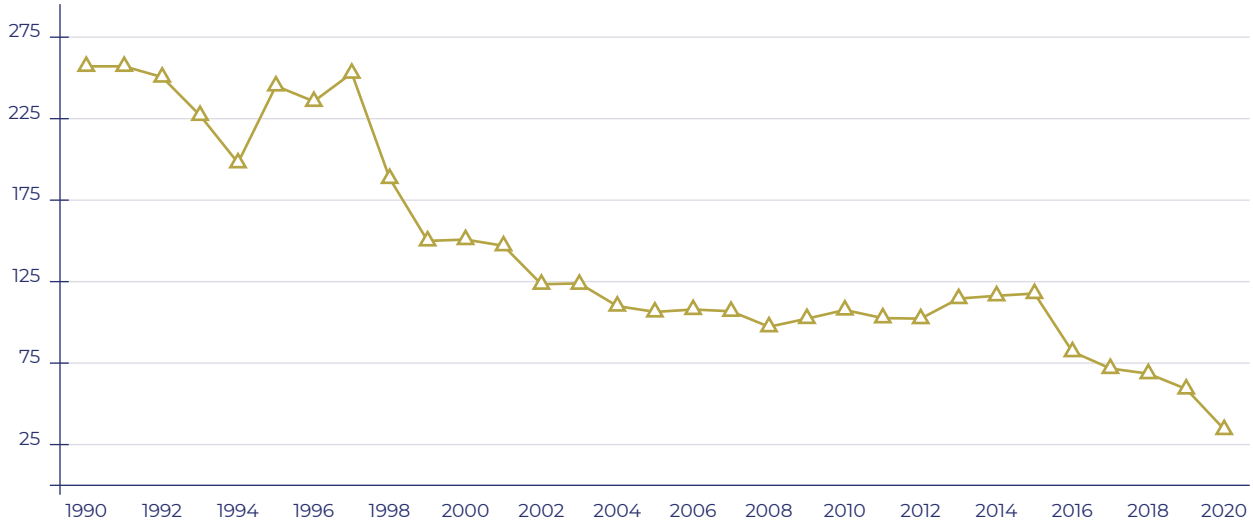


Fig. 6.2. Emissions reduction by Kola GMK at the industrial sites in Nikel and Zapolyarniy. Data provided by Kola GMK.

Air pollution from the smelter operation

In 1977, emissions of sulphur dioxide from Nikel amounted to 332.2 tonnes and 62.1 tonnes from Zapoljarniy (total of 394.3 tonnes).

The emission levels in Nikel and Zapolyarniy has been substantially reduced since then, particularly after year 2000 (fig. 6.2). In 2020, emissions of sulphur dioxide were 1,498 tonnes in Zapolyarniy and 33,121 tonnes in Nikel (in total: 34,619 tonnes). According to the data provided by Murmansk UGMS on March 9, 2021, the level of sulphur dioxide in air was low in January and February 2021 and its concentration did not exceed the permitted level.

The Nikel smelter before closing. Photo by Frank Martin Ingilæ.

Closing procedure

The closing procedure was initiated in 2020 and is to be completed in 2021. The shutdown of production facilities was carried out in several stages, in accordance with the approved schedule. Currently, several options for future industrial site are being considered:

- partial dismantling of equipment with further conservation of buildings
- profiling of part of the buildings as infrastructure for future small manufacturing companies
- conservation of the rest for use as objects of industrial tourism.

It is planned that Murmansk abrasive plant will commence its operation in the area close to the ex-industrial site of Kola GMK in 2021. In its operation, it will be guided by the Russian environmental legislation in force.

Monitoring of impacts of smelter closure

Throughout the implementation, monitoring of emissions' impact in the Russian territory and at the border with Norway will be continued to obtain an objective picture of the environmental situation. The monitoring will be performed by Murmansk Hydromet (Murmansk UGMS), Pasvik State Nature Reserve and other specialized organizations on the Russian side, and Norwegian Institute for Air Research (NILU), on behalf of the Norwegian Environment Agency, on Norwegian side. In the framework of the expert group on air quality monitoring under the Norwegian-Russian Environment Commission, the parties exchange and discuss monitoring results and make joint reports on air quality results in the border area.

View of the smelter after its closure in Nikel, Russia (2021). Photo by Pasvik Reserve.

In addition to state monitoring, Kola GMK performs integrated research into transboundary air pollution monitoring at its own initiative. For this purpose, it employs relevant institutions such as the State Institute of Applied Ecology (2004–2005); Atmosphere (a research institute) Kola and Karelian Science Centers and Pasvik State Nature Reserve.

To achieve the UN's global goals in the field of sustainable development, Nornickel and its affiliated companies focus on making a transition to ESG-management in the next 5–10 years. The company develops environmental programmes which include reduction of pollution, rehabilitation of disturbed lands and reduction of greenhouse gasses. The programmes will meet Russian and international environmental standards.[16]

https://www.nornickel.com/sustainability/esg-highlights

[16] https://www.nornickel.com/sustainability/esg-highlights/

6.3. Pressures on the environment in the Pasvik river catchment

Water regulations and effects on the environment

The hydropower regulations have changed the water level in Lake Inari and the characteristics of the Pasvik river course. Impacts of the regulations, accomplished measures to reduce impacts and challenges for the future are described below.

Regulation of Lake Inari is based on the Agreement made in 1959 by the Finnish, Russian and Norwegian governments. The Agreement stipulates the requirements that apply to regulation of Lake Inari, and thus the water flow in the Pasvik river. An upper and lower regulation limit has been set and a level of water level specified that the lake must be drained down to 1st May. In accordance with this Agreement, each of three countries has appointed its own representatives authorized to resolve the implementation of the Agreement on behalf of its Ministry. Currently the regulation representatives are from TGK-1, the ELY Center and NVE. The Representatives have also appointed experts to attend the annual regulation meeting. These meetings are arranged in February, and the main goals are to determine regulations that year based on status and hydrological assessments. Routines have been implemented for how the regulation may have to be changed despite to what is decided at the regulation meeting (as a result of, for example, unforeseen circumstances during the spring flood)

Preparatory meetings are held in the working group where hydrology professionals from Finland and Norway as well as personnel from the Russian and Norwegian power plants meet. In the preparatory meeting, proposals for regulation are prepared. In recent years, work has been done to consider how climate change can lead to an earlier snowmelt and the consequence this will have for regulation of Lake Inari.

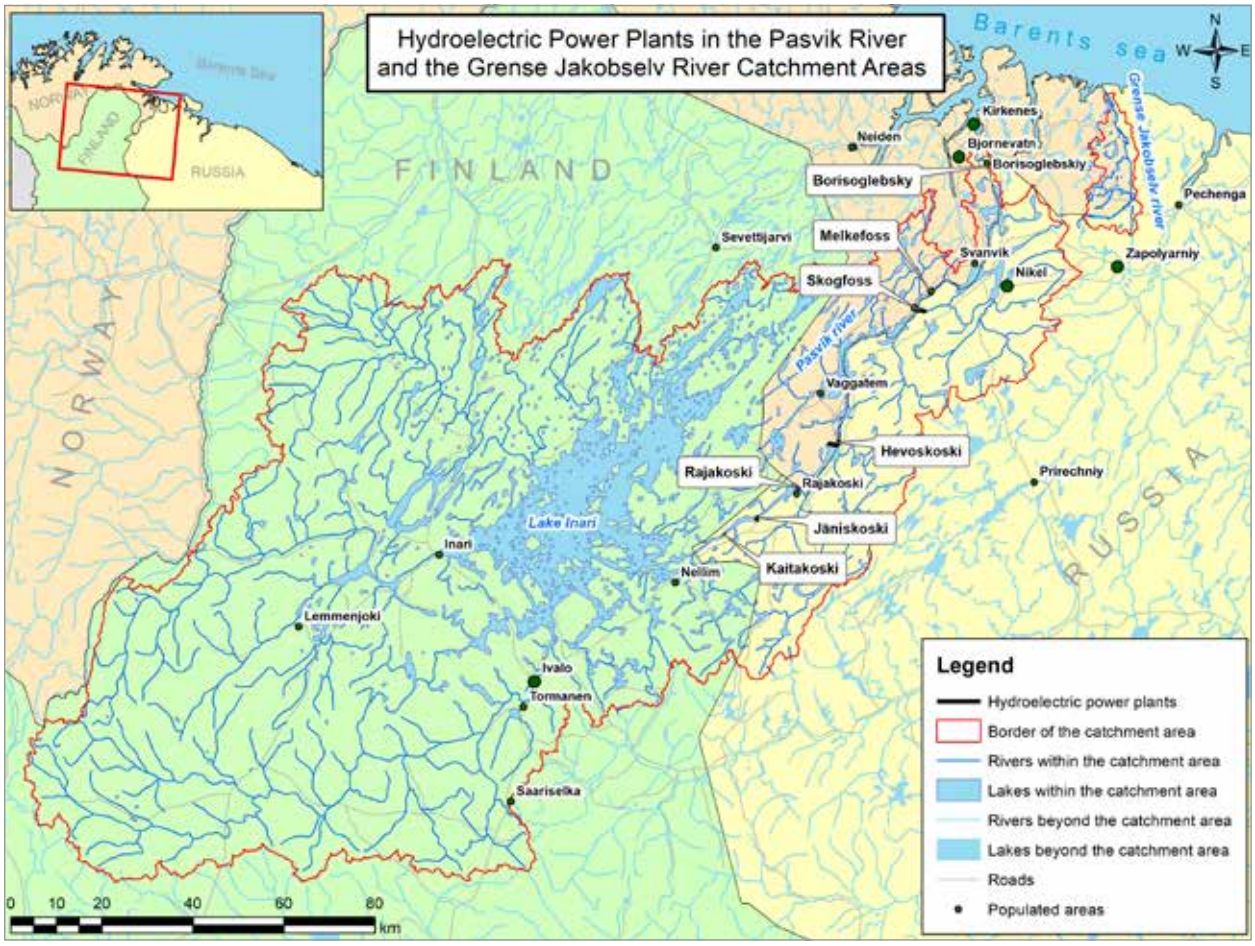


Fig. 6.3. Map of Russian and Norwegian HEP plants stations along the Pasvik river.

Picture of Shore erosion at Lake Inari. Photo by ELY-Centre 2020.

In order to improve the management of water resources in the Pasvik River catchment and to rationalize the exchange of hydrological information by organizations of Finland, Russia and Norway, a joint project is being implemented. ELY Centre for Lapland and Finnish Environment Centre with the involvement of Russian and Norwegian hydroelectric power stations and experts from the Norwegian Water Resources and Energy Directorate will create a hydrological model of the Pasvik River catchment and establish a hydrological data bank (Pasvik IBA project – Baltic Sea, Barents and Arctic Cooperation (IBA funding) managed by the Ministry for Foreign Affairs of Finland).[17]

Lake Inari

Currently, Lake Inari is being regulated on the Russian side by the Kaitakoski power plant located approximately 8 km downstream of the Virtaniemi border crossing station. Constructed in 1959, the Kaitakoski power plant replaced the Niskakoski regulating dam, located approximately 5 km upstream.

In Lake Inari, the regulation has had a strong effect on the shoreline vegetation, fish stocks and other aquatic fauna. As part of the regulation of Lake Inari, the water level had to be raised by approximately 0.5 m compared to the natural water level, which is the main reason for bank erosion. Furthermore, during the open water season, the water level is maintained at a relatively constant level in comparison to the natural water level fluctuation. As a result of these changes, there has been a decline in shoreline vegetation. The numbers of large benthic fauna and zooplankton that thrive in the aquatic sedge stands have been estimated to have decreased. Both are important sources of food for fish and these changes are reflected in the size of the fish stock. Particularly affected are the stocks of nine-spine stickleback, arctic char, trout and whitefish.

A significant decrease in the water level during the winter months causes changes in frost-sensitive organisms and increases the mortality of eggs of autumn-spawning fish. In winter and spring, the water level drops 1.2 m, which is 0.6 m more than it would without regulation.

Rising water levels at the beginning of summer impacts birds, for example, black-throated loons that nest right at the water's edge.

[17] https://um.fi/iba-hanketoiminta

Erosion control stucture at Partakko, Inari. Photo by Juha-Petri Kämäräinen 2018.

In its natural state, the annual variation in the water level in Lake Inari was approximately 1.25 m. Under the permit conditions, the regulation range is 2.36 m. Since 1999, a water level target zone has been applied in the regulation of Lake Inari. As a result, the annual water level variation has remained at 1.40 m between 2000 and 2020. This regulation is based on the recommendations of the Inari Lake Study conducted in 1992–1997. The recommendations were adopted as a supplementary guidance document (Supplement 2) to the Implementation of the Inari Lake Regulation. According to these guidelines, the highest summer water levels should be lowered, and the excessively low water levels raised. Furthermore, after the summer flood peak, efforts should be made to lower the water level by approximately 15–25 cm, which would expand the range of macrophytes and increase the diversity of the shore ecosystems. At the same time, the abundance of littoral zooplankton and probably aquatic invertebrates would increase, which would improve the nutritional status of benthic fish. Use of the recommendations would also reduce landslides along the banks of Lake Inari and the lower reaches of the Ivalojoki River.

The Lake Inari Study completed in 2019 analysed the development of the state of Lake Inari during the current regulation practice in 2000–2017. Although the changes achieved are not large, they have been positive for the aquatic environment.[18]

Other compensatory measures as fish stockings are described in the chapter on Pasvik fish stocks below.[19]

Kirakkajoki catchment area

The Kirakkajoki watershed includes Hammasjärvi and Rahajärvi lakes and the twenty-kilometer-long main section of River Kirakkajoki. The catchment area of the river is about 525 km^2 and it flows into Ukonjärvi, which is connected to Lake Inari through two short rapids. The Kirakkaköngäs hydropower plant, which regulates Lake Rahajärvi, was built in 1953. When the regulation of Rahajärvi began, water levels have been raised by about 2.5 m.

Before the Kirakkaköngäs rapid was dammed, the Kirakkajoki cachment was a good habitat for migratory salmonids: trout, whitefish and grayling. The power plant cut off the breeding and feeding migration of migratory fish between Lake Inarinjärvi and the Kirakkajoki water system. It is estimated that the regulations have significantly weakened the migratory fishery. The operation of a small hydropower plant is financially quite challenging in the face of future renewal needs. Kirakkakönkä's natural canopy still remains and has been used for bypasses during floods. The municipality of Inari has taken the initiative to shut down the Kirakkakönkä power plant.

Regulation of Lake Rahajärvi. Photo by ELY-Center 2020.

There has been a spawning stock of trout in Hammasjärvi (rare in Finland). It is currently unknown whether the original trout populations remain and how closely related they are to the adjacent Ivalojoki and Juutua Rivers' populations. It is important to determine the genetic structure of trout populations in water bodies. About 98% of the trout stocks in the Inari area are known, which provides a good basis for comparison.[20]

[18] Lapin elinkeino-, liikenne ja ympäristökeskus 2019. Inarijärven tilan kehittyminen vuosina 1960-2017, https://www.doria.fi/bitstream/handle/10024/170745/Raportti_27_2019.pdf?sequence=5&isAllowed=y

[19] http://www.pasvikmonitoring.org/englanti/saannostely_e.html

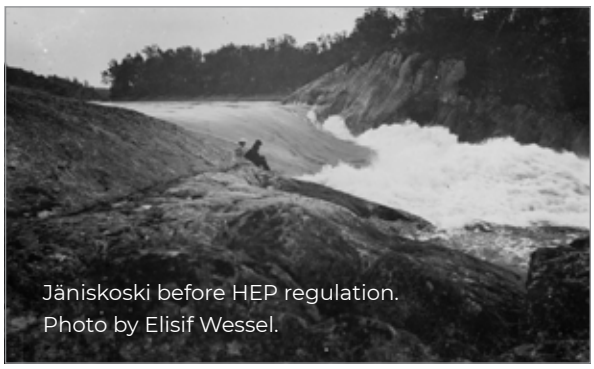
[20] (Sarjamo-Hilkka 1989, reproduced publications of RKTL)

River Pasvik

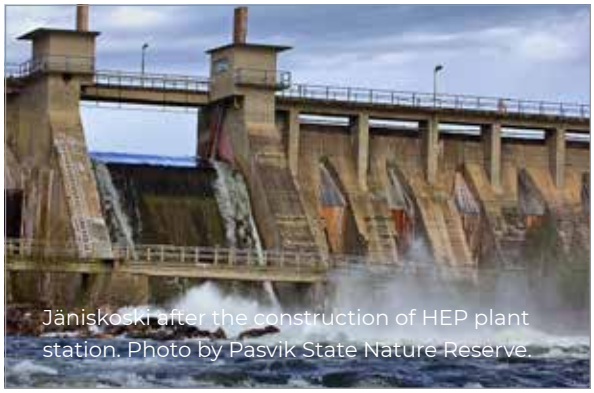
The construction of the seven hydropower stations in the Pasvik River has caused radical changes in the hydrological regime of the river system. Rapids and stretches of river with a strong current have disappeared and the occurrence of slow-flowing river parts has increased, largely changing the characteristics of the river.

Due to changes in the currents, shorelines along the river have become overgrown. Some flood meadows, where rare eastern plant species used to grow, have disappeared.

The fish stocks of the Pasvik river are greatly affected by limited fish passage due to the hydropower dams. This challenge is discussed further in the chapter on fish stocks.



Jäniskoski before HEP regulation. Photo by Elisif Wessel.



Jäniskoski after the construction of HEP plant station. Photo by Pasvik State Nature Reserve.

Regulation dams

The construction of seven HEP plants on the Pasvik River caused radical changes in the hydrological regime of the river system. Due to the changes mentioned above, the river`s banks overgrow. Some flood meadows with rare plant species disappeared. The fish stocks of the river are affected by limited fish passage due to the hydropower dams. This challenge is described in the Chapter on fish stocks.

Skogfoss HEP plant, Norway, has an embankment dam – Menikka dam (Lille Menikka dam / Glukhaya dam). It is located in the territory of Pasvik State Nature Reserve, Russia. Menikka dam was built in vicinity of the old tributary of the Pasvik river/the Menikajoki river in 1963–1964. It is 175 meters long and 15 meters high; its height varies from 50.87 to 51.87 meters above the sea level because of water abstraction. The total abstraction of water from Skogfoss HEP plant is 160 million m^3.

The dam is owned by Pasvik Kraft AS. Currently, the dam does not meet modern Norwegian safety requirements. Last time its reconstruction took place in 1987 before Pasvik State Nature Reserve was set up.

Pasvik State Nature Reserve and the Russian Ministry of Natural Resources lifted the question concerning reconstruction of Skogfoss dam and the Menikka dam within the framework of the Joint Russian-Norwegian Commission on Environmental Protection and the Intergovernmental Russian-Norwegian Commission on Economic, Industrial, Scientific and Technical Cooperation in 2017. The issues have since been discussed with the Directorate for Water Resources and Energy and the Ministry of Oil and Energy, which are the competent Norwegian authorities.

The Russian territory, where the dam is situated, is being leased by Norway for an indefinite period of time. At the same time the roads to the dam are located in the territory of Pasvik Nature Reserve and their usage will bring certain changes in local nature.

Skogfoss HEP plant station.

Technical and Environmental documentation and Norwegian permissions based on Norwegian law will be sent to Russian authorities. Documentation according to letter dated 29.08.2017 from Ministry of Nature Resources and Environment and the Russian Federation will be sent for approval to Russian authorities for the impacts outside the leased territory of the Dam Mänika – that is inside the territory of Pasvik State Nature Reserve, Russia. It is a joint objective to monitor the natural processes in the Pasvik River valley (reserve, hydropower companies). The monitoring will contribute to protection and research into specially protected natural areas.

Photo by Silja Wara.

Fish stocks and fishing in the River Pasvik and Lake Inari – ecological impacts

The original fish species of Lake Inari and the Pasvik water course are whitefish (Coregonus lavaretus) with its different diversities, brown trout (Salmo trutta), Arctic char (Salvelinus alpinus), grayling (Thymallus thymallus), pike (Esox lucius), burbot (Lota lota), perch (Perca fluviatilis), nine-spined stickleback (Pungitus pungitus), three-spined stickleback (Gasterosteus aculeatus) and minnow (Phoxinus phoxinus)[21]. There is also Atlantic salmon (Salmo salar) in the Pasvik river below Borisglebsk.

Vendace Coregonus albula (L.) was introduced to tributaries of the subarctic Inari-Pasvik watershed (Finland, Norway and Russia) in 1956 and 1964–66. The species invaded downstream and established a population in Lake Inari, Finland, in the 1970's. Lake trout (Salvelinus namaycush) was introduced to Lake Inari for the first time in 1972. The stockings were stopped in 2012. Landlocked salmon (Salmo salar sebago) was also stocked to the lake, but the stockings stopped in 2001. Both species are now monitored with regular sampling and studies.[22]

Vendance further invaded the Pasvik water course around 1990 and has now become the dominant pelagic species in the watercourse. The vendance invasion has changed the fish composition in the water system. The whitefish in Pasvik is polymorphic, consisting of three different morphs. Vendance is a specialist plankton-eater and since the invasion, the plankton-eating population of whitefish has been reduced by 90%.

The brown trout in the Pasvik water course is a fast-growing form which mainly feeds on vendance and whitefish in the pelagic. It is a popular fish for angling. The water regulations in the river have reduced the spawning and nursery areas for brown trout in the river by 80–90%. Grayling has also suffered from the water regulations due to loss of stretches of running water.

The Norwegian Environmental Agency launched a national strategy in 2020 for the protection of fast-growing brown trout populations. The Pasvik river is one of twelve candidates to become a national brown trout river.[23]

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[21] Kalavarat 2006. J., Raitaniemi & K., Manninen. Inarijärven kalakannat – Fiskbestånd i Enare träsk , Erno Salonen. 2007. Riista- ja kalatalouden tutkimuslaitos

[22] Ympäristö.fi. Säännöstellyt järvet ja joet. Inarijärven tila. https://www.ymparisto.fi/fi-FI/Vesi/Vesien_kaytto/Saannostely/Saannostellyt_jarvet_ja_joet/Inarijarven_tila(29599) 7.1.2020

[23] Miljødirektoratet (2020). Rapport: Forslag til strategi for bevaring og utvikling av bestandene av storørret.

Fishing in Lake Inari and the Pasvik River

The landowner Finnmark Estate (FeFo) manages fishing in the Norwegian parts of the river Pasvik, according to specific fishing regulations[24]. Only Norwegian citizens can fish in the Norwegian parts of the main river stretch.

Photo by Pasvik State Nature Reserve.

In the Russian part of the catchment located the Pasvik State Nature Reserve, fishing is completely prohibited. Outside the conservation area, fishing is carried out in accordance with Russian Legislation ("Federal Law on Fishing and the Conservation of Aquatic Biological Resources" – Federal Law No. 166) and the Fishing Rules established in 1975 by the Agreement between the Government of the Soviet Socialist Republics and the Government of Norway on the regulation of fishing and protection of fish stocks in the Vorjema and Pasvik rivers.

In Russia amateur and sports fishing in is based on permits for the extraction (catch) of aquatic biological resources, which provides a separate accounting of catch by type of aquatic biological resources and places of catch. For the Russian side, the introduction of a new system of accounting and control over the population of certain fish species is relevant.

In the Norwegian side, FeFo has introduced a system of fish permits and compulsory reporting of catches in order to monitor the fish stocks more closely.

In Finland, fishing is regulated by Fishing Act, regulation and by the regulations given by the fishing right holder. Based on the Fishing Act, the authority responsible for the restrictions, regulations and catch limits of Inari fishery area is Center for Economic Development, Transport and the Environment. The latest fishing regulation of Inari is found at https://inarinkalatalousalue.fi/materiaalit/.

Angling and ice fishing are general fishing rights in Finland (also for those who are out-of-town), which as a rule don't require license.

Whitefish catch from net fishing in Lake Inari.
Photo by Erno Salonen 2017.

In waters situated in Skolt-areas, Skolts have a fishing right according to the Skolt Act. In Inari, the real estate owners are members of a participants' association, which grants fishing rights for the waters in their ownership. Original estates and farms that are established according to Natural source of livelihood Act have ownership to private waters that are not part of participants' association.

There are currently around 20 active commercial fishermen registered in the Inari fishing area. In wintertime, 5-10 commercial fishermen practice netfishing in Lake Inari. In the wintertime, commercial fishing is minor, and the catches are a few tons at the most.[25]

[24] https://lovdata.no/dokument/LF/forskrift/1976-08-20-8?q=Forskrift%20om%20fiske%20i%20den

[25] Inarin kalastusalueen käyttö- ja hoitosuunnitelma. Inarin kalastusalue 2007.

Fish stocking at Pasvik Kraft photo by Anne Smeland.

Fish stockings as compensating measures following water regulations

Both Finland and Norway are using fish stockings to compensate for losses to natural fish production following the water regulations.

Because of the damage to fish stocks caused by regulation of the lake, a Finnish court ordered large-scale obligatory stocking in 1975. At the obligations, it was prescribed that brown trout, landlocked salmon, arctic char and whitefish need to be introduced in Lake Inari and its tributaries. The fish hatchery is run by Luke and owned by the municipality of Inari. The goal of the fishery obligation is to compensate the reduced catches caused by regulation and strengthen the natural increase in local fish stocks. For the fish stock identification, the fish hatchery uses otolith marking with alizarin red S (ARS) color. All the introduced juveniles are marked the "eyed ova" stage or when the eggs are newly hatched.[26] The monitoring reports and other key sources for the planning of fishery obligation are found at https://www.luke.fi/julkaisut/.[27] In 2020, the following species were introduced to the Lake Inari catchment: brown trout (61309 individuals), whitefish (315000 individuals) and arctic char (74000 individuals). The arctic char stocks in Lake Inari are mainly dependent on introductions; therefore, 50-70 percent of arctic char catches are from introduced fish.

Inari fishery. Photo by Markku Gavrilov.

In the Norwegian part of the Pasvik river, the County Governor of Troms and Finnmark has the authority to impose legal orders to the hydropower concession. The hydropower company (Pasvik Kraft) is currently obliged to introduce 5000 brown trout per year in order to compensate for the lost production potential.

[26] P., Heinimaa & T., Rauhala. Inarijärven säännöstelyn kalatalousvelvoitteen istutussuunnitelman tarkennus vuodelle 2002. 3.2.2020. Luonnonvarakeskus, Inari.

[27] J., Iivari & T., Rauhala. Inarijärven säännöstelyn kalatalousvelvoitteen istutussuunnitelma vuosille 2016-2020. 2.3.2016. Luonnonvarakeskus, Inari.

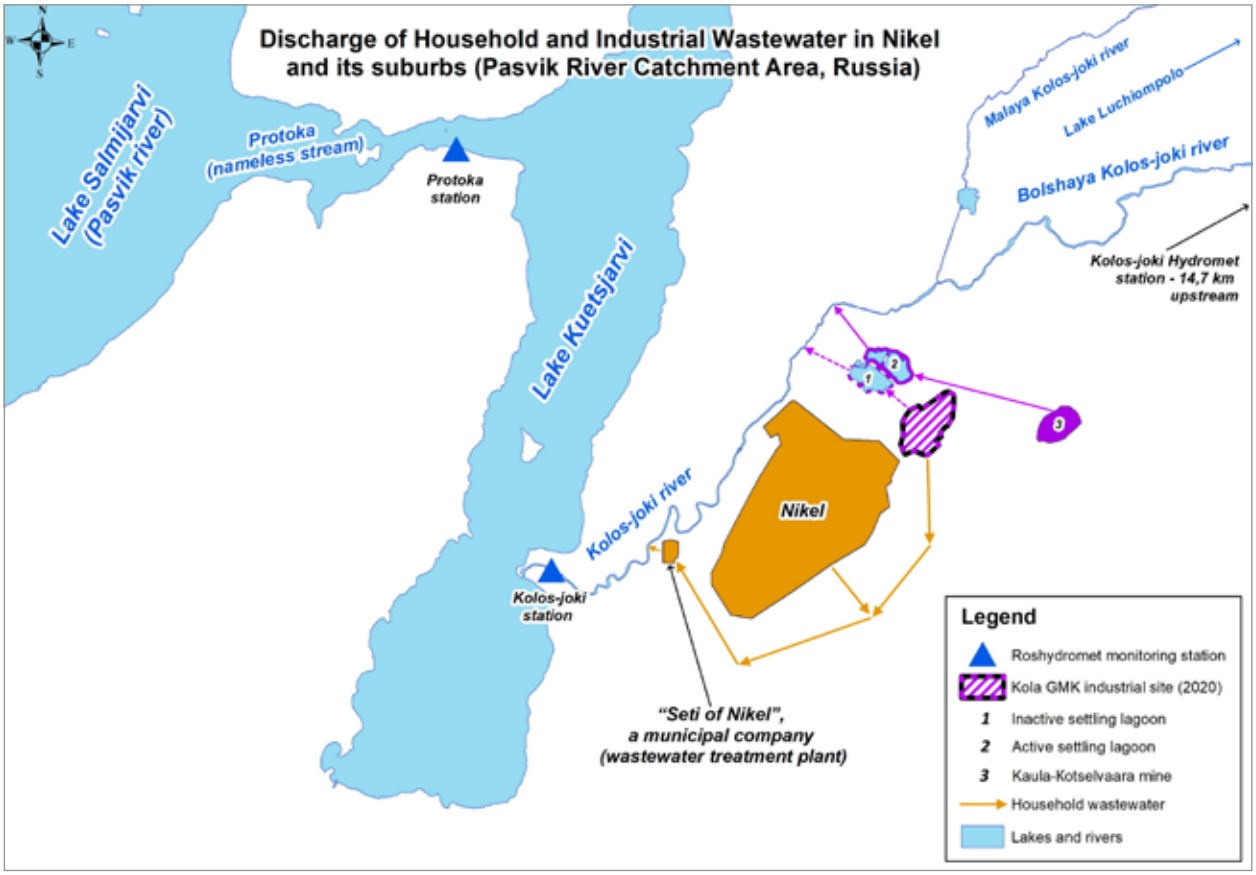

Fig. 6.4. Discharge of industrial wastewater into the Pasvik river basin (2021).

Industrial discharges impacting aquatic ecosystems

Industrial wastewater discharges from the smelter in Nikel

Fig 6.4 shows discharge of industrial wastewater from the now closed down smelter in Nikel. Industrial wastewater was treated in two sedimentation ponds before being discharged into the Kolosjoki river and the Pasvik watercourse.

At present Kola GMK plans to assess the status of natural environment with the help of experts from leading Russian research institutions after demounting activities at the industrial site of the ex-smelter. An authorized company is to develop a project for recultivation of the area as envisaged by law. Ecological restoration of the Kolos-joki river with the view of its possible stocking and monitoring is also being considered as well as efforts to avoid diffuse discharges in the ground waters.

According to the data provided by UGMS in the Murmansk region, the report "On the Status and Environment Conservation in Murmansk region, 2019"[28], hydro-chemical monitoring is carried out by UGMS specialists in the Pasvik river basin, namely in the Kolosjoki river, the Protoka (a nameless stream) which connects Lake Kuetsjarvi, Lake Salmijarvi and the Pasvik river.

The main pollutants found in water bodies are nickel and copper.

The Report says that the Kolosjoki river was the most polluted one in the Pasvik river basin on Russian side in 2019. The content of heavy metals and sulfates was rather high in the samples taken during the year (for more information please refer to https://gov-murman.ru/region/environmentstate/). There was a certain upward trend in terms of content of polluting substances in spring. The seasonal dynamics in the distribution of nickel is less evident, which indicates chronic nature of water pollution.

[28] https://mpr.gov-murman.ru/activities/napravleniya/okhrana-okruzhayushchey-sredy/00.condition/index.php

Syd-Varanger mine waste rock dump. Photo by Silja Wara.

Water samples were taken in five sections of the Pasvik river six times a year. The section above Kaitakoski hydroelectric power plant is a background one and the section below Borisoglebsk HEP plant is the last one in the river. The flow from the Kolos-joki river affects water quality in the river's last section. It flows into Lake Kuets-jarvi; the Protoka (the nameless stream) connects Lake Salmijarvi and Lake Kuetsjarvi, the latter is a part of the Pasvik river system. High or extremely high level of pollution according to Russian water code was not registered in 2019.

A seasonal variation in distribution of copper in the Russian parts of the Pasvik river was not identified; its average annual content in all sections exceeded the permitted level. Excess level of nickel (up to 2 times) was observed in two out of six samples taken in the section below Borisoglebsk HEP plant; in other sections of the river, level of nickel in water was below the permitted level in Russia. The level of zinc varied (from minimum up to 4 times above the permitted level) in the Pasvik river during the year. The content of manganese exceeded the permitted level in two samples; its maximum concentration slightly exceeded the permitted level. The content of mercury exceeded the permitted level in 63% of the samples. The value of total iron and aluminum did not exceed the permitted level. As for organic substances, they were slightly higher in four samples as well as oil products were slightly higher in the sample taken in the last section.

In the Norwegian parts of the Pasvik river, downstream the town of Nikel, the chemical status is classified as poor according to the EU Water Framework Directive (WFD) due to elevated levels of nickel (NI) above threshold levels in water. In addition, levels of mercury in water are elevated both upstream and downstream Nikel.

Syd-Varanger AS mining drainage waters

The iron ore in Sør-Varanger was discovered by the Norwegian Geological Survey (NGU) in 1868. Production was established by the AS Sydvaranger company (later Sydvaranger AS) on a site in Bjørnevatn in 1906.

Production on the site was operative from 1906–1944, from 1944–1996 and again from 2009 to 2014 with various owners. The mine was closed in 2014, but a re-opening is being planned[29] and an environmental permit is being revised by the Norwegian Environment Agency (per February 2020). The current company, Sydvaranger Drift AS was registered in 2017. This company aims to produce 3.5–4.5 mill tonnes of iron ore concentrate annually. Wastes from previous and new mining activies are to be deposited in a sea tailing disposal in Bøkfjorden (Varangerfjorden), which is outside the planning area. It is planned to deposit 4 mill tonnes of suspended solids and 73 tons of chemicals in the sea tailings per year.

[29] Details on the previous production of the AS Syd-Varanger including control reports are given on the webpage www.norskeutslipp.no .

Sydvaranger Drift AS has a permit in accordance with the Pollution Control Act for mining and has submitted new documentation to the Norwegian Environment Agency in the process of revising the permit. The current permit gives Sydvaranger Drift AS permission to discharge mine drainage water into the Langfjorden catchment and to Krokvatnet and Lillevatn in Pasvik catchment.

Pressures from industries on water bodies are registered in Norway in the open database vann-nett[30].

Summary of the pressures from previous mining on water bodies in the area:

- Discharge from the waste rock deposits might affect the lake Ørnevatnet and tributaries (water bodies in Vann-Netts database 246-2460-L[31] and 246-69-R[32])
- Mine drainage waters have moreover been discharged into Langfjorden (water body 0424030601-C), and through Krokvatnet and Lillevann-Reitanvann draining to the Pasvik river by Fossevatn (water body L-246-65230-L).
- The small lakes Førstevann, Andrevann and Tredjevann close to Kirkenes centre were polluted earlier by dioxins from previous mining production. The latest study is from 2009, new studies are needed.
- Sea tailing disposal in Bøkfjorden.

Waste collection and landfills

Landfills are a source of diffuse discharges of chemical pollutants. Monitoring and measures are important in order to reduce risks of impacts on surrounding water bodies.

The following waste disposal sites are situated within the Pasvik catchment area in Russia:

- solid waste disposal area (industrial sites of the Kola GMK)
- manure pit, Zhivotnovod of Pechenga, an ex-collective farm situated in the vicinity of Nikel)
- solid waste household disposal area in Nikel (remediation started)
- solid waste household disposal area in Rajakoski (remediated).

Household waste collection and transport have been performed by Murmansk branch of Upravlenie okhodami Ltd. (Waste Management company), a regional operator, since January 1, 2019.

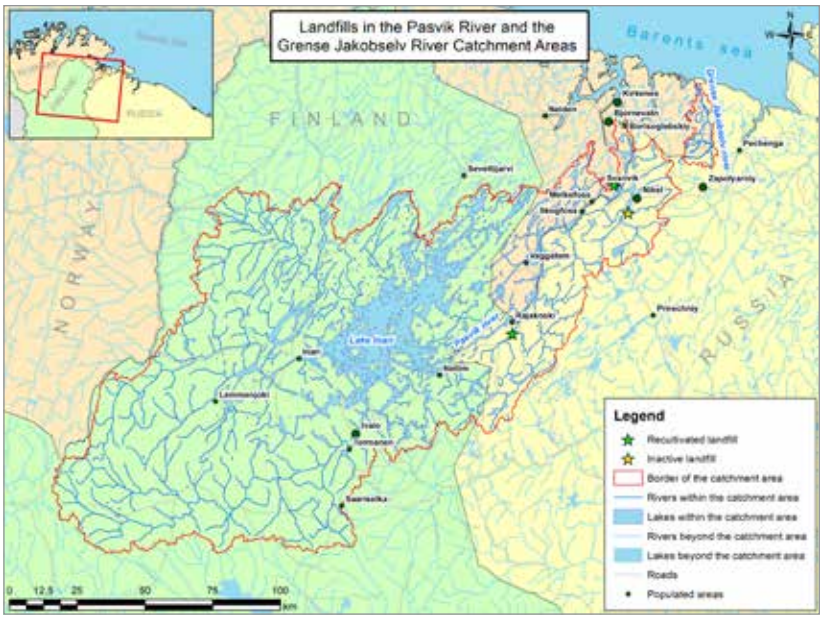

Fig. 6.6. Landfills in the Pasvik catchment area.

[30] https://vann-nett.no/portal/

[31] https://vann-nett.no/portal/#/waterbody/246-2460-L

[32] https://vann-nett.no/portal/#/waterbody/246-69-R

Household waste from the Pechenga district is delivered to the solid waste disposal area and the waste sorting complex, which is situated in the settlement of Mezhdurechie, Kola district, Murmansk region. According to the plan for shutdown and remediation of solid household waste disposal area in the Murmansk region (18.3.2021), it is planned to develop the project documentation for the now closed landfill for solid household waste disposal area in Nikel. The project documentation is to be developed in 2022. First, there will be ecological public project appraisal and after that, remediation activities will commence in the area.

The landfill in Rajakoski is situated 5 km off the village. It was closed in 2016. Its remediation took place in the period from 2018 till 2020.

The Administration of the Pechenga district has established a commission in order to identify unauthorized waste disposal sites in the district, including Nikel. The commission monitors the situation in the area, identifies disposal sites and takes measures to eliminate them.

Vittakuru Landfill. Photos by Ely-Center.

Sør-Varanger municipality has its household waste transported to an inter-municipal landfill in Tana, Eastern Finnmark. However, before inter-municipal cooperation was established in the 1980's, each municipality had a number of smaller landfills. These did not have modern-day national standards to prevent run-off and leaking of polluting agents to surrounding nature. Such landfills may therefore still be a source of pollution if measures are not implemented, and the site is not monitored.

Within Sør-Varanger municipality, there is a closed down landfill in the Pasvik River catchment in proximity of Loken in Pasvik. A monitoring report from 2018[33] has concluded that the water quality in the nearby water bodies is affected but the source of this pollution is unclear at the time being and the case is being followed up by the pollution authority of the County Governor. There are also still several unauthorized disposal sites in Sør-Varanger which need to be surveyed and cleared. Also, sites with World War 2 remnants may also cause leaching of polluting agents to soil and water sources.

In Norway, the database "Grunnforurensning" gives an overview of registered sites with polluted soils.[34]

The municipality of Inari belongs to the Lapland Waste Management Association (Lapeco), which takes care of the waste management of the residents, waste counseling and the tasks of waste management authorities on behalf of its owner municipalities. Combustible waste is transported to the final disposal site at Oulun Energia's Laanila eco-power plant via transfer loading stations. The waste to be recovered is delivered for further recovery.

The last landfills were closed and restored in the municipality of Inari in the early 2000s. The largest landfill in operation has been Vittakuru landfill. It started operations in 1982 and was closed on September 2005. The landfill area is about 4 hectares.

According to the environmental permit granted for landfills in Finland, the landfill operator (in this case Inari municipality) must be responsible for the aftercare of the landfill for at least 30 years after the closing of the landfill. The current monitoring of water and groundwater impacts in the Vittakuru landfill area is based on a monitoring program made by the municipality of Inari in 1999, the monitoring is implemented by Eurofins Ahma Oy.

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[33] Muladal, R og Huru, H.2018. Vanndirektivet. Miljøundersøkelser i vannforekomster ved gamle avfallsanlegg i Sør-Varanger kommune 2018. Naturtjenester i Nord, rapport 11.

[34] https://grunnforurensning.miljodirektoratet.no/

Photo by V. Bunzun.

The nearest waterbodies in the landfill area are Vittakurunoja creek (400m) and a Lake Ujejärvi (1200 m).
The environmental impacts of the landfill are monitored by taking samples of groundwater (monitored from two monitoring pipes below the landfill) and surface water (monitored from a point below the landfill and from a reference point above the landfill) in the vicinity of the landfill. The leachate quality of the landfill has been monitored from the leachate basin. Sampling is done twice a year. In summary of the 2020 monitoring results, the landfill has only minor impacts on the surface waters below the landfill.

Discharges of nutrients (phoshorous and nitrogen)

In the Lake Inari catchment, which is 2/3 of the Pasvik catchment size, a significant part of the amount of phosphorus and nitrogen entering water bodies originates from natural leaching and deposition directly into water bodies. Only 10% of the total phosphorus and 6% of the total nitrogen load is due directly from human activities. In addition to forestry and agriculture, less than third of this amount comes from sparsely populated areas and point sources.[35]

The Russian authorized agencies, which control water body status, are: Administration for the Dvina-Pechora water basin and the Ministry for Natural Resources and Ecology of Murmansk Region.

In water bodies downstreams Nikel[36] in the Pasvik river course in Norway, phosphorous and nitrogen levels are montitored and measured to be within the thresholds of very good environmental standard according to Water Framework Directive (WFD)[37] norms and euthrophication is not a problem. Indexes based on ecological data (phytoplankton) also support this conclusion.

[35] Inarijärven tilan kehittyminen vuosina 1960–2017

[36] Monitoring data exists from the following water bodies downstreams: Svanevatn and Skrukkebukta.

[37] EU Water Framework Directive.

Discharges of sewage (household wastewaters)

Centralized wastewater treatment is an efficient way to influence domestic wastewater discharges. Wastewater treatment plants are particularly effective in removing phosphorus, which is a nutrient that usually restricts primary production in inland waters. The major municipality wastewater treatment plants in the Pasvik area are Seti of Nikel, Svanvik, Mellanaapa and Inari village treatment plants. Diffuse sources are sparsely built-up areas in Lake Inari catchment and along Pasvik river as well summer cottages in the vicinity of Nikel. These households are not connected to the central sewage systems.

Table 6.1. Household wastewater treatment (sewage) plants in the Pasvik catchment.

The wastewater treatment plant at Skogfoss is based on infiltration to ground and water data is therefore not available.

Waste water unit	The amount of water treated at the plant, (m^3)/year	Total phosphorus (P), kg/year	Total nitrogen (N), kg/year	BOD-7, kg/year	Suspended solids, kg/year
Finland					
Inari village	64,017	23.59	3,938	727.24	756
Mellanaapa	420,222	72.73	28,166	2,824	1,725.40
Inari fish hatchery	13,909,601	174.70	1,288.50	This data is included in Inari village plant results*	This data is included in Inari village plant results*
Norway					
Svanvik	Data is not available.	41.391 (2018)	315.36 (2018)	197.1 BOD_5 (2018)	Data is not available.
Russia					
TGK -1 company wastewater treatment plants	2,200	0	0.108	Data is not available.	1.6
Seti of Nikel, municipal company, town of Nikel	4,380,000	1,496	57,490.8	11,627	24,691

* The sludge and domestic wastewaters from Inari hatchery are discharged to Inari village treatment plant. This for, discharges of BOD-7 and suspended solids are not measured at the hatchery.

Definitions:

Total phosoporus (P) = Total amount of dissolved phosphate phosphorus, organic and inorganic phosphorus.

Total nitrogen (N) = Total amount of nitrate, ammonium and organic nitrogen.

BOD-7 = Biochemical Oxygen Demand is a measure of the amount of oxygen needed for microorganisms to degrade organic material in water within seven days. The BOD value depends mainly on the amount of organic matter in the water, but also on the amount of nutrients.

Suspended solids = In the case of wastewaters, suspended solids mean the amount of solid material contained in water or sludge.

The population of Nikel is about 11,012 people (2018); there are 132 apartment houses in the settlement (2021). Domestic wastewater is treated at the wastewater treatment plant; the treated water is discharged into the Kolos-joki river (the latter is a part of the Pasvik river catchment). The rated capacity of the wastewater treatment works is 12,000 m^3 a day. It has biological and UV treatment as well as a filter bed. As its equipment is obsolete, the reconstruction of the treatment facilities in Nikel is expected in the coming years.

There are summer cottages in the vicinity of Nikel, but no centralized water supply and sewage system in that settlement. People stay there mostly in summertime and they abstract water from Lake Kuetsjarvi.

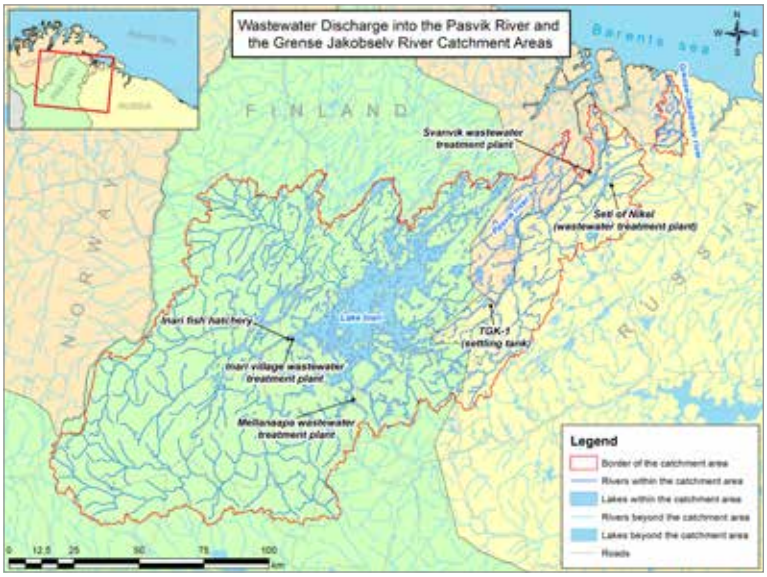

Fig 6.7. Wastewater discharge in the catchment area.

The population of Rajakoski is 210 persons and there are 30 apartment houses in it. The population of Borisoglebskiy is 70 persons and there are 19 houses in it.[38] Every settlement has a centralized water supply and sewage system. In Rajakoski water is abstracted from the reservoir of Rajakoski HEP plant; wastewater is treated in the septic tanks and after that, it is discharged into the Pasvik river. Tap water is treated mechanically; there is also bactericidal UV treatment. Wastewater is treated in the septic tanks in Borisoglebskiy and Salmijarvi.

The local treatment system needs to be modernized due to the wear and tear of the equipment. The wastewater treatment works in Nikel do not meet modern ecological and quality standards. There is also a need for new wastewater treatment works in Rajakoski.

TGK-1 Company has a water supply system in its facilities. Water is abstracted from the reservoir and treated wastewater is discharged into the tail water. As water consumption is low there, abstraction and discharge of water is not big. That wastewater is referred to the category of household wastewater; the main pollutants in it are total BOD, ammonium ion, nitrates, nitrites, phosphates, chlorides, sulphates and synthetic surfactants. The HEP plants do not generate industrial wastewater.

According to the public water register, Form 1.18 (2017), water below Borisoglebsk HEP plant is considered to be conditionally clean by the data of the comprehensive hydro-chemical water analysis in water bodies.

The Russian authorized agencies, which control water body status, are: Administration for the Dvina-Pechora water basin and the Ministry for Natural Resources and Ecology of the Murmansk Region.

Along the Pasvik valley in Norway, there are 388 households and additional 411 cabins. In 2016, 15 % of the buildings were connected to municipal plant the Pasvik valley in Norway, 77% had separate infiltration units, and 8 % had direct discharges without any treatment. Many of the cabins do not have water inside and no sewage and are therefore in the last category with no treatment.[39]

In Svanvik, there is a municipal sewage treatment plant (biological treatment), that has been renovated in 2019. The maximum allowed discharge of the plant is 300 PE (people equivalents). The discharge is into the main river stem. Monitoring of the discharges of the plant is not in accordance with national regulations and will be corrected from 2021. At Skogfoss, there is another municipal plant of a smaller size, based on infiltration to ground.

[38] https://minec.gov-murman.ru/files/pechengskiy-rayon.pdf

[39] Rapport – registrering av spredte avløp langs Pasvikelva. Sør-Varanger kommune, 2016

Outside of Svanvik and Skogfoss villages, there are separate, private units, usually per house. Nowadays, environmental permits are compulsory also for these units, but these were not common earlier. There is, therefore, at the moment, no overview of the number of units and their status. A survey is needed and is proposed as one of the measures in this plan. For discharges to freshwater ecosystems, septic tanks alone are not in accordance with national regulations on pollution. Infiltration to ground is generally needed in addition in order to meet the environmental standards in the law, but cabins with no water intake are expempted.

The hydropower stations of Pasvik Kraft at Melkefoss and Skogfoss have closed sewage systems (tanks).

In Finland, around 80 % of the residents in Ivalo population center are connected to the central sewage system. At Inari village, the percentage of residents that are connected is 84 %. In Saariselkä, the sewage covers the same area as water supply system. In sparsely populated areas, domestic wastewater is mainly treated in septic tanks. After the septic tanks the wastewaters are saturated into the soil, but some amount of the water is still discharged directly into a ditch or water system. A survey of this matter is needed and is proposed as one of the measures in this plan.[40]

There are two municipal wastewater treatment plants in the Lake Inari catchment area in Finland: Inari village plant and Mellanaapa treatment plant. Wastewaters from Ivalo and Saariselkä population centers are discharged to Mellanaapa treatment plant. Both plants have biorotor process with pre-clarification and chemical precipitation. Treated wastewaters from Inari village plant are discharged to Lake Inari, treated waters from Mellanaapa are discharged along the discharge stream into the Akujoki River about 5 km before the Ivalojoki River.

The Mellanaapa wastewater treatment plant was modernized in 2005. The treatment plant was implemented in such a way that it can treat the wastewater of 6,500 inhabitants in Ivalo and 21,000 inhabitants in the Saariselkä area under conditions where the amount of water to be treated varies greatly. It is influenced by the seasonal activities of Saariselkä Tourist Center. During the high season, Mellanaapa can process 3,500 m^3 per day, but so far even during the high season there was less than 1,500 m^3 wastewater for treatment per day. According to the monitoring reports, the operation of the Mellanaava wastewater treatment plant meets the treatment requirements set by the Environmental Permit Office. Despite this the ecological status of the Akujoki River is classified as insufficient.

The population equivalent for the Inari village treatment plant is 860. However, heavy tourism, increased accommodation capacity and new construction have increased the load, which is why Inari Lapin Vesi Oy decided to increase the capacity of the treatment plant.[41, 42] In 2021 the biological dimensioning has been raised making the current capacity about 45% higher than before. There is approximately 25-40% of the remaining capacity in relation to current consumption. In the past eight years the Lapin Vesi Oy has renovated automation, added sludge drying and now increased the capacity of Inari village treatment plant. There for, there is no planned measures for the next ten years.

A fish hatchery operated by the Natural Resources Institute Finland (Luke) locates in downstream of Juutuanjoki River. Waters from the fishtanks are treated at the hatchery before discharging to Juutuanjoki River. The sludge and domestic wastewaters are discharged to the Inari village treatment plant.[43] Today, nutrient load of the hatchery is very small. The share of the hatchery in the phosphorus load is less than 2% of the amount of natural leaching in the Juutuanjoki River. Improved efficiency of the feed used, and improved feeding techniques have reduced the load on the feed.[44]

Effects of hatchery and Inari village wastewater plant to the water bodies of Juutuanjoki and Lake Inari are monitored jointly. The total nutrient concentrations in the Juutuanjoki and Kalkulahti bay water indicated barren water quality. The hygienic quality of the water in Juutuanjoki and Kalkulahti is also excellent. Only the water quality of the deep-water points is probably affected by the load coming from the wastewater treatment plant.

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[40] Finlex. Lainsäädäntö. Ympäristönsuojelulaki. 2014. https://www.finlex.fi/fi/laki/alkup/2014/20140527#Lidp448307792

[41] Lapin Vesi Oy. Selvitys Inarin kirkonkylän jätevedenpuhdistamon toiminnan muutoksesta 2019.

[42] Pohjois-Suomen aluehallintovirasto. Inarin kirkonkylän jätevedenpuhdistamon ympäristöluvan lupamääräysten tarkistaminen. 11.7.2017

[43] Environmental and Water Management Permit for the Inari hatchery.16.12.2005

[44] https://www.ymparisto.fi/vesienhoitoalue/teno__naatamojoki__ja__paatsjoki/osallistuminen
(or new address after May 2021: Tenon–Näätämöjoen–Paatsjoen vesienhoitoalueen vesienhoidon toimenpideohjelma pinta- ja pohjavesille vuoteen 2027)

Agriculture

Agriculture is most important in the Norwegian parts of the catchment, with 539 hectares of arable land. Finland comes second, the corresponding figure for Inari municipality is 530 hectares. The Pasvik valley in Norway has traditionally been an important farming area. Today, production is moderate and impacts small scale related to the size of the catchment area. There are 12 operating farms per 2019 (eight with milk production, one with sheep and three farms with only forage production).

Farming in Norway is dependent on governmental subsidies and in order to qualify for these, the farm has to comply to regulations regarding planning of fertilizing, storage and spreading of fertilizers and pesticides. Each year, 10% of the farms are controlled. These controls have not revealed large challenges along the Pasvik river. These results are supported by water chemistry monitoring data. Phosphorous and nitrogen levels are within the thresholds of very good environmental data according to WFD[45] norms and euthrophication is not a problem in the Pasvik river system.

In Russia, there are no farming activities in the border area.

Forestry

Before the Second World War the area was the site of intensive forestry activities and the River Pasvik was used to float timber. Floating stopped when the area was divided between the three countries and the watercourse was regulated. In Finland forestry is still important. There is a total of about 3,650 km^2 of forestry area. Forestry activities in the Norwegian part of the area are much more modest, with 350 km^2 of productive forest land. In Russia there used to be a department of the Verkhnetulomsk logging company situated in Janiskoski, but it is now closed.

There are approximately 190,000 ha of state forest in the municipality of Inari in Finland. In relation to the total state land area of the municipality (1.3 million ha), this is about 14% of the total area. There is a total of about 365,000 ha of forestry area, so even just over 50% of it is covered by possible forestry activities. The small relative area covered by forestry is due to large protected and wilderness areas in addition to protected and wilderness areas, the commercial forest area also has a lot of e.g., areas excluded from forestry due to diversity and reindeer husbandry. For example, it has been agreed with the local herdsmen that the main pastures of the herdsmen will be temporarily excluded from activities.

Climatic factors limit forest growth and regeneration. Thus, it has not been in the past or in the future commercially viable to make forest drainage or fertilization in the area.

Forestry activities in the state forests in Inari municipality are significantly smaller compared to what the current forest resources of the region would allow. (The annual felling plan is 115,000 m^3/year, but in recent years the felling volume has been only about 50,000 m^3/year.)

Felling and forestry measures are only carried out on mineral lands, so from the point of view of water impact, risky measures are not taken on peatlands. In addition, the construction of forest roads and the renovation of forest roads, as well as various road maintenance work, are included in the activities. The degradation of soil and surface vegetation caused by regeneration cutting may increase the leaching of solids and bound nutrients. In addition, the construction of forest roads has caused some migration barriers for fish. During ReARC- project, funded by the Kolarctic – CBC program, in 2019–2020 total of 742 road crossings in the Lake Inari catchment area were surveyed and their functionality for fish migration were assessed. The template used in technical inspections was created in a previous project of Metsähallitus (Esteet pois!- project). As a result of the survey, it was stated that almost every other (45%) of the surveyed road crossings on the Lake Inari catchment area is in some degree an obstacle for fish and other aquatic organisms.[46]

The Pasvik valley in Norway has about 35,000 ha of productive pine-forest mainly owned by Finnmarkseiendommen (FeFo). Intenstive forestry was practised till the beginning of the 1990's. The main forestry activity nowadays is thinning along with some smallscale timber production. Around 5,000 m^3 is logged yearly of an annual growth of 42,817 m^3.

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[45] EU Water Framework Directive.

[46] https://www.eraluvat.fi/erapalvelut/hankkeet/esteet-pois.html, https://www.eraluvat.fi/media/dokumentit/esteet-pois/esteetpois_loppuraportti.pdf

The forestry activities imply the use and driving of machinery in the terrain as well as the disposition of dead plant material in the forest bottom which potentially may cause erosion and nutrient run-off. However, flat terrain, low precipitation and draining masses in the Pasvik valley, helps reduce the risk of erosion and nutrients leaking into the water systems. The landowner, FeFo, is committed to perform all forestry activity according to the PEFC-forestry standard. This standard promotes sustainable forest management through independent third-party certification.

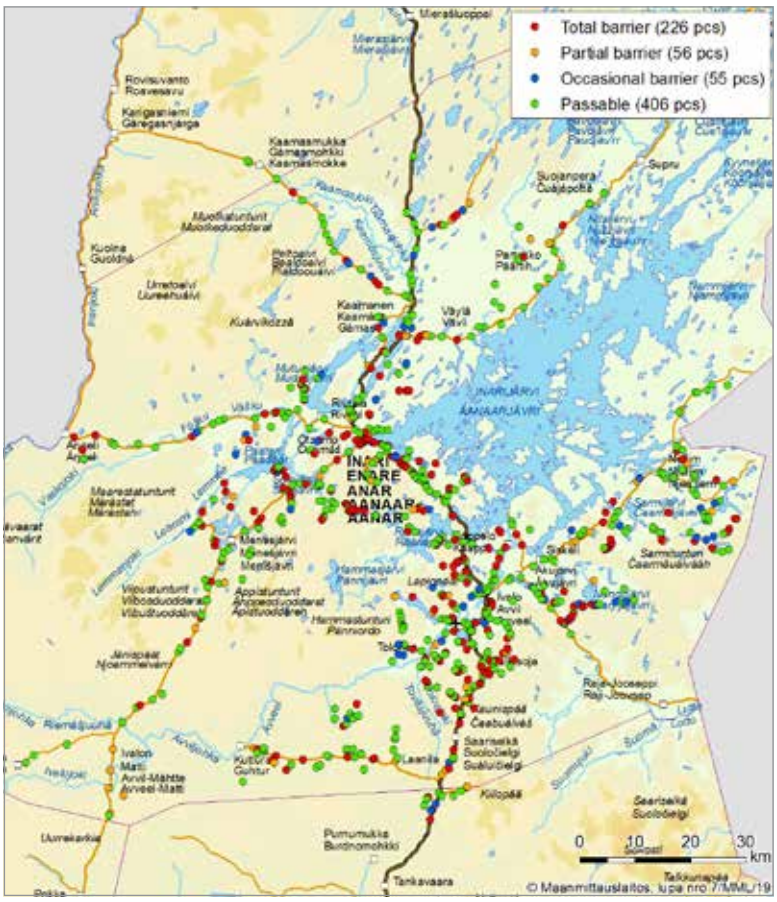

Fig. 6.8. Map that shows migration barriers in the Inari-catchment.

In Norway, a system of voluntary forest protection has been practiced since 2003.[47] The system came as an initiative from the Norwegian Forest Owners' Association as a solution to lower the level of conflict between forest owners and the environmental protection authorities in protection processes. The idea is that the landowner offers the state areas for protection. If the state finds the area worthy of protection they accept, and the landowner gets economic compensation in return for the area. In Pasvik valley the County Governor's office and Fefo has negotiated a suggestion for voluntary forest protection. This negotiation processes are still going and can take several years to complete. Therefore, it is not clear whether or not these processes will lead to voluntary forest protection areas in Pasvik.

In Russia, there are no forestry activities in the border area.

Water supply and consumption by industry and households

The largest water consumer on the Russian side is the settlement of Nikel, the administrative centre of the Pechenga municipal district in the Murmansk region. The settlement is situated on the left bank of the Kolosjoki river, which is part of the Pasvik catchment. In Nikel, water for municipal purposes, households and industrial needs is abstracted from Lake Luchlompolo and treated. The intake limit is 5,500,000 m^3/y, but the actual consumption is smaller.

The quality of water taken for municipal purposes in Russia is monitored by owners of the facilities and government authorities (Rospotrebnadzor, Russian Federal Service for Surveillance on Consumer Rights Protection and Human Wellbeing). In Norway and Finland drinking water is monitored by the owner (municipal or private).

In Norway, water supply at Svanvik, Skogfoss and Rødsand is supplied from municipal facilities. There are many private ground water wells along the Pasvik river on Norwegian side. The private owners are responsible themselves for ensuring the quality of their drinking water. However, systematic sampling and analysis of the water quality in these wells should be accomplished in order to secure safe drinking water and monitor the state of the ground waters in the area.

[47] https://frivilligvern.no/historien-bak-ordningen

The mining company Sydvaranger Drift AS has a permission to extract 6000 m3/hour of water from the river Pasvik above Boris Gleb (Norwegian-Russian bilateral agreement of 30.04.1976). This permission has so far not been used. If utilized, power production at the Russian hydro power station in Boris Gleb will be reduced and Norway will have to supply the lost production from the Norwegian net as a compensation.

Lapin Vesi Oy is responsible of water supply in Ivalo, Inari (center) and Saariselkä in Finland. Also, the water cooperative in Nellim is part of Inarin Lapin Vesi Oy. There is two water pumping plant in Ivalo: Alumavaara and Törmänen. In both plants, the water goes through UV- purification before it is conducted to the water supply system. In Alumavaara the water is also treated with limestone alkalisation. There are 1546 households connected to the water supply system.

At Inari village center the water is conducted from Nukkumanjoki for 250 households. The water is treated with UV-purification and limestone alkalisation. In 2016 the average water intake / month was 121 – 337 m3/day. In Saariselkä there are three water pumping plants: Koparárova, Laanila and Paljakainen. The water is treated with UV- purification. There are around 550 households connected to the water supply system.

Gold panning and effects on water ecosystems

In 1850, along with hunting, fishing and reindeer husbandry, gold mining became an equal part of the natural resource livelihood of the local population in Northern Finland. The most effect on the employment the gold mining had in the early decades of 1900, when big gold companies employed hundreds of workers. Today gold panning is mostly practiced by small group of enthusiasts.

Scattered gold prospecting takes place in the tributaries of Lemmenjoki and Ivalojoki rivers. It is performed by excavating sandy soils by shovel or excavator. All types of gold prospecting require a permission from Finnish Safety and Chemicals Agency (Tukes) and additionally the use of excavator principally demands an environmental permit from the environmental licensing authority. In 2018 there were 14 units in Lemmenjoki and 45 units in the Ivalojoki tributary operating with machinery under an environmental permit. There are currently 110 environmentally licensed gold panning areas outside the Lemmenjoki. The units prospecting by shovel are more numerous, but less extensive in volume. Machinery gold panning under environmental permit is required to control and minimize its environmental impact by using sediment basins and overland flow when necessary. The operators are also obligated to monitoring of their impact on water quality. Shovel work is less controlled. It has been ruled in the reformed Mining Act (2011) that machinary will not be allowed in gold prospecting in the Lemmenjoki national park as of 2020.

Gold panning in Harrijoki River. Photo by Jouni Rauhala 2019.

Gold panning site in Miessijoki River(Lemmenjoki National Park) before landscaping. Photo by Jouni Rauhala 2019.

Gold mining with excavators has affected the surface waters in the Pasvik (Lake Inari) basin. Many rivers have suffered from increased erosion and nutrient-load, metals and suspended solids caused by mining and other land-use. Changes in habitat and water quality have led to impoverished biodiversity and decreased the reproduction of valuable fish stocks like brown trout and other endangered organisms in the water system. The main impact from gold mining to the water quality comes from the solid soil particles that become suspended in panning and get rinsed into the receiving river or stream. The biggest impact of gold mining on water quality is due to the solids, as a result of which fine sediment covers trout spawning grounds.

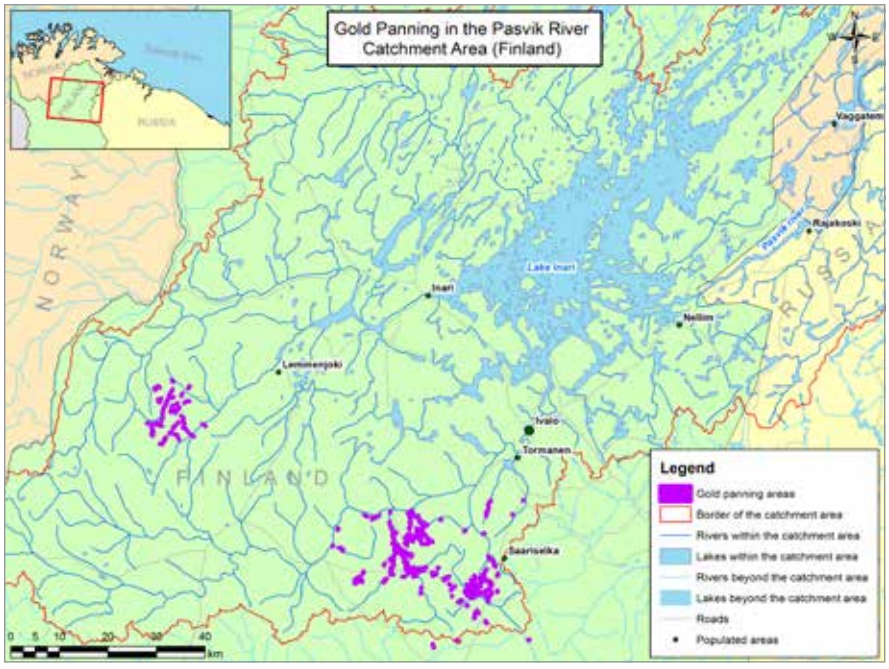

Fig 6.9. Gold panning areas in the Pasvik catchment

Machinery gold prospecting has caused turbidity and siltation of waters in the Lemmenjoki National Park (Miessijoki, Postijoki, Vaskojoki, Jäkälä-Äytsi, Ravadasjoki, Puskuäytsi) and

Ivalojoki (Sotajoki, Palsinoja) areas. In Lemmenjoki National Park, machinery gold panning has ended June 30th, 2020.

The rehabilitation and landscaping of the affected gold mining sites of the Lemmenjoki National Park is planned and will be completed by July 1st, 2022.

Norwegian semi-domesticated reindeer in Pasvik Reserve captured by a wildlife camera, Russia (2021). Photo by Pasvik Reserve.

Reindeer herding: description of activities and impacts on Pasvik Nature Reserve.

Reindeer herding is a traditional source of livelihood in the area with a long history. It is an important branch of the primary industry in the Finnish and Norwegian part of the catchment area. In Finland, approximately 150–200 persons are employed in the reindeer sector. The total stock on Finnish side consisted of 31 949 reindeers by the last counting in 2019/2020, but the number varies from year to year. The biggest allowed amount is set to 39 200 reindeer.[48]

In Norway, there is one reindeer herding district which utilizes the catchment area of Pasvik: District 5A/5C Bahcaveaijjii/Pasvik. The district consists of 5 siidas and 27 households. In a 2018 count, the district had around 2,400 reindeer.

Intensive reindeer grazing has reduced the lichen cover in both Norway and Finland. Norwegian reindeer cross the national border and come to Pasvik State Nature Reserve in Russia every year, and they are a problem and threat to the reserve, its terrestrial ecosystem status, lichen cover and rare species. The problem of unsanctioned visits of Norwegian domestic reindeer to Russian side of the Pasvik river has existed for many years. Reindeer cross the state border and come to Pasvik State Nature Reserve, which is prohibited by the Russian law on protected areas. In the protected areas on the Norwegian side of the border, regulations are different and reindeer herding is allowed.

In accordance with the Treaty on the regime of the Soviet-Norwegian border and on the procedure for solving border conflicts and incidents in the territory of the USSR and the Kingdom of Norway (1949) and the Agreement on the mutual return of reindeer crossing the state border (1977), Norwegian domesticated reindeer are being driven from the Russian bank of the Pasvik river, including from the territory of the Pasvik State Nature Reserve back to Norway.

This work is carried out with the participation of Russian and Norwegian Border Commissioners. On the Norwegian side, the problem of reindeer husbandry on the border of the two countries is within the competence of the Reindeer Herding Department of the County Governor Office of Troms and Finnmark, on the Russian side – the Pasvik State Nature Reserve and the Department of International Cooperation of the Russian Ministry of Natural Resources.

[48] The total amount was set by forestry- and agriculture ministry in 1990: https://www.finlex.fi/fi/laki/alkup/2000/20000071

Several meetings with reindeer herders, relevant experts, nature conservation managers and border commissioners have been arranged. The Norwegian party started constructing a special reindeer fence along the Norwegian bank of the river. It should help to solve the problem. In 2013 a continuous reindeer fence was set up in the Norwegian Pasvik nature reserve. It takes time to build the fence along the whole stretch of the river. Also, the existing fence needs maintenance and renewal. The County Governor of Troms and Finnmark will bring the issue forward to national authorities in order to secure finances for the needed works.

It is also necessary to harmonize the methods for calculating the costs of damage to the vegetation cover in the territory of Pasvik State Nature Reserve as a specially protected area in Russia.

Tourism and effects on the environment

Over the years 2015-2019, the number of overnight stays in Inari has been between 430,000–560,000. The yearly number of airplane travelers to Ivalo has registered to be over 200,000 in last years. The tourism activities of Lake Inari are mainly outdoor activities in nature. Common outdoor activities are snowmobiling, cross-country skiing, snowshoeing, northern lights, diving, husky, reindeer and horse safaris. In the summers the tourism activities centers on hiking, gold panning, fishing, hunting and water sports. Nowadays, the tourism in Lake Inari is centered in the vicinity of villages. Destinations for tourism in rural villages are Inari, Nellim, Veskoniemi, Partaikko and Keväjärvi.[49]

In the 1990s, Finnish Lapland tourism has developed into tourist centers. According to Lapland's tourism strategy (2003), the functional areas of influence formed by airports and tourist centers are the starting point for the regional structure. Large water supply projects in Lapland's tourist centers are based on this strategic choice. Between 1995 and 2006, investments were made in the water supply of six of Lapland's largest tourist centers. The targets were extensive, usually supranational investment projects. The biggest tourist destination in Northern Lapland is Saariselkä travel area.

The Saariselkä area water supply project was implemented in 2002-2005 and a new central treatment plant Mellanaapa in Ivalo was built. Wastewater from the Saariselkä area is discharged to Mellanaapa for treatment. The transmission sewer project included the construction of a 38 km long transmission sewer and a main water pipeline from Saariselkä to Ivalo. The basic idea of the transmission sewer project has been that the wastewater of the Saariselkä Tourist Area is discharged in the vicinity of a water body where dilution conditions are good and small watercourses in the Saariselkä area are spared. The treatment plant was implemented in such a way that it can treat the wastewater of 6,500 inhabitants in Ivalo and 21,000 inhabitants in the Saariselkä area, in which case the maximum daily water consumption is estimated at 4,000 m^3/d. In practice, there are far fewer residents in 2019 and more than half of the capacity of the Mellanaapa wastewater treatment plant still remains.

In Sør-Varanger municipality in Norway, tourism has increased over the past few years. Currently, there are 300 FTE[50] employees in Sør-Varanger. The number of hotel nights have increased by 40% over the past five years, from 66,000 in 2014 to 93,000 in 2019. A further increase is expected as a result of a higher demand during winter (husky rides, snowmobile safaris and king crab fishing). For visits to Øvre Pasvik National Park and Øvre Pasvik Landscape Protection Area, visitors shall be guided through facilitation measures and information, so that the conservation values and cultural monuments are safeguarded.[51] Facilitation in the peripheral zones of the nature conservation areas is a priority. In the Pasvik River in the Upper Pasvik landscape conservation area, facilitation measures for paddlers are under work, and routes for short cycle paths between the forest roads are under planning.

In Russia, tourist visits are by 2020 mainly made to the Pasvik State Nature Reserve. It is a strictly protected area of the federal level, which can be reached only in compliance with special requirements, in a special walking tour accompanied by reserve staff. A tourist season depends on weather conditions and usually lasts from the middle of May till the end of September. About 200 tourist comes to visit Pasvik State Nature Reserve a year, whereas the number of visitor-center's guests in Nikel is around 1000 a year.

[49] Inari.fi, Inari-info.Tilastotietoa https://www.inari.fi/fi/inari-info/tilastotietoa.html

[50] FTE= Full-time equivalents.

[51] Please see visitors strategy: http://www.nasjonalparkstyre.no/Ovre-Pasvik/Planer-og-publikasjoner/Besoksstrategi-Ovre-Pasvik/

Nature in Grense Jakobselv (Vourjema). Photo by Natalia Polikarpova.

6.4. Pressures on the environment in the Grense Jakobselv (Vuorjema) catchment

The Grense Jakobselv- Vuorjema catchment is affected by industrial pollutants. The water body is classified with poor chemical status in the Norwegian WFD classification due to elevated levels of nickel.[52]

Studies[53, 54]. have confirmed that Grense Jakobselv has a small, threatened stock of pearl mussels (Margaritifiera margaritifiera). The number of pearl mussels registered in the Norwegian territory was 470 individuals in a distance of 130 meters. There was also spotted substantial number of pearl mussels in the Russian territory. From the length distribution, 10 % of the pearl mussels were 5 mm or less. This reveals that the recruitment is weak. Also, number of hostfish were found to be low. The limited area the mussels was found in makes the population weak to external disturbances. New cross-border studies are needed to map the population further.

Other pressures to the river environment are described below.

Pressures on fish stocks and fishing in Grense Jakobselv

The Grense Jakobselv/Vuorjema is the most eastern river with anadromous fish stocks in Norway. The river has stocks of Atlantic salmon (Salmo salar), sea trout (Salmo trutta) and Arctic char (Salvelinus alpinus). Fish can migrate up to the lake Jakobselvvatn, which makes a river stretch of 39 km available anadromous species. Apart from the lowest 8 km, the river has suitable habitats for spawning and for juveniles.

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[52] See fact sheet on the Grense Jakobselv water body: https://vann-nett.no/portal/#/waterbody/247-17-R

[53] Aspholm. P et al. 2017. Undersøkelse av forekomst av elvemusling i Grense Jakobselv. NIBIO rapport 13/2017.

[54] Aspoholm. P et al. 2020. Undersøkelse av forekomster av elvemuslinger i Grense Jakobselv 2020. NIBIO rapport 131/2020.

The fish stocks in the river are affected by pollution from industrial and other sources, the invasion of pink salmon (Oncorhynchus gorbuscha), changes in the river environment due to erosion control measures and impact of fishing.

According to the Norwegian salmon quality norm (2016-2019) the status of the salmon stock in Grense Jakobselv is classified as good. Even though, the genetic integrity is classified as moderate because of involvement of genes from farmed fish. The classification is done on basis of anthropogenic pressures, the rivers spawning target and harvestable surplus. The spawning target for salmon in the Norwegian parts of the river is set to 621 kg females per year. Based on snorkeling counts in the period 2014–2017, the achievement of the spawning target summed up to 93%. Catches were lower in 2018 than previous years. The snorkeling counts in 2018 concluded that the spawning target this year was met by 161%.[55] However, the latest report questions whether the spawning target is set too low in relation to the rivers actual production potential.[56] A continued precautious approach to fishing management in the rivers is thus recommended.

The status of the sea trout stocks is uncertain but estimated to be low (spawning stock of less than 50 individuals). Catches of trout over the past 10 years have amounted to less than 25 individuals per year on the Norwegian side. For Arctic char, the stock status is also set as uncertain (source: Lakseregisteret[57]). Fishing in the Norwegian part of the river is managed according to a regulation of 07.12.2012[58] (first version from 1976). Seasonal fishing licences are issued only to inhabitants of Sør-Varanger. Other Norwegian citizens can buy daily fishing licences. Fishing in the Norwegian part of the river is open only to Norwegian residents.

Fishing on the Norwegian side is managed by the landowner Fefo (The Finnmark Estate). Fishing rights and management are leased to a local NGO, Sør-Varanger hunter and fishing association (JFF).

Fishing in the Norwegian parts of the river is regulated by maximum catches. Quotas have been introduced to protect the salmon stocks from effects of fishing, hereunder negative effects on the spawning stock and future production. The seasonal quota per fisherman is 15 salmon in 2019, within which each fisherman is allowed to catch 3 middle-size salmon (3–7 kg) and 1 larger salmon (<7 kg). Releases of any fish above this quota is compulsory.

Pink salmon (Oncorhynchus gorbuscha)

Pink salmon is a Pacific Ocean salmon species which was introduced to the North-West of Russia from the late 1950's till year 2000. More than 200 million pink salmon eggs from Sakhalin island were introduced into the hatcheries along the White sea in the period of 1956-1979. Pink salmon fries were then introduced in a larger number of Russian rivers with drainage to the Barents Sea and the White Sea. The pink salmon stocks, however, did not reproduce themselves in those rivers before eggs from an odd-year generation from the river Oda were introduced in the 1980's. Today, there are self-reproducing pink salmon stocks in many North-West Russian rivers and in rivers off the coast in Norway. In 2017, a larger and unexpected invasion of pink salmon in Norwegian rivers was recorded. Almost 6500 pink salmon were reported caught in 271 rivers along the entire coastline in Norway in 2017.[59]

In Russia, pink salmon is classified as an important food resource and work on its breeding and production will continue. In Norway, pink salmon is considered an alien species which is to be eradicated if possible. Grense Jakobselv has the largest percentage of pink salmon in Finnmark and a self-reproducing stock. The autumn 2017 snorkeling counts documented the presence of 600 individuals of pink salmon.[60]

The knowledge of the effects of pink salmon on the native stocks is limited. Even though pink salmon spawn earlier than local salmonids, they may be aggressive towards other fish, which can be scared away from holding pools and spawning sites. If pink salmon occurs in lager numbers, angling for Atlantic salmon and other fishes may be negatively impacted. After hatching, pink salmon may start feeding in the river before moving to the sea. Pink salmon juveniles may compete with juveniles of other salmonids for a few weeks during spring, if they occur in large numbers.

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[55] Drivtelling i fire elver i Sør-Varanger høsten 2018. Rapport 2018-10, Ferskvannsbiologen.

[56] Drivtelling i fire elver i Sør-Varanger høsten 2018. Rapport 2018-10, Ferskvannsbiologen.

[57] Norwegian salmon register: http://lakseregister.fylkesmannen.no/lakseregister/public/default.aspx

[58] https://lovdata.no/dokument/LF/forskrift/1976-08-20-3002

[59] These are minimum numbers as an official reporting system was lacking in 2017.

[60] Drivtelling i fire elver i Sør-Varanger høsten 2018. Rapoprt 2018.-10, Ferskvannsbiologen

Also, it cannot be excluded that pink salmon may impact the growth and feeding of other salmonids in the sea if they occur in large numbers. This has so far not been studied. The same applies to the issue of whether pink salmon can spread diseases to new areas. Pink salmon die after spawning and the decay of dead fish adds nutrients to the rivers, which can potentially alter river ecosystems.

The Norwegian Scientific Committee for Food and the Environment published in January 2020 an assessment of the risk to Norwegian biodiversity and aquaculture from pink salmon. The committee concludes that the high numbers of pink salmon to Eastern Finnmark in 2017 and the expansion to West Finnmark and Troms in 2019 indicate an ongoing expansion within Norway. The committee recommends continued mitigation measures to reduce impacts on native salmonids, included targeted fishing and removal of pink salmon, adapted to local conditions.

Also, one of the steps to solving the problem should be public awareness of environmental threats to which unauthorized introduction of alien species can lead, and an understanding of the importance and seriousness of this issue.

Changes to the river environment: Erosion control measures

In the 1949 bilateral border agreement between Norway and Russia, both countries have committed themselves to protect the river's shores. The borderline is the thalweg and for it not to change, erosion needs to be controlled. This has resulted building 12 km of erosion control structures on both sides of the river in Norway and Russia.

In practice, the rivers lowest parts are canalized, water flow reduced, and river habitats are changed, resulting in negative impacts on the river ecosystems. Along with this, erosion control structures may also have negative visual impacts (e.g. large stones and reduced value of riverbed for anglers and other visitors).

When erosion control structures are built, erosion is eased at the site where they are constructed but may increase at other sites. Continuous monitoring of the structures is therefore needed to prevent unnecessary damage and costs, as well as identifying need for measures at new sites.

In addition, it would be beneficial to conduct environmental adaptations to existing erosion control structures.

Erosion control structures in Grense Jakobselv River.
Photo by Natalia Polikarpova.

Tourism in Grense Jakobselv

On the Norwegian side of the border in Grense Jakobselv, day-visits from tourists are frequent while the road is open (from May-November). The traffic is highest during the summer months, where many mobile-home cars arrive in order to visit the seashore. At the seapoint, facilities for tourists have been constructed.

In the Russian territory of Grense Jakobselv's catchments border control regime prevails. Currently there is no tourism infrastructure in that area.

Reindeer herding

In Norway, the reindeer herding district 1/2/3 Nuorta Mátta Várjjat-Østre Sør-Varanger utilizes the catchment area of Grense Jakobselv. The district consists of two initial siidas and 4 households. The highest permitted number of reindeer in the district is 900. In a 2018 count, the district had around 620 reindeer.

6.5. Conclusion: Main topics for the Multi-Use planning process

Based on the information above and input from authorities and the public in the three countries, the main topics for the multi-use planning process and the programme of measures (PoM) have been identified and summed up in the tables below (table 6.1 and 6.2). The main topics were approved by the steering group in their meeting on 18.09.2019 and revised at the steering group meeting on 27.4.2021.

Main planning topics – Pasvik catchment

- Monitoring of the environmental status of ecosystems in the Pasvik catchment – influence of past and present industry. Water regulations and their effects on the environment.
- Ecological enlightenment (information and education) and citizen science.
- Fish in the Pasvik catchment areas.
- Sewage (wastewater) discharges from households and industrial sources.
- Tourism.
- Land use (forestry, agriculture and reindeer herding and its effects on Pasvik State Nature Reserve, Russia).
- Gold panning - effects and restoration measures (Finland).
- Landfills (Russia and Norway).

Main planning topics – Grense Jakobselv/Vuorjema catchment

- Monitoring of the environmental status of ecosystems in the Grense Jakobselv/Vuorjema catchment – influence of past and present industry.
- Pink salmon- monitoring and preventive measures (Norway).
- Changes to the river environment: erosion control.
- Nature conservation.

Grense Jakobselv River.
Photo by Pasvik State Nature Reserve.

Chapter 7 – Programme of measures (2021–2030)

Vision

Sustain and improve the state of the environment of the river Pasvik and Grense Jakobselv (Vuorjema) catchment areas, to the benefit of the local people and for a viable economy in the Russian, Norwegian and Finnish border area.

7.1. Industrial pollution

Challenges:

The Nikel smelter was closed in December 2020, but new activities are being planned in area. Due to this, it is still necessary to continue the successful work to reduce pollution from closed and operating industrial facilities by increasing their efficiency, preventing diffuse discharges to water systems and improving the quality of wastewater treatment.

Goal 1: Emissions from the industry are reduced to a level that minimizes impacts on air, aquatic and terrestrial ecosystems

Measures

No.	Measure	Responsible institutions – project coordination*			Year						
					2021	2022		2023		2024–2026 (mid)	2027–2030 (long term)
		Russia	Norway	Finland	Autumn	Spring	Autumn	Spring	Autumn		
1.1	State of the Environment project – trilateral monitoring and research project to follow changes in the environment after the closing the smelter in Nikel.	Roshydromet (Murmansk office), Dvina-Pechora, CLATM and Pasvik Reserve	SFTF	ELY-Center							

* Full name of organizations and institutions responsible for measures can be found in Annex 3.

7.2. Water regulations

Challenges

- To continue the development of Lake Inari's ecological regulatory practices, and to strengthen and improve cooperation between countries in the management of water resources in the Pasvik River. The practices must be implemented in a way that causes the least possible damage to the ecology of the water resources and, meet the recreative needs of local people. The regulatory practices must also take into consideration years of extraordinary water conditions.

- To continue the studies of climate change effects on hydrology of the whole water system and its regulation as well as to utilize new research results in the environmental impact assessment.

The regulation causes erosion of the shores in Lake Inari and have impact on the ecology of the shoreline ecosystems of river Pasvik. Landslides in Lake Inari are identified and pre-protected, but new measuring techniques need to be developed to improve efficiency of measures and costs.

In the Kirakkajoki catchment area, it is a need to restore fish migrations and production areas for fish. It is currently unknown whether the original trout population remains in Kirakkajoki and how closely related they are to the adjacent Ivalojoki and Juutua Rivers' populations. It is important to determine the genetic structure of trout populations in water bodies and their viability.

For the Norwegian parts of the river, hydropower plants with dams are limiting for natural production of brown trout. New compensatory measures to reduce this impact must be identified.

In Lake Inari, there is a need to continue the monitoring of juvenile production in the Ivalojoki river tributaries and in the Sotajoki river system.

Goal 2: Negative impacts of regulation on environment is reduced within the planning period.

Measures

No.	Measure	Responsible institutions			Year						
					2021	2022		2023		2024–2026 (mid)	2027–2030 (long term)
		Russia	Norway	Finland	Autumn	Spring	Autumn	Spring	Autumn		
2.1	Reporting to the transboundary water commission on regulation of Lake Inari, water level in the Pasvik river and regulation impacts on protected areas.	TGC-1, Pasvik Reserve, MNR of the Murmansk region	NVE and SFTF	ELY Centre							
2.2	Survey of possibilities for increasing natural reproduction of trout by measures in the mainstream river Pasvik excluding aquatic parts of Pasvik Reserve, Russia.	Pasvik Reserve and research institutes	SFTF								

No.	Measure	Responsible institutions			Year						
					2021	2022		2023		2024–2026 (mid)	2027–2030 (long term)
		Russia	Norway	Finland	Autumn	Spring	Autumn	Spring	Autumn		
2.3	Implementation of measures identified in report (point 2.5), voluntarily or by legal order.	Pasvik Reserve with research institutes	SFTF								
2.4	Information about water levels in the Pasvik river are published on the internet	TGC-1	NVE								
2.5	Research into the impact of the Janiskoski HEP reconstruction (construction of a small HEP)	TGC-1, Pasvik Reserve, Murmansk UGMS, (Roshydromet), Minprirody of the Russian Federation, MNR of the Murmansk region, Rospri-rodnadzoetc									
2.6	To establish a trilateral hydrological data bank (IBA project)			ELY Centre							
2.7	To make a hydrological model for Pasvik River catchment (IBA project)			SYKE, ELY Centre							
2.8	Digitization and utilization of old monitoring data in the assessment of erosion risk in Lake Inari.			ELY Center							
2.9	Preliminary study and assessment of the rehabilitation needs of the Kirakkajoki River, the options for restoring a migration route and the need for support stocking.			Ramboll Oy							
2.10	A rehabilitation plan for the Kirakkajoki water system.			Inari municipality/ ELY Centre/ consulting company							
2.11	Genetic identification of subpopulations of trout populations in rivers of Kirakkajoki catchment above Hammasjärvi lake.			LUKE							

7.3. Wastewater from households

Challenges

- To plan and implement wastewater measures require information on the current state and the pressures on water bodies. Discharges from point sources include municipal discharges and loading from hydropower stations in Russia and the fish hatchery in Inari.
- To rehabilitate the wastewater plant in Nikel. In connection with the long service life of the treatment facilities in the town of Nikel and decrease in the population, it is economically amiable to build new treatment facilities.

Mellanaapa wastewater treatment plant negatively affects the Akujoki River and measures to be implemented when revising the environmental permit.

At Svanvik wastewater treatment plant monitoring data is lacking, and monitoring needs to be implemented.

For household wastewater units, treating sewage up to 50 person equivalents (pe), surveys are needed, followed by renovation of units with deficiencies.

Goal 3: To give a status of and reduce the ecological effects of household wastewater discharges from households on water ecosystems in the Pasvik-Inari catchment.

Measures

No.	Measure	Responsible institutions			Year						
					2021	2022		2023		2024–2026 (mid)	2027–2030 (long term)
		Russia	Norway	Finland	Autumn	Spring	Autumn	Spring	Autumn		
3.1	Joint project on waste water nutrient loading	Pechenga municipal district and Pasvik Reserve	SFTF	ELY-Center							
3.2	Survey of wastewater units in the catchment area of the Pasvik River*.	Administration of the Pechenga district	Sør-Varanger municipality (impositions) Owners of units	Inari municipality							
3.3	Construction of new wastewater treatment plant in the settlement of Nikel, including preparing of technical specifications.	Administration of the Pechenga district, government of the Murmansk region and Pasvik Reserve									
3.4	New environmental permit for Mellanaapa wastewater treatment plant. The state of Akujoki is taken into account in the permit processing.			AVI							
3.5	Implement monitoring of and reporting on discharges of wastewater from Svanvik		Sør-Varanger municipality								

* The measure includes: **Norway:** Control and rehabilitation of smaller wastewater units along the Pasvik river; **Finland:** Information work- small wastewater units. **Russia;** Inspection of treatment facilities in the settlements located in the Pasvik River basin: making recommendations for their repair, reconstruction or construction of new ones, depending on the condition.

7.4. Ecological enlightenment, environmental education and citizen science

Challenges

To develop further information to the local public, extend the use of digital information platforms, involve the public in citizen science and voluntary work and further develop environmental education events and programmes.

Goal 4: Mass awareness of environmental consequences from human activities

Measures

No.	Measure	Responsible institutions			Year						
					2021	2022		2023		2024–2026 (mid)	2027–2030 (long term)
		Russia	Norway	Finland	Autumn	Spring	Autumn	Spring	Autumn		
4.1	Annual Russian-Norwegian and Russian-Finnish "Days of the Borderlands"	Administration of the Pechenga district, Pasvik Reserve and school 2	Sør-Varanger municipality	Inari municipality							
4.2	Local and international annual seminars, conferences, ecological festivals, eco-educational actions and events; filming, birdwatching and monitoring, registration of waterfowls etc .	Pasvik Reserve, MNR of Murmansk Region, Administration of the Pechenga district, ANO VtorayaShkola	SFTF and NIBIO Svanhovd/ Visitor Center Øvre Pasvik National Park	Metsähallitus, ELY-Center, Inari municipality							
4.3	Popular and scientific publications about nature in the Pasvik-Inari catchments	Pasvik Reserve	SFTF	Metsähallitus, ELY-Center							
4.4	Educational ecological projects, workshops etc for children, students, teachers and volunteers (i.e. Phenology of the North Calotte, Junior Ranger Programme in the Visitor Centers, Forskerlab, My national park,)	Pasvik Reserve, Educational department of Pechenga administration	NIBIO Svanhovd/ Visitor Center Øvre Pasvik National Park	Metsähallitus/ Vasatokka Youth centre							
4.5	Developing citizen science by biological samples collection of local fauna in the Pasvik Rver valley (fish, brown bear, ect.) and assisting researchers)	Pasvik Reserve	NIBIO Svanhovd/ Visitor Center Øvre Pasvik National Park	Metsähallitus							

7.5. Landfills

Challenges

To recultivate a previously used solid waste landfill near the town of Nikel, Russia. Work will also continue to prevent and clear up small illegal dumps. In Norway, there is a closed down landfill close to Svanvik (Loken), which will be monitored in order to prevent run-off to water courses. In Finland, the monitoring of environmental impacts of Vittakuru landfill will be continued at least for 15 years.

Goal 5: Reduce impacts on soils and waters from landfills in the vicinity of the Pasvik River.

Measures:

No.	Measure	Responsible institutions			Year						
					2021	2022		2023		2024–2026 (mid)	2027–2030 (long term)
		Russia	Norway	Finland	Autumn	Spring	Autumn	Spring	Autumn		
5.1	Recultivation of the closed down solid waste landfill in the settlement of Nikel	Administration of the Pechenga district, Government of the Murmansk region									
5.2	To identify and eliminate small unauthorized dumps	Administration of the Pechenga district									
5.3	Loken landfill: follow up previous monitoring and conclude on whether additional measures are required		SFTF								
5.4	Vittakuru landfill: Continue previous monitoring of environmental effects			Inari municipality							

7.6. Gold panning in Finland

Challenges

- To restore rivers affected by gold panning, improve fish habitats and increase biodiversity and fish production.
- To restore rivers and streams previously used for log-driving or gold mining.

In the planning of the land use, measures affecting the status of water systems must be designed in such a way as not to endanger the specific nature and fishing values of the water system. The most important spawning areas in rivers for Inari Lake trout are labelled in the Provincial plan of Northern Lapland (approved in May 2021) as a "Valuable watercourse". The label identifies streams that have particular value for nationally endangered species, maintaining biodiversity and for fishing.

The effects of gold panning on the ecological status of water bodies (eg fish, benthic fauna) and on brown trout reproduction need further studies.

Goal 6: To minimize the effects of gold panning on water bodies and natural environment.

Measures

No.	Measure	Responsible institutions	Year						
			2021	2022		2023		2024–2026 (mid)	2027–2030 (long term)
		Finland	Autumn	Spring	Autumn	Spring	Autumn		
6.1	The rehabilitation and landscaping of the affected gold mining sites of the Lemmenjoki National Park	Gold mining companies with supervision from TUKES, and ELY Centre							
6.2	Study of the effects of gold mining on the ecological status of water bodies (eg fish, benthic fauna) and on brown trout reproduction	Metsähallitus, ELY Centre and Luke							
6.3	Monitoring of the juvenile production in Ivalojoki river tributaries and in the Sotajoki river system	Luke							
6.4	Founding a workgroup of authorities and other stakeholders for cooperation and sharing information in order to improve the ecological status of Lake Inari catchment area and to be used as a basis for new permits	ELY Centre, AVI, TUKES, Inari municipality, Arktisen Lapin ympäristönsuojelu, Gold mining companies, LKL							

In addition, it is recommended that:

- methods for monitoring siltation and water conservation of gold panning will be improved
- the goals of water management are taken into account more closely in permitting process environmental permits allowed overland flow (to the lands owned by Metsähallitus)
- increased rainfalls (effects of climate change) are taken into account in environmental permits (design of reservoirs)

7.7. Forestry

Challenges

There is a need to decide and implement measures with the aim to minimize potential water impacts from forestry. Training of forestry staff, contractors and machine operators is needed, as well as on quality assurance of the implementation of water protection measures. It is also desirable to focus nature conservation work on water protection measures (e.g. removing migration barriers for fish on forest roads).

Goal 7: Forestry activities are conducted according to Programme for the Endorsement of Forest Certification (PEFC)-standards in Norway and Finland.

Measures

No.	Measure	Responsible institutions		Year						
				2021	2022		2023		2024–2026 (mid)	2027–2030 (long term)
		Finland	Norway	Autumn	Spring	Autumn	Spring	Autumn		
7.1	Restoration planning after logs floating in Sarmijoki, Kessijoki, Korvasjoki, Nellimöjoki and Kirakkajoki rivers.	ELY Centre and Metsähallitus								

7.8. Reindeer herding and impacts on Russian reserve

Challenges

To assess and elaborate common rules and methods for compensating the damage caused by Norwegian domesticated reindeer in the Russian protected area.

Goal 8: To minimize conflicts associated with reindeer grazing in Pasvik State Nature Reserve.

Measures

No.	Measure	Responsible institutions		Year						
				2021	2022		2023		2024–2026 (mid)	2027–2030 (long term)
		Russia	Norway	Autumn	Spring	Autumn	Spring	Autumn		
8.1	Assess and calibrate methods of calculating compensation for damage caused to the nature reserve by domesticated reindeer from Norway	Pasvik State Nature Reserve, Russian Border Commissionaire, Ministry of Foreign Affairs, Minprirody of the Russian Federation	SFTF, Norwegian Border Commissioner, Ministry of Foreign Affairs							

7.9. Tourism

Challenges

Sustainable tourism is an ongoing goal in the whole Pasvik catchment area. Regional authorities of three countries, border municipalities and tourist companies will need to contribute to environmentally responsible tourism, ranging from tourism strategies, concepts for development, promotion of the goals of low- carbon tourism to concrete actions taken by the tourism industry.

Goal 9: The tourism of the Pasvik catchment area is sustainable. The catchment is preserved as an area of clean environment and wilderness with space for both local users and tourists.

Measures

No.	Measure	Responsible institutions			Year						
					2021	2022		2023		2024–2026 (mid)	2027–2030 (long term)
		Russia	Norway	Finland	Autumn	Spring	Autumn	Spring	Autumn		
9.1	Sharing environment safety instructions for tourists	Pasvik reserve	Øvre Pasvik National Park Center	Inari municipality, tourist companies, Metsähallitus							
9.2	Provincial plan of Northern Lapland 2040 in accordance with the principle of sustainable development directing the tourism in certain areas			Lapin Liitto							
9.3	Lapland's tourism land use strategy			Lapin Liitto							
9.4	Development of an operating model for international sustainable tourism for the Inari Lake area			Inari municipality, Inari-Saariselkä Matkailu Oy and travel companies							

No.	Measure	Responsible institutions			Year						
					2021	2022		2023		2024–2026 (mid)	2027–2030 (long term)
		Russia	Norway	Finland	Autumn	Spring	Autumn	Spring	Autumn		
9.5	Development of mountain biking taking into account sensitive nature and other walkers using existing trails and routes.		Øvre Pasvik National Park Board	Metsähallitus, Inari municipality, travel companies							
9.6	Instructions and restrictions for dog sledding to minimize the environmental impacts of dog sleds			Inari municipality							
9.7	Development of the Concept for the development of tourism in the Pechenga district, making new ecological tours, path and routs, developing the infrastructure of existing routs, i.e. on protected areas	Administration of the Pechenga district, the Tourism Committee of the Murmansk region, ANO, School 2 Pasvik Reserve, Kola GMK									
9.8	Organization of tours in Pasvik Reserve and Pechenga area and integration of these ecological routes into the tourism products of regional travel companies, development cooperation with tour operators and hospitality industry.	The Tourism Committee of the Murmansk region, Pasvik Reserve, ANO, School 2									
9.9	Development of nature-friendly / sustainable traffic with vessels on water and watercourses that take vulnerable nature and other users into account.		Øvre Pasvik National Park Board								

Grense Jakobselv-Vuorjema catchment

7.10. Nature protection in Grense Jakobselv-Vuorjema

Challenges

To carry out joint Norwegian-Russian survey and monitoring of the European pearl mussels' populations in Grense Jakobselv.

Goal 10: Protection of terrestrial and aquatic biodiversity in the Grense Jakobselv-Vuorjema valley.

Measures

No.	Measure	Responsible institutions		Year						
				2021	2022		2023		2024–2026 (mid)	2027–2030 (long term)
		Russia	Norway	Autumn	Spring	Autumn	Spring	Autumn		
10.1	Bilateral cross-border survey of the European Pearl Mussel as rare species	Pasvik Reserve	SFTF							
10.2	Norwegian-Russian monitoring of the pearl mussel populations	Pasvik Reserve	SFTF							
10.3	Establishment of new protected area "Vuorjema River Valley"	Ministry for Nature Resources and Environment of the Russian Federation								

7.11. Pink salmon

Challenges

The spread of pink salmon has unknown and potentially threatening effects on native salmonids. In Russia, pink salmon is viewed as a resource. In Norway, pink salmon is classified as an alien species and eradication measures are favourable, including the Norwegian parts of the border river Grense Jakobselv (Vuorjema).

Goal 11 (Norway): Eradicate pink salmon from the Grense Jakobselv river.

Measures

No.	Measure	Responsible institutions	Year						
			2021	2022		2023		2024–2026 (mid)	2027–2030 (long term)
		Norway	Autumn	Spring	Autumn	Spring	Autumn		
11.1	Targeted fishing aimed at removing individuals of pink salmon from the river	NEA, but operated by local fishing association							

7.12. Changes to river environment – erosion control measures and canalization of river

Challenges

Because of the erosion control structures built on both sides of Grense Jakobselv river the rivers lowest parts are canalized, and erosion is eased at the site where they are constructed but may increase at other sites. This results in reduced water flow and changes in river habitats which have negative impacts on the river ecosystems.

Goal 12

- *To develop Russian-Norwegian cooperation on erosion control measures along the Grense Jakobselv – Vuorjema,*
- *To minimize impacts on the natural river environment*

Measures

No.	Measure	Responsible institutions		Year						
				2021	2022		2023		2024–2026 (mid)	2027–2030 (long term)
		Russia	Norway	Autumn	Spring	Autumn	Spring	Autumn		
12.1	Implementation of measures identified in the research and monitoring of erosion.	Dvina-Pechora water basin management, Dvinaregionvodhoz	NVE and SFTF							
12.2	Joint inspection of erosion constructions of the Vuorjema River	Dvina-Pechora water basin management, Dvinaregionvodhoz	NVE							
12.3	Environmental adaptations of existing erosion control structures.		NVE and SFTF							

Chapter 8 – Recommendations for future co-operation on environmental monitoring

It is recommended to improve the cross-border exchange of data to further improve the quality of environmental monitoring in the Pasvik River and Grense Jakobselv river catchments.

8.1. Trilateral monitoring of industrial impacts on the environment in the border areas

Chapter 5.1 gives an overview of the existing monitoring of industrial impacts on aquatic and terrestrial ecosystems. The existing trilateral monitoring programme is based on monitoring impacts of the largest influencer - the Nikel smelter. As the smelter is now closed, there is a need to monitor changes and restitution of nature over time. Also, new industrial activities are being planned in Nikel and the impacts of new industry on the environment in the border area needs attention. These needs will be covered by following up the existing trilateral programme; and through extended efforts in the proposed trilateral research project (see measure 1.1.).

In addition, we have these recommendations for future cooperation on monitoring of industrial impacts:

- Publish a trilateral water monitoring report every 6 years
- Organize an annual meeting to exchange water monitoring results
- Revise the existing ground water monitoring programme (Norway)
- Revise the trilateral monitoring programme (terrestrial and aquatic parts) after the completion of the State of Environment - project (measure 1.1).

8.2. Other monitoring

Impacts of water regulations

- To monitor impacts on the protected areas from climate change and water regulation of the Pasvik river (Russian participants: Pasvik Reserve and Roshydromet, Norwegian participant: Governor of Troms and Finnmark).

Monitoring of wastewater discharges

- To monitor water discharges in all three countries. Furthermore, to collect and compare basic household wastewater data (location and size of discharges) between the three countries

Chapter 9 – Structure for follow-up of plan

Reporting on the follow-up on the Programme of Measures (PoM)(2021–2030) will be carried out annually in a meeting between the coordinating institutions from Russia, Norway and Finland.

The Russian partner (Pasvik State Nature Reserve) and the Norwegian partner (The County Governor of Troms and Finnmark) will alternate in arranging these annual meetings, within the framework of the Norwegian-Russian environmental commission. The three coordinating institutions will participate in these meetings on equal terms. We recommend arranging the follow-up meetings back-to-back with other bilateral/trilateral meetings when possible.

Appendices

Appendix 1: International conventions and agreements relevant for the Multi-Use planning process

No	Date of adoption	Title of the document	Document Objectives
1	1949	Treaty on the regime of the Soviet-Norwegian border and on the procedure for solving border conflicts and incidents in the territory of the USSR and the Kingdom of Norway	
2	27.06.1956	Agreement between Norway and the Soviet Union on the utilization of the waterpower on the Pasvik (Paatso-joki) river	
3	29.04.1959	Agreement between Norway, Finland, and the Soviet Union on regulation of Lake Inari by means of the Kaitakoski hydro-electric power station and dam	
4	02.02.1971	The UN Convention on Wetlands of International Importance, especially as Waterfowl Habitat	To facilitate protection of wetlands and, as far as possible, the wise use of wetlands
5	07.12.1971	Convention between Norway and the Soviet Union on regulation fishing and conserving the fish stocks in the Grense-Jakobselv river (Voriema) and the Pasvik River (the Paatsojoki)	
6	11.02.1977	Agreement on the mutual return of reindeer crossing the state border	
7	13.11. 1979	Convention on Long-Range Transboundary Air Pollution	To limit and, as far as possible, gradually reduce and prevent air pollution, including its transboundary pollution over long distances
8	05.11.1980	Agreement between Norway and Finland on The Finnish-Norwegian Transboundary Water Commission, a body for co-operation and communication between the states.	Gives propositions and recommendations on matters concerning the transboundary water bodies, for example: water quality monitoring, fishing, water level regulation or construction that has impact on the waters.
9	15.01.1988	Agreement between the Government of the Union of Soviet Socialist Republics and the Government of the Kingdom of Norway on cooperation in the field of environmental protection	To Improve of the environment and improvement of ecological safety in both countries
10	June 1991	Arctic Environmental Protection Strategy (AEPS) adopted in June 1991 by Canada, Denmark, Finland, Iceland, Norway, Sweden, the Soviet Union, and the United States	The AEPS deals with monitoring, assessment, protection, emergency preparedness/response, and conservation of the Arctic zone
11	17.03.1992	UN Convention on the Protection and Use of Transboundary Watercourses and International Lakes.	To prevent, control and reduce any transboundary impact on water bodies. To develop monitoring and research programs, to provide exchange of information, mutual assistance and public awareness.

No	Date of adoption	Title of the document	Document Objectives
12	05.06.1992	UN Convention on Biological Diversity	The conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of benefits arising from the use of genetic resources, including by providing the necessary access to genetic resources and by appropriate transfer of appropriate technologies, taking into account all rights to such resources and technologies as well as through proper funding.
13	29.04.1992	Agreement between the Government of the Russian Federation and Government of the Republic of Finland on cooperation in the field of environmental protection	To improve environment and ecological safety in both countries
14	03.09.1992	Agreement between the Government of the Russian Federation and the Government of the Kingdom of Norway on cooperation in the field of environmental protection	To solve important environmental problems, to keep ecological balance, to study harmful environmental impacts, to develop and implement dissuasive measures.
15	11.01.1993	Declaration on cooperation in the Barents Euro-Arctic Region.	Cooperation on environment, economy, science and technology cooperation. Regional infrastructure. Indigenous peoples, human contacts and cultural relations, and tourism
16	19.09.1996	Arctic Council The Ottawa Declaration	
17	13.06.1997	Alta declaration on The Arctic Environmental Protection strategy	To increase efforts to limit and reduce emissions of pollutants into the environment, and the promotion of international co-operation to reduce the identified pollution risks
18	23.10.2000	Directive 2000/60/EC of the European Parliament and of the Council laying down the basis for Community action in the field of water policy	To Purify water bodies and maintain them in a clean state
19	24.11.2006	Agreement between the County Administration in Murmansk and the County Governor in Finnmark on the implementation of the project «Pasvik-Inari Friendship Park»	
20	21.01.2008	Cooperative Agreement between Finnish, Norwegian and Russian protected areas – about establishing Pasvik-Inari Trilateral Park	
21	2010	Memorandum of the Green Belt of Fennoscandia	
22	22.05.2014	Bilateral agreement between Norway and Finland with a view to meeting the requirements Water Framework Directive (WFD)	The agreement defines the four catchments of Tana, Neiden, Munkelva and Pasvik as the International River Basin Area (IRBD).

Appendix 2: Comparison of EU's Water Framework Directive (WFD) and Russia Water Codex

Criteria	Water Framework Directive (WFD)	Russia Water Code
Management unit	River-basins and water bodies (national and international)	Water bodies and river basins management under the Water Code of the Russian Federation, transboundary water bodies and river basins – Water Code of the Russian Federation + international agreements
Monitoring and/or management measures?	Focus: Management measures based on monitoring results	According to the monitoring results, including pollution of water bodies (for discharges into wastewater) - payment for the negative impact on the environment. The tax is used to restore ecological balance in nature, minimize anthropogenic impact on the environment and improve the situation in the regions.
Monitoring criteria	Sets criteria for monitoring (parameters and analysis) and classification	The standards for permissible discharges and microorganisms into water bodies are set according to the maximum permissible concentrations in the reservoir or background concentrations of the reservoir, in accordance with the methodology and are approved for water users for a period of not more than 5 years, in the territorial bodies of the Federal Agency for Water Resources. Water users develop a monitoring program and a sampling schedule (wastewater and in the control section, frequency, composition of pollutants), which are approved by the territorial bodies of the Federal Agency for Water Resources. In accordance with the sampling schedule, water users present the results of sample analyzes (wastewater and in the control site).
Databases	**Norway:** www.vannmiljo.no (monitoring data) and www.vann-nett.no (classification systems which show environmental status of water bodies). **Finland:** www.syke.fi/en-US/Open_information (open data includes versatile information on water resources, surface and ground waters)	All monitoring data are entered to the GWR (state water register)
Is the Management plan including Programme of Measures (PoM) required?	Yes	Yes
Management authority	Tana, Pasvik and Neiden river-basin in Norway: Finnmark County Administration (management plan), The County Governor of Troms and Finnmark (monitoring). Tana, Pasvik and Neiden river- basin in Finland: ELY-center of Lapland.	Pasvik - Federal Agency for Water Resources represented by the territorial authority

Appendix 3: Abbreviations used in Programme of Measures

Abbreviation	Full name
Norwegian institutions and organizations	
SFTF	County Governor in Troms and Finnmark
NVE	The Norwegian Water Resources and Energy Directorate
NIBIO Svanhovd	Norwegian Institute of Bioeconomy Research, department at Svanhovd, Pasvik
NEA	Norwegian Environmental Agency
Russian institutions and organizations	
Pasvik reserve	Pasvik state nature reserve
TGC-1	Territorial generating company number 1
CLATM in the Murmansk region	Centre for laboratory analysis and technical measurements
MNR of the Murmansk region	Ministry of Natural Resources and Environment of the Murmansk Region
ANO	Center for Social Projects of the Pechenga District
Finnish institutions and organizations	
ELY Center	Centre for Economic Development, Transport and the Environment for Lapland
SYKE	Finnish Environment Institute
Luke	Natural Resources institute Finland
AVI	Regional State Administrative Agencies
TUKES	Finnish Safety and Chemicals Agency
LKL	The Gold Prospectors Association of Lapland
Lapin Liitto	The Regional Council of Lapland
Metsähallitus	Metsähallitus is an unincorporated state enterprise, which uses, manages and protects state-owned land and water areas in Finland

Kolarctic
CBC | CROSS-BORDER COOPERATION

PASVIK
National Nature Reserve

Statsforvalteren i Troms og Finnmark
County Governor of Troms and Finnmark

Centre for Economic Development, Transport and the Environment