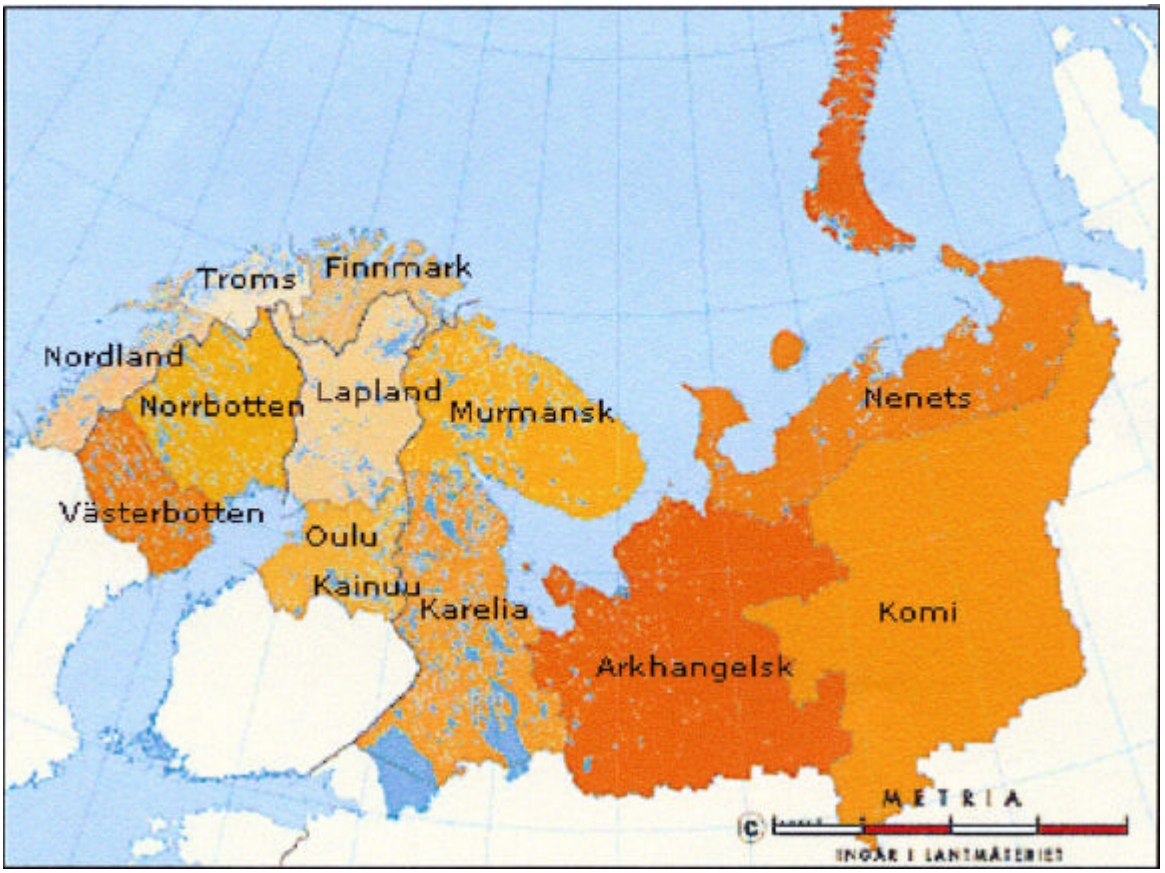
Nordic Environment Finance Corporation (NEFCO)

Updating of Environmental "Hot Spots" List in the Russian Part of the Barents Region:

Proposal for Environmentally Sound Investment Projects



AMAP Secretariat
Oslo, August 2003

THE NORDIC ENVIRONMENT FINANCE CORPORATION (NEFCO)

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Table of Content.

Abbreviations

AMAP	Arctic Monitoring and Assessment Programme
BEAC	Barents Euro-Arctic Council
BRC	Barents Regional Council
CP	Cleaner Production
FME	Finnish Ministry of the environment
MEMP	Murmansk Environmental Management Programme
NC	Nordic Council
NCPTF	Norwegian Cleaner Production Trust Fund
NDEP	Northern Dimension Environmental Partnership
NEDF	Nordic Environmental Development Fund
NEFCO	Nordic Environment Finance Corporation
NIB	Nordic Investment Bank
NPAF	National Pollution Abatement Facility (set up in the context of the World Bank Environmental Management Programme Loan)
PPC	Project Preparation Committee for the Environmental Action Programme for Central and Eastern Europe Environment in the Environment for Europe process
TACIS	Technical Assistance to the Commonwealth of independent states
WB	World Bank

Foreword

The Report on Updating of the environmental "hot spot" list in the Russian part of the Barents Region and proposals on environmentally sound investment projects has been carried out by a joint AMAP/Russian Expert Group (EG), with active participation of local environmental protection authorities and experts, and headed by the Secretariat of the Arctic Monitoring and Assessment Programme (AMAP). The project has been initiated and financially supported by the Nordic Environment Finance Corporation (NEFCO) as a follow-up of the request of the Kirkenes Summit of the Barents Euro-Arctic Council (BEAC).

During the meetings and field missions, EG collected and assessed the available information on environmental and human health problems caused by pollution sources in the administrative territories of the Russian Federation entering the Barents Region (Republic of Karelia, Republic of Komi, Murmansk Oblast, Arkhangelsk Oblast and Nenets Autonomous Okrug). It should be noted the available information from these territories was not always unified, and it has negatively influenced on harmonization of chapters dedicated to specific administrative territories. However, EG decided not to unify these chapters for the expense of valuable data and information, which was available not for all territories.

Based on data and information obtained, the Expert Group has selected the most urgent areas of concern related to pollution sources, and outlined them as an updated "hot spot" list. This list consists of 42 "hot spots", and proposals for 52 investment project aimed on mitigation of environmental impacts from these "hot spots".

The report is prepared and presented in English, and will be translated into Russian.

Acknowledgements

I would like to acknowledge the work done by the members of EG whose efficient work has allowed to prepare this report in a short time to present it to the 6th meeting of the Environment Ministers of the Barents Euro-Arctic Council. Special thanks should be given to the AMAP Deputy Executive Secretary Vitaly Kimstach, and experts from Akvaplan-niva (Tromsø, Norway) Tatyana Savinova and Vladimir Savinov who compiled the information and drafted the report.

The work over the Report could not be feasible without an active support from the Ministry of Natural Resources, particularly the Deputy Minister Kirill Yankov, Deputy Head of the Department of Environmental Safety Andrei Pechkurov and Deputy Head of the Department of International Co-operation in Environmental Protection Yuri Alexandrovsky.

The contributions from the experts of the environmental protection authorities of the Republic of Karelia, Republic of Komi, Murmansk and Arkhangelsk Oblast and the Nenets Autonomous Okrug have been of great importance. In this connection, I wish to thank the leaders of these regional groups Alexander Shirlin, Alexander Popov, Vladimir Khrutsky, Victor Kuznetsov and Rafail Rumyantsev for organization of the work in the regions.

Oslo, 12 August 2003
Lars-Otto Reiersen
AMAP Executive Secretary

1. INTRODUCTION.

1.1. Background.

The Governments of the Nordic Countries in 1994 requested the Nordic Environment Finance Corporation (NEFCO) to initiate the Barents Region Environmental Programme, with the goal to assist the Russian authorities in their efforts to improve the environmental situation and decrease pollution problems, as well as to support the economic development in the Russian part of the Barents Region (Fig. 1). The programme consisted of three phases:

- Identification and prioritization of environmentally sound investment projects.
- Feasibility studies of the selected projects
- In cooperation with other financial institutions and donors, implementation of the selected projects.

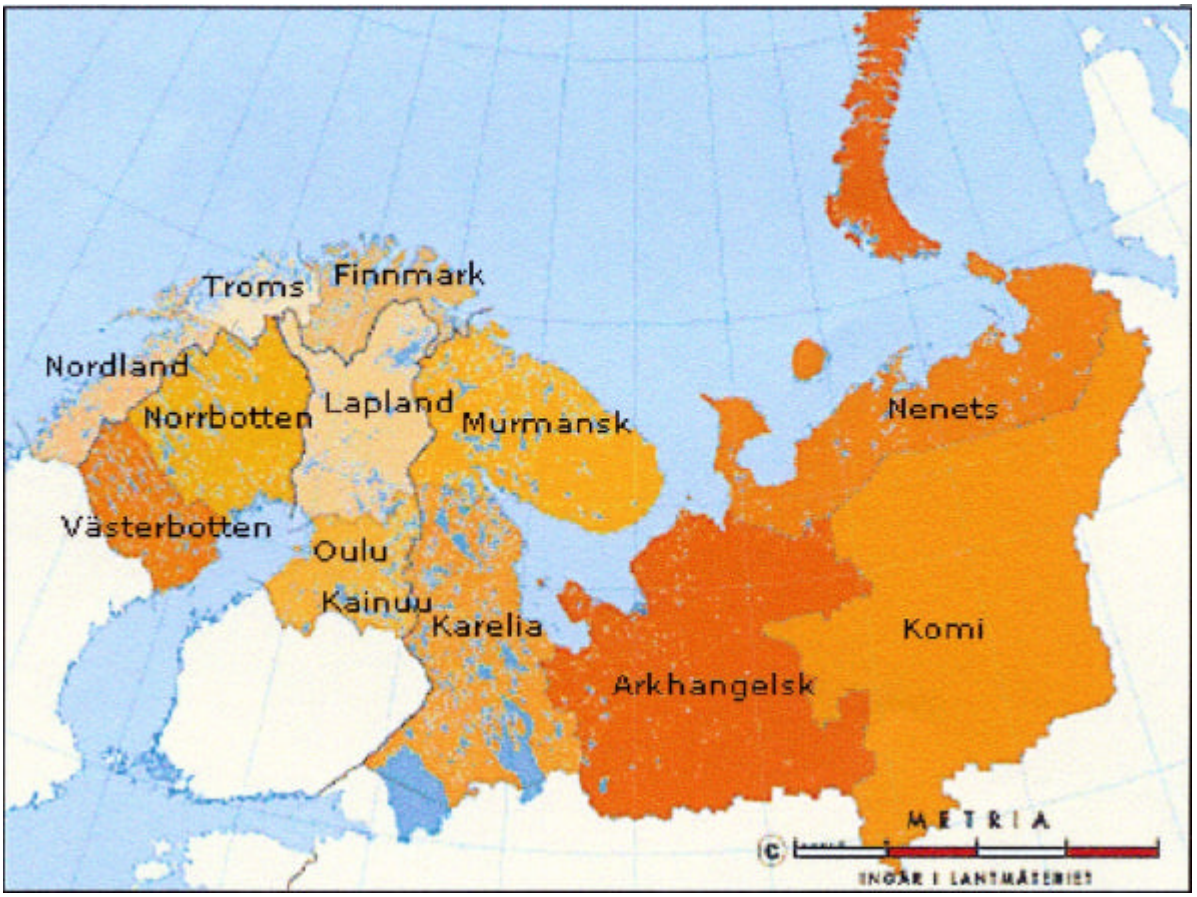

Fig.1. Map of the Barents region

NEFCO, in collaboration with the Arctic Monitoring and Assessment Programme (AMAP) as an implementing agency, presented the outcome of the first phase of the programme in 1995 as the NEFCO/AMAP Report "Proposals for Environmentally Sound Investment Projects in the Russian Part of the Barents Region" in two volumes, one presenting the findings related to environmental (non-nuclear) issues, and the other focusing on nuclear safety related projects. The report identified a total of 66 environmental projects within non-nuclear sectors, and five comprehensive nuclear safety projects (including in all 14 specific measures). Out of these, a short list of 22 project was established, 5 of which related to

nuclear safety and 17 to other environmental issues. The report was endorsed by the Ministers of Environment of the Barents Euro-Arctic Council (BEAC), and the projects were included as the part of the BEAC environmental action programme.

The Declaration of the Summit of the Barents Region countries dedicated to the 10th Anniversary of the Barents Euro-Arctic Council (Kirkenes, Norway, 10-11 January 2003) signed by the Prime Ministers, supported the instrumental role of NEFCO in implementing of environmentally sound small and medium sized projects in the Russian part of the Barents Region (Fig. 2-6). The documents adopted by the Summit encouraged NEFCO to revise the environment "hot spot" list in this region compiled in 1995. In this connection NEFCO, on the initiative from the BEAC Working Group on Environment, in collaboration with the AMAP Secretariat, has initiated the project on updating the list of environmentally sound project, implementation of which is important for further improvement of environmental situation in this region, keeping in mind presentation of the new report to the Meeting of the Environment Ministers of the Barents Euro-Arctic Council in Sweden, August 2003.

Fig. 2. Map of the Murmansk Oblast

Fig. 3. Map of the Republic of Karelia.

Fig. 4. Map of the Arkhangelsk Oblast.

Fig. 5. Map of the Nenets Autonomous Okrug.

Fig. 6. Map of the Republic of Komi.

1.2. Progress in implementation of the NEFCO Programme – 1995.

In the NEFCO/AMAP report "Environmentally sound investment projects in the Russian part of the Barents Region" (Volumes 1-2, December 1995) twenty-two projects were singled out as priority environmental actions in the Barents Region (seventeen non-nuclear and five nuclear safety projects).

The measures taken so far in respect of the projects are summarised below. The status is presented as of June 2003 and based on information available to NEFCO at that time.

Part 1 - Non radioactive contamination

The information presented under this section is also summarized in Appendix 1.

Projects in the Murmansk Oblast

M 41 Construction of communal waste water treatment system in the town of Kildinstroy
M 61 Improve the treatment of municipal waste waters discharged into the Kola fjord from Murmansk City, the Northern sewage treatment plant

These projects, together with **M 81** (Water supply in Lovozero village) and **M 44** (Improvement of Monchegorsk City water supply system), were integrated into one water and sewage treatment pre-feasibility study commissioned by NEFCO. Plancenter (Finland) and Norconsult (Norway) completed the study in June 1997.

In 1999, the regional Environmental Committee admitted funds for start up of construction works as regards the project **M 61.** Further local funds were allocated in the 2000 budget. On this basis, grants from both the Nordic Council and the Nordic Environmental Development Fund (administered by NEFCO) have been made available for the project in 2000 (4MRUR). With these allocations the construction works are under implementation in line with the consultants' recommendations. Additional local resources have been made available in 2001-2003 and it is now expected that the project can be finalized in the summer of 2003.

Project **M41** is interrelated to **M 61** and the pre-feasibility study recommends no major action. Project **M41** is, however, also studied in the Kola River Environment Project (KREP). The cost estimate of the project is RUR 44 million. A project for one of the components has been proposed for TACIS financing.

M 44 Improvement of Monchegorsk City water supply system

The results of the pre-feasibility study have been presented to i.a. the PPC (Project Preparation Committee for the Environmental Action Programme for Central and Eastern Europe Environment in the Environment for Europe process) in search of donor support for further studies of viable alternative solutions. Finnish experts have participated in the work to identify new water resources. Practical measures will most likely have to be linked to the future of the Monchegorsk Nickel Combined Smelter "Severonickel".

M 51 Establishment of a system for treatment of non-radioactive hazardous waste in the Murmansk Oblast

A pre-feasibility study commissioned by NEFCO was presented in October 1997. The study was made by Chemcontrol (Denmark) and recommends two specific projects in this area. One is the upgrading of the oil treatment plant at the fishing port of Murmansk (estimated investment need approx. USD 1 million). The other is improving the municipal waste incinerator. Local authorities have undertaken measures in respect of the oil treatment. Implementation of the incinerator project (investment plan approx. USD 2 million) which consists of four components is commencing in 2003 with local funds and funds from NEFCO (the Nordic Environmental Development Fund). NEFCO has also secured funds from the TACIS JEP program to assign technical experts to assist in the planning and procurement. The Finnish Ministry of the Environment will participate in the project with funds for technical support of operations and monitoring. Certain measures have already been completed with own resources.

M 52 Treatment of faeces and effluents from the Murmanskaya poultry farm (Kola River water shed)

Studies of and recommendations for the project have been made both by Swedish and Norwegian consultants. The proposed solution includes two elements, one being the

reduction of effluents by modernisation of the production, and the other solving the leakage and overflow problems of the existing storage pond of effluents. Local funding has been used in order to reduce the environmental risk related to the storage pond and to modernize the poultry houses. Additional loans were approved both from the Norwegian Cleaner Production Trust Fund (administered by NEFCO) and NEFCO's revolving facility for Cleaner Production. However, according to available information discontinuation of the activities of the enterprise has put the project on hold.

M 101 Energy saving and reduction of the airborne emissions from the Southern heating and power plant in Murmansk City

A major program for the rehabilitation of the entire district heating system of Murmansk City has been proposed as one of the projects in the NDEP (Northern Dimension Environmental Partnership). The Nordic Investment Bank is appointed as the lead agent for this project. Swedish consultants are currently (with Swedish funding) preparing a comprehensive project study (including an update of earlier studies made by Finnish, Swedish and US consultants).

Projects in the Republic of Karelia

K 31 Segezha pulp and paper mill, reduction of gas and dust emission and wastewater discharges

A comprehensive mill turn-around investment programme in the magnitude of USD 150 million was planned with the then foreign owner of the plant. Following the withdrawal by the Swedish investor the project was discontinued. Recently the new owners of the Segezha plant have been able to secure external loans for plant modernization.

K 32 Nadvoitsy aluminium plant, reduction of gas and dust emission and wastewater discharges

A partial modernisation of the plant has been made by converting a limited amount of pots to modern technology. Following the NEFCO/AMAP report a Finnish expert was assigned by NEFCO to review the Russian feasibility study. This review recommended updating of the study. It has, however, not been possible to mobilize donor assistance for a supplementing feasibility study.

K 41 Kostamuksha iron pellet plant, Karelsky Okatysh, reduction of wastewater discharges and industrial gas emissions.

Negotiations between the Finnish and Karelian authorities, suppliers, NEFCO and Karelsky Okatysh, on ways to complete the half-finished desulphurisation project (which would require finalisation of the line for crushing and burning of limestone in Kostamuksha) have not lead to results. An independent expert group nominated by NEFCO in 2000 reviewed the situation and the investment plans of Karelsky Okatysh. Their report acknowledged the significant reductions of sulphur emissions already achieved, but recommended that the desulphurisation project would be implemented as a subsequent step to further reduction of the environmental load. Investments aiming at securing the supply of raw-material are currently in preparation at Karelsky Okatysh.

K 61 Artificial rearing of Atlantic Salmon in the Karelian part of the White Sea, in order to increase the stock of salmon in the Karelian rivers

So far no action.

Projects in the Archangelsk Oblast, including Nenets AO

A 42/43 Drinking water supply in the cities of Archangelsk and Novodvinsk

A major program for the rehabilitation of the water and sewage system in Arkhangelsk has been proposed as one of the projects in the NDEP (Northern Dimension Environmental Partnership). The proposed program comprises both water treatment and distribution and wastewater collection. As a separate project measures are proposed for the upgrading of the wastewater treatment plant at the Solombala Pulp and Paper Mill, which also treats the municipal wastewaters. The European Bank for Reconstruction and Development is the lead agent of these two projects.

A46 Archangelsk pulp and paper mill in Novodvinsk, reduction of wastewater discharges and gas and dust emission

Following the NEFCO/AMAP study the Archangelsk mill received USD 7 million financing from the National Pollution Abatement Facility (set up in the context of the World Bank Environmental Management Programme Loan). A second loan is under preparation. NEFCO is financing renewable energy investments in a subsidiary of the Arkhangelsk mill.

A 71 Preservation of virgin north taiga forest in Mezen County

The project is linked to the planned national park in the Belomoro-Kuloiskoje Plato.

Projects concerning indigenous and traditional people

M 81 Water supply in Lovozero village

A pre-feasibility study for the project was carried out together with **M 81** (Water supply in Lovozero village) and **M 44** (Improvement of Monchegorsk City water supply system). On the basis of the study a small-scale investment project has been carried out and successfully implemented with financing from Norway, the Barents Regional Council and NEFCO (the Nordic Environmental Development Fund). The project was implemented in co-operation between Lovozero and Karasjok municipality (Norway), which operates as a twinning partner.

A 81 Improvement of environmental aspects of human health in the settlement of Nelmin Nos

So far no specific action.

A 82 Drinking water and sewage treatment in small villages of Kenozero national park

NEFCO has preliminarily agreed to finance together with Norway and local sponsors a project for water management in the settlements in the Kenozero national park. Preparation of the project is ongoing.

Projects concerning the entire Barents Region

G 91 Integrated environmental and human health monitoring systems

So far no specific action. Preparation of the Murmansk Environmental Management Programme for capacity building within the environmental authorities may bring this project forward. Several proposals concerning improving of the environmental monitoring have been made to TACIS by the local and regional environmental authorities; however, their compliance with the general plan is unclear.

Part 2 - Radioactive contamination

Several projects and action programmes are under consideration. The CEG (Contact Expert Group) has undertaken a comprehensive effort to disseminate the Russian strategy for Spent Nuclear Fuel management. MINATOM is representing the Russian Federation. CEG also has established a database comprising over 100 (partly overlapping) projects. The projects proposed in the NEFCO/AMAP report have been listed in the CEG project database, with a view to integrating them into the CEG process.

Concrete projects have been slow in materializing. One reason has been the time needed for refining the strategy and for priority setting. Another obstacle has been the difficulty to reach satisfactory arrangements in respect of nuclear liabilities. Certain bilateral agreements have been concluded and some others are pending. The agreement between NEFCO and Minatom was successfully signed in July 2002. The MNEPR was signed in May 2003.

A number of concrete projects have been developed in the meanwhile while others are being conceptualised. The NDEP Support Fund includes a substantial nuclear safety element, which will become active following the entry into force of the MNEPR. In addition bilateral and international actions will continue in parallel.

In respect of the NEFCO/AMAP projects it can be noted that several changes have occurred since 1995 when these were identified. Some of them are still relevant and included in the current priorities, while others have been given a lower priority. The priority setting is made in the context of the CEG.

1. Handling and transport of radioactive waste and spent nuclear fuel.

1a) Transporting vessel for spent nuclear fuel

A proposal for the building of a ship to collect waste and spent fuel has been presented from the Norwegian side. The project is still under consideration. NEFCO has indicated an interest to consider participation through the Nordic Environmental Development Fund.

1b) Transport ship for transport to Novaya Zemlja

This proposed project is pending the solution of the overriding question of a medium term storage facility (Project 2).

1c) Emptying and removal of full waste storage

Several studies haven been commissioned, i.a. by the European Commission. Alternative solutions for the emptying of old waste storages, removal and transport of the SNF and safe intermediate storage have been and are still being considered by the Russian authorities. Preparation of a project for emptying fuel storages in the Andreeva Bay has recently been initiated.

As a specific measure Norway, France, the Netherlands, the European Commission and NEFCO (through the Nordic Environmental Development Fund) have agreed to support the Lepse project. The purpose of this project is to empty the Lepse storage vessel in Murmansk. Expected start for the implementation is 2003.

Another concrete project proposal is constructing and licensing an 80-ton transportation and medium-term storage cask for SNF. The project has been supported by Finland, Norway, Sweden, USA, the European Commission and NEFCO (through the Nordic Environmental Development Fund), but is currently pending due to the Russians preference for using a 40-ton storage cask instead of the 80-ton.

1d) Treatment of liquid radioactive waste with stationary and mobile equipment

Three projects have been implemented with Atomflot and the Northern Fleet; a Norwegian-American, a Norwegian and a Finnish project.

1e) Facility for reduction of solid radioactive waste before transport and storage

No specific action has been identified presently.

2. Regional storage for radioactive waste and spent nuclear fuel (especially if not suited for reprocessing).
Storage site at Matochkin Shar
Storage site at South Novaya Zemlja.

The selection of a site is related to the implementation of the Russian program for nuclear waste.

3. Development of alternative techniques for decommissioning of nuclear submarines

NEFCO has after review of the proposed alternative technology concluded that there was not a sufficient basis to commence any specific project. However, in general, the decommissioning work is proceeding.

4. Nuclear safety at the Kola Nuclear Power Plant. Safety culture, pre-project

Considerable efforts have been put into improving the safety at the Polyarnie Zory Nuclear Power Plant by Finnish, Norwegian and American sponsors and the European Commission, including a USD 10 million programme.

5. Risk and impact assessment including monitoring systems

Risk and impact assessment for men and the environment from military and civilian sources
Monitoring system for environmental releases of radioactivity from civilian and military sources
Emergency system in the Archangelsk Oblast
Monitoring system in the Archangelsk Oblast
Regional laboratory

Several efforts have been made to establish surveillance and early warning systems. So far not much has been done in respect of *environmental* monitoring. This issue may perhaps best be dealt with in the context of a general regional environmental monitoring system (Project **G 91**).

1.3. Lessons learned.

In general project implementation has progressed slower than what was expected at the time of preparation of the 1995 report. However, as the information on project progress included in this report shows, several projects have witnessed positive steps in the most recent years. Experience shows that other aspects, rather than environmental benefits, to a large extent determine the possibilities to implement projects. Below some key lessons learned are summarised:

Investor policies. Usually a project has to be funded by a number of investors, which could include the Russian Federation, local administrations, local utilities, local private investors, foreign private investors, local banks, international banks, and international grant agencies. All these financiers have different policies for how their funds should be spent. The only investors that to some extent are able to take only environmental considerations are budgetary sources, including grant agencies. Besides the environmental benefits, the main critical aspects are; financial capacity of the project owner, regional political priorities, and local institutional capacity and framework.

Financial environment. In order to implement projects financial stability is needed. This includes amongst others that investors are able to maintain and fulfil their initial financial commitments. The financial crisis in 1998 reduced the number of implemented project drastically. The effects of the crisis were felt until 2002. Currently the financial situation in Russia is improving and turning more stable, which will improve the possibilities for project implementation.

Regulatory framework. The legislation in Russian is under constant development, and over the past decade the legislation and regulation have improved. Despite the positive development changes in legislation and regulation pose a challenge for investors in tracking the changes. A rapidly changing legislation and regulation sometimes leads to contradictions and a lack of understanding of its application both by investors and local authorities. Also,

changes in the governmental bodies and ownership and organisation in enterprises have been relatively frequent over the past 10 years, thereby reducing the stability.

Project Stability. The time to implement projects from pre-planning to commissioning is frequently long in Russia. Factors that prolong the implementation time are usually related to changes in Investor policies, the Financial Environment and the Regulatory Framework. A problem is that a project normally can only endure a limited number changes before it becomes difficult for the investors to continue to participate in the project, as changing circumstances lead to a need to revise investment decisions. A long implementation time can by itself prohibit implementation due to restrictions how long funds can be made available for a project. Also, a long implementation time increases the cost for preparation, and in most projects the preparation costs will at some point become too high for investors if no concrete progress is made.

Public Utilities. Many projects relate to public utilities e.g. water, energy, waste and in the public sector the lack of implementing necessary reforms to allow for self-sustaining utilities has had a negative effect on the project implementation. However, currently changes are envisaged and by 2008 utilities should have full cost recovery from tariffs.

Nuclear Safety. The 1995 NEFCO/AMAP report was a relevant contribution to the international work with nuclear waste projects in Russia. Since the formation of the Contact Expert Group (CEG), international cooperation on nuclear waste projects in Russia has had a specific forum of its own. Significant steps were taken in 2002 and 2003 with; i) the formation of the Northern Dimension Environmental Partnership (NDEP) Support Fund, which intends to contribute around 150 million EURO to nuclear waste project in the region, and ii) signing of the nuclear liability agreement MNEPR, which allows foreign institutions to participate in projects.

Information. Information on the environmental situation in northwest Russian improves constantly. Therefore, it is likely that new important projects will have to be addressed in the future despite not having been identified yet. The key areas were information is lacking or scarce are military installations and Persistent Organic Pollutants (POPs).

Regions. The regions in northwest Russia are different in terms of possibilities and ability to implement projects. This ranges from the political support and financial capacity to the regulatory and institutional framework.

Based on the assessment of lessons learned the updated NEFCO/AMAP has been based on the following considerations:

- As the work of CEG is progressing along its own path there is no need to include nuclear waste projects in report.
- Due to the lack of information on military installations an updated NEFCO/AMAP report cannot include any projects in connection with such installations.
- It seems counterproductive to establish a limited priority hot-spot list due to the uncertainties related to project implementation. Therefore the report only includes a hot-spot list (without any prioritisation order) that can provide investors with environmental justifications for an investment based on the fact that a project is included in the list. The success of the environmental work in the region can be

measured by the number of hot-spots removed from the list e.g. an objective could be to remove one hot-spot per region per year and thereby all hot-spots would be removed within the next 10 to 15 years.

- As information on the environmental situation in northwest Russian improves constantly, the NEFCO/AMAP report needs to be updated periodically e.g. every 5th year. Also, the periodical updating should be used as a tool to monitor progress in environmental work in the region.

2. ORGANIZATIONAL FRAMEWORK AND METHODOLOGY.

2.1. Geographical scope of the project.

The project covers the following administrative territories of the Russian federation entering the Barents Region: Republic of Karelia, Republic of Komi, Murmansk Oblast, Arkhangelsk Oblast, and Nenets Autonomous Okrug. Taking into account that the Republic of Komi was not a member of the Euro-Arctic Barents cooperation in 1995 and, due to that have not been covered by the NEFCO/AMAP Report – 1995, the present report contains more detailed general description of the republic of Komi. The corresponding descriptions of the other administrative territories of the Russian Federation have been presented in the Report – 1995.

2.2. Organizational framework of the project.

The project has been coordinated by the AMAP Secretariat and the designated departments of the Ministry of Natural Resources of the Russian Federation, mainly the Department of International Cooperation in the Field of Environmental Protection and the Department of Environmental Safety. The work has been implemented with active participation of environmental protection authorities of the respective administrative territories subordinated to both, the Ministry of Natural resources of the Russian Federation and regional administrations.

During preparatory stage of the project, the following steps have been made:

- Kick-off meeting between NEFCO and the AMAP Secretariat (Oslo, 3 February 2003)
- Preparation of the project documentation (February 2003).
- Consultation meeting between the AMAP Secretariat and the Russian federal executive bodies (Ministry of Natural Resources, Ministry of Economic Development and Trade) and institutions planned to be involved in the project (Moscow, 20-21 February 2003).
- Preparation of the document “Priorities of the NEFCO/AMAP Project “Updating of the NEFCO/AMAP Report “Proposals for Environmentally Sound Investment Projects in the Russian Part of the Barents Region” and its distribution among Russian ministries, regional environmental protection authorities and institutions relevant to the project implementation (Appendix 2).
- Organizational meeting at the Ministry of Natural Resources of the Russian Federation with participation of the representatives of the Russian federal executive

bodies, regional environmental protection authorities and institutions relevant to the project implementation, which was chaired by the Deputy Minister of Natural Resources Kirill V. Yankov)Moscow, 3 April 2003 (Appendix 3).
- Formation of the central expert group for the work in the administrative territories of the Russian Federation entering the Barents Region (10-20 April 2003)
- Missions to Arkhangelsk Oblast (21-25 April), Nenets Autonomous Okrug (27-30 April), Murmansk Oblast (12-16 May), Republic of Karelia (19-23 May), and Republic of Komi (26-30 May).
- Drafting of the report.

The central expert group (CEG) has been established for the work in the regions. This group consisted of:
- The AMAP Secretariat
- Department of Environmental Safety of the Russian Federation Ministry of Natural Resources
- Norwegian-Russian Cleaner production Centre
- Centre for International Projects
- International experts (Akvaplan-niva, Tromsø, Norway)

Full list of CEG members is presented in Appendix 4.

Representatives of Akvaplan-niva have been invited to the CEG, taking into account an important role of this research institution in preparation of the NEFCO/AMAP Report – 1995, and their active participation in the Russian-Norwegian environmental cooperation, particularly in the Russian part of the Barents Region.

The role of the cleaner production programme in the Russian part of the Barents Region, which is organised and implemented by the Norwegian-Russian Cleaner Production Centre, and with NEFCO involvement in this programme, has been acknowledged by BEAC Working Group on Environment and Summit in Kirkenes. In recent years, due to active collaboration between NEFCO and this centre, a number of effective environmentally sound small and medium-sized projects have been implemented. In this respect, the role of cleaner production methodology in solving environmental problems related to “hot spots” identified under this project cannot be overestimated. From the other hand, the experience and knowledge on the environmental impacts originated from specific enterprises, which have been gained by the Cleaner Production Centre, could be useful for the success of the project, and in this respect participation of the Cleaner Production Centre expert in the missions of the CEG has been acknowledged and welcomed. Besides, the Cleaner Production Centre has presented its presentation related to possible follow-up of this report (Appendix 5).

Based on the recommendation of the Ministry of Natural resources, the expert from the Centre for International Projects (CIP) has been included in CEG. CIP has been designated by the Ministry of Natural Resources as the Russian Performing Entity for preparation of Russian National Action Plan under the Stockholm Convention on POPs and, taking into account CIP involvement in a number of pollution-related projects under the Arctic Council Action Plan for elimination pollution in the Arctic (ACAP) the NEFCO/AMAP Report-2003 might benefit from this contribution.

At the initial stage of the project preparation it had been envisaged that the Russian National Pollution Abatement Facilities (NPAF) will be also engaged in the project implementation

for assessment of economic state of the enterprises detected as environmental "hot spots". However, after consultations with NPAF it has been agreed that evaluation of the economic state of the enterprises might be beyond the stage of detection of environmental "hot spots", and should be under the scope of feasibility study of the selected projects as the follow-up of the NEFCO/AMAP Report -2003.

In each administrative territory under the scope of the project, regional environmental protection authorities have designated a limited number of local experts who worked with the CEG as a joint team in the respective region. However, a large number of persons, both at official and expert levels, were involved into the expert work during the CEG missions. The list of persons involved is presented in Appendix 6. Their valuable contributions are greatly acknowledged and appreciated.

2.3. Project priorities.

The NEFCO/AMAP Report - 1995 covered the following 10 environmental issues of concern:

1. Environmentally safe operation of nuclear installations.
2. Handling and storage of radioactive wastes.
3. Reduction of industrial gas emissions.
4. Preservation of freshwater resources, including improvement of drinking water supply.
5. Solid wastes.
6. Prevention of marine pollution of the White Sea and the Kola Fjord.
7. Preservation of forest resources.
8. State of the environment and lifestyle of the indigenous and traditional population in the Region.
9. Development of integrated environmental and human health monitoring system.
10. Environmental issues concerning energy consumption and energy saving.

Since the NEFCO/AMAP Report – 1995, the issues related to radiation safety and radioactive wastes have been singled out into a separate field, into which significant financial resources have been invested. In this connection, **it was agreed not to include issues 1 and 2 into the scope of this project.**

Issues related to environmental impact and lifestyle on health of the indigenous population is currently studied within the framework of the RAIPON/AMAP/GEF Project "Persistent Toxic Substances, Food Security and Indigenous Peoples of the Russian North". In this connection, **it was agreed not to include the issue 8 into the project scope.**

In this context, main attention in the project was dedicated to the issues 3, 4, 5, 6, 10.

2.4. Methodological approach in selection of environmental "hot spots"

In the investment projects selection process, as in the previous exercise, main attention paid to official data available at the environmental protection authorities and other institutions. However, taking into account that the currently used state statistics forms do not fully correspond to the requirements to data and information on emissions and other forms of

environmental impacts followed from the recent international treaties, including the Stockholm POPs Convention, Kyoto Protocol to the Global Climate Framework Convention, etc., attention was also paid to possibilities of environmental releases from the enterprises of pollutants that are not covered by the forms of state statistics but fall under the above treaties. First of all, it concerns by-products (dioxins/furans, PAH), mercury, etc.

The general approach used in selection of major polluters was the following. The expert team considered total environmental released from the given administrative territory of the Russian Federation (republic, oblast, autonomous Okrug) and contribution to it from each of the administrative territories (city, district) subordinated to it. Based on this consideration, cities and districts, which provide major contribution to total environmental releases ware selected for further assessment. In each city and district selected for further assessment, the expert team considered major pollution contributors (enterprises) from the point of:

- General pollution input;
- Specific contaminants;
- Trends in pollution releases since the NEFCO/AMAP report – 1995.

Based on such an assessment, the list of main pollution issues for each Russian administrative territory under the scope of the project has been compiled.

3. POLLUTION ISSUES IN THE RUSSIAN PART OF THE BARENTS REGION.

3.1. Environmental situation in the Murmansk Oblast.

3.1.1. Air pollution.

Comparison of 2002 and 1994 total industrial air emissions in the Murmansk Oblast and emissions of major contaminants, based on the state statistics data, is presented in Table 1.1. The table documents that, since the previous NEFCO/AMAP Report, total industrial emissions were reduced by almost 30%. It should be also noted that the most significant reduction, both in absolute value and in a share in total emission, is documented for sulphur dioxide. Taking into account that the Murmansk Oblast, due to its large nickel combined smelters, is considered as the most significant regional emission source of acidifying compounds and the subject of a special environmental concern for the neighbouring countries, this fact is worthy of particular attention. It proves that environmental protection measures taken at both national/local level and within the framework international cooperation gives its definite positive results. Considerable contribution to reduction of SO_2 emissions was made by reduction of amount of sulphur-rich ore from the Norilsk area treated at the nickel combined smelters, and application of new technologies with more efficient sulphur extraction from industrial gases (from 50.81% to 68.78%). It should be also noticed that emissions of major specific contaminant have been reduces as well (nickel – 1,118/1,780; copper – 864/1,097; volatile organic compounds – 423/726; gaseous fluoride – 674/848, benzo(a)pyrene – 1.94/2.24, all in tonnes).

Table 1.1.

Industrial emissions of major contaminants in the Murmansk Oblast.

Component	Amount emitted, tonnes		Percentage	
	1994	2002	1994	2002
Total emissions	470,047	332,533	100	100
Sulphur dioxide (SO_2)	377,150	240,096	80.2	72.2
Carbon oxide (CO)	30,046	29,807	6.4	9.0
Nitrogen oxides (NO_x)	13,563	14,724	2.9	4.4
Dust	49,662	43,730	10.5	13.2

The territorial distribution of industrial air emissions is presented in Table 1.2. As in 1994, major contribution to air pollution in the Murmansk Oblast originates from Pechengsky District and Monchegorsk, where large nickel combined smelters are located. At the same time, data clearly document significant reduction of industrial air emissions from these two sites. Although Kirovsk is not considered as one of the main polluting sites of the Murmansk Oblast, it is important to note a strong negative trend documented for this city. Industrial air emissions almost doubled here for the reported period, with the corresponding contribution of all major air-borne contaminants.

In general, the highest peak concentrations of major air-borne contaminants in atmospheric air of the cities, measured over a 20 minutes period, correspond to reduction of industrial emissions. At the same time, it is difficult to find direct correlation between these two

Table 1.2.

Industrial air emissions of major contaminants in the cities and districts (rayons) of the Murmansk Oblast, thousand tonnes

City/District (Rayon)	Total		SO_2		NO_x		CO		Dust	
	1994	2002	1994	2002	1994	2002	1994	2002	1994	2002
Murmansk	34.5	26.8	26.6	19.6	1.3	2.8	3.5	2.2	2.2	1.7
Apatity	24.9	21.9	14.6	12.0	5.1	3.9	0.3	0.2	4.9	5.8
Kirovsk	6.1	11.5	4.0	6.7	0.9	2.1	0.5	1.1	0.8	1.4
Kandalaksha	28.7	22.8	8.7	5.4	0.8	0.6	11.3	7.2	9.4	8.2
Monchegorsk	111.5	58.1	97.7	43.9	1.3	1.2	0.9	3.8	10.3	7.8
Olenegorsk	10.8	12.4	5.1	4.4	0.8	1.0	1.5	2.6	2.9	3.9
Severomorsk	9.8	10.2	6.5	6.4	0.8	0.6	1.7	2.3	1.6	0.7
Kovdorsky District	8.2	7.7	5.0	3.8	0.5	0.5	1.4	1.9	1.1	1.4
Kolsky District	5.7	5.0	2.9	2.3	0.3	0.3	1.3	1.7	1.2	0.7
Lovozersky District	3.4	2.0	1.9	1.3	0.2	0.2	0.6	0.3	0.03	0.08
Pechengsky District	215.2	137.9	199.0	124.4	0.5	0.6	2.9	2.2	12.7	10.6

Table 1.3.

Air pollution in the cities/towns of the Murmansk Oblast, the highest peak through the year, measured over a 20 minutes period, in Maximum Allowable Concentrations (MAC)

Contaminant	City/town															
	Apatity		Kandalaksha		Kirovsk		Kola		Monchegorsk		Murmansk		Nickel		Olenegorsk	
	1991	2001	1991	2001	1991	2001	1991	2001	1991	2001	1991	2001	1991	2001	1991	2001
SO_2	0.2	0.3	0.9	0.3	0.6	0.7	0.5	0.3	3.6	0.6	0.7	0.5	4.4	4.2	0.5	0.2
NO_x	4.4	1.1	4.6	1.4	2.0	1.1	2.0	2.1	1.2	1.6	3.2	2.4	1.3	2.5	1.3	2.2
CO	3.0	1.6	0.6	1.0	1.2	1.4	1.0	0.8	1.2	2.0	1.8	1.2	1.2	1.6	1.2	1.2
Dust	2.0	1.2	1.8	0.8	1.0	0.8	0.8	0.6	1.2	1.4	1.0	0.8	0.8	0.8	3.0	1.4
Benzo(a)pyrene	1.4	0.3	5.8	1.2	-	-	-	-	8.6	1.4	4.0	1.3	2.9	1.3	-	-

characteristics. It should be noted that air concentrations of contaminants strongly depend on meteorological situation in a certain monitoring site. Besides, mobile sources, automobile traffic first of all, significantly contribute to air pollution. In 1994, emissions from automobile transport have been estimated as 16% of total emissions. In 2001, this number has increased to 31%.

Table 1.4.

Total emissions from major industrial pollution sources in the Murmansk Oblast in 2002, thousand tonnes.

Enterprise	Total emissions		Enterprise	Total emissions	
	t. x 10^3	% in city/rayon		t. x 10^3	% in city/rayon
Murmansk			Olenegorsk		
Murmansk HPP	14.5	54.1	SC "Olkon"	10.9	87.9
TEKOS	5.6	20.9	Severomorsk		
Apatity			HPP	8.5	83.3
HPP	18.5	84.0	Kovdorsky District		
SC "Apatit"	3.5	16.0	Sc "Kovdor GOC"	7.1	92.2
Kirovsk			Kolsky District		
SC "Apatit"	11.5	99.7	HPP	2.3	46
Kandalaksha			Lovozersky District		
SC "SUAL"	14.5	63.6	Revda HPP	0.8	40
HPP	3.3	14.5	SC "Lovozero GOC"	0.3	15
Monchegorsk			Pechngsky District		
NCS "Severonickel"	51.8	89.2	SC "Pechenganickel" Nickel	65	47.1
			SC "Pechenganickel" Zapolyarny	67.5	48.9

Table 1.4 presents data on major industrial air pollution sources in 2002. It is clearly seen that, in spite of significant reduction of their emissions, nickel combined smelters continue to be main polluters of the atmospheric air. Heat and power plants located all over the Murmansk Oblast are considered as the second largest type of air polluters. It should be noted that heat and power plants are also significant emitters of CO_2, the greenhouse gas contribution to climate change. However, Russian state statistics forms to not include CO_2 emissions, and it is difficult to assess contributions of specific enterprises into total CO_2 emissions, as well as the contribution of the Murmansk Oblast.

3.1.2. Freshwater resources and drinking water.

3.1.2.1.Freshwater pollution.

Changes in waste water discharges since 1994 is presented in Table 1.5. Total waste water amount has slightly increased due to increase of cooling water discharge from the Kola nuclear power plant. Amount of waste waters from other sources was reduces on approximately 10 %. However, the situation with waste water treatment became definitely worse- Amount of waste waters treated to the conditionally pure level decreased from 15.5 to 4.6 %. At the same time, amount of insufficiently treated waste waters increased both in

percentage and absolute numbers. Amount of conditionally pure waters discharged without treatment became also lower.

Table 1.5.

Amounts of waste waters discharged in the Murmansk Oblast.

	1994		2002	
	mln. m^3	%	mln. m^3	%
Total waste water discharges	1680		1776	
Discharges from Kola NPP (unpolluted)	1173		1319	
Discharges from other sources	507	100	457	100
Treated according to standards	78.5	15.5	457	4.6
Insufficiently treated	229.1	45.5	272.5	59.6
Polluted, discharged without treatment	102.5	20.2	94.1	20.6
Untreated, conditionally pure	96.8	19.1	69.4	15.2

Waste water discharges from major industrial enterprises, compared to 1994, are presented in Table 1.6. The most significant reduction of waste water discharges took place at the "Severonickel" combined smelter in Monchegorsk. At the same time, JSC "Apatit" and, particularly, "Kovdor GOC" increased volumes of their waste water discharges, with corresponding amounts of contaminants discharged, mostly inorganic salts.

Besides large industrial enterprises, municipal water supply and sewage systems significantly contribute to pollution of surface water bodies. Their total sewage water discharge in 2002 was 135.7 mln. m^3, including 121.3 mln. m^3 of polluted ones. Discharge of significant amounts of biologically degradable organic substances (characterized by BOD value), which comprises more than 90% of their total discharge in Murmansk Oblats, is the matter of special concern. Untreated sewage continues to be discharged in Murmansk, Severomorsk, Polyarny, Gadzhievo, Zaozersk, Ostrovnoy, most of them, into fjords and Barents Sea. At the same time, discharges of 8 among 14 municipal sewage water treatment plans operating in the Murmansk Oblast meet the existing guidelines (Olenegorsk, Murmashi, Murmashi-3, Verkhnetulomsky, Shongui, Molochnoe, Kildinstroy, Umba).

Municipal enterprise "Murmanskvodokanal" discharged in 2002 61.1 mln. m^3 of sewage, including: into Kola bay – 50.3 mln. m^3 without treatment. However, sewage discharged by this enterprise into Kola and Tuloma rivers are treated according to the existing standards.

Volumes of waste waters in Murmansk Oblast discharged by different branches of economy is presented in Table 1.7. Taking into account that most of waste waters discharged by the energy branch are unpolluted cooling waters from Kola nuclear power plant (1319 of total 1351 mln. m^3), the largest amounts of polluted waste waters are discharged by the enterprises of non-ferrous industry and municipal service. However, they have different chemical composition of waste waters (Table 1.8). In case of non-ferrous industry, inorganic components are dominating contaminants. Communal waste waters are characterized by large volumes of biologically degradable organic substances, suspended matter and components responsible for eutrophication of waters bodies and other effects on ecosystems and, *a priori*, sanitary and epidemiological state of water bodies.

Table 1.6.

Waste water discharges by selected industrial enterprises of the Murmansk Oblast, tonnes

Enterprise	Total discharge. mln. m^3		Biodegradable organic substances		Suspended matter		SO_4^{2-}		Cl^-		Ni		Cu	
	1994	2002	1994	2002	1994	2002	1994	2002	1994	2002	1994	2002	1994	2002
Severonickel NCS, Monchegorsk	24.5	14.7	137.5	48.7	706	364	34,678	38,780	7,343	6,800	54.2	10.9	1.57	2.10
Pechenganickel NCS, Pechenga, Zapolyarny	27.2	25.3	100	63.6	139	105	2,219	6,384	206	269	4.0	6.0	-	0.05
Kovdor GOC, Kovdor	36.3	50.9	236	211.5	248	175	4,522	9,063	851	467	-	-	-	-
Lovozero GOC, Lovozero District	17.1	13.6	78	21	302	200	103	82	102	76	-	-	-	-
JSC “Apatit”, Kirovsk	137.4	145.5	151	288	908	514	6,697	8,694	1,161	909	-	-	-	-

Table 1.7.

Volumes of waste waters discharged by different branches of economy in the Murmansk Oblast in 2002, mln. m^3

Branch of economy	Total	Without treatment	Insufficiently treated	Treated accord. to standards	Conditionally pure
Power production	1351.36	0.77	0.54	1.60	1348.46
Ferrous metallurgy	51.40	2.83	40.82	4.63	3.12
Non-ferrous metallurgy	41.05	68.49	31.58	0.98	0.00
Industry of rare metals	13.44	9.03	4.28	0.00	0.12
Chemical industry	151.88	0.0	133.32	2.36	15.20
Municipal service	135.70	66.45	54.87	11.07	3.30
Agriculture	11.68	0.12	1.64	0.00	9.92
Transport	3.27	0.60	0.74	0.01	1.91
Military	4.06	1.43	1.71	0.00	0.92
Other	12.13	4.48	3.00	0.25	5.45
Total:	1775.97	94.15	272.52	20.90	1388.40

Table 1.8.

Discharge of contaminants with waste waters by different branches of economy in the Murmansk Oblast in 2002, tonnes

Branch of economy	BOD	Suspended matter	Oil	SO_4^{2+}	Cl^-	N-NH_4^+	NO_3^-	Ni
Power production	40	40	-	100	40	9.7	0.9	0.2
Ferrous metallurgy	210	180	-	9120	480	27.5	0.9	-
Non-ferrous metallurgy	120	510	10	45610	7110	28.8	86.0	16.9
Chemical industry	290	570	10	8660	910	24.6	369	-
Municipal service	9410	7570	40	2180	4430	1178	487	1.2
Agriculture	80	50	-	20	60	8.0	6.9	-
Transport	40	30	-	30	1230	3.6	1.4	-
Military	110	120	-	20	240	15.7	3.2	-
Other	10	150	10	100	100	1-3	12-9	-
Total:	10310	9220	70	65840	14600	1297	1153	18.3

3.1.2.2.Drinking water supply.

In the 1995 NEFCO/AMAP drinking and household water supply was considered as one of the most important environmental human health problems for the Murmansk Oblast. In spite of a number of actions taken during this period, including some investment projects implemented with NEFCO involvement, it is difficult to state noticeable improvement of the situation. The Murmansk Oblast Centre for Sanitary and Epidemiological Inspection informs that, by the end of 2001, 1.0% of samples taken from water supply systems do not correspond to microbiological guidelines, and 14,4% - to chemical guidelines. The most alarming situation with microbiological pollution is in Zaozersk – 11.3% (Malaya Litsa – 1.9%, Zapadnaya Litsa – 18.7%) Mirmansk city – 6.1% (settlement Drovyanoe – 4.0%, settlement Abram-Mys – 8.3%), settlement Zeleny Bor – 5.5% (Zaleny Bor-1 – 26.7%), Kolsky District – 1.7% (settlement Shongui – 7.1%, Ura-Guba – 3.4%, Teplychny Combinat

– 6.0%, Loparskaya st. – 7.4%. settlement Mezhdurechye – 6.3%). Chemical pollution is the highest in the following sites: Murmansk city – 75.0% (settlement Drovyanoe – 100%, Abram-Mys – 50,0%), Zaozersk – 70.1%, Severomorsk 67.7%, Settlement Zelenoborsky 23.5% Pechengsky District – 11.1% (settlement Prirechensky – 67.2%, Borisoglebsky – 17.5%). It should be noted that most of the samples that do not meet chemical guidelines, exceed the values of organoleptic variables (odour, colour, turbidity, and iron concentration).

The previous NEFCO/AMAP Report has included the project "Water supply system in the town of Lovozero" in the priority list. The first phase of this project, which has been implemented with NEFCO involvement and with financial support from the Karasjok municipality, Norway, solved the most urgent drinking water quality problem. In spite of the fact that other issues of drinking water supply system in this settlement, e.g. groundwater use, communal effluents treatment system, etc. are to be solved in the forthcoming time, the experience of the first phase on this project, taking into account that water quality problems in Lovozero were the same as listed above, should be used in the other sites, particularly relatively small settlements.

In some cases, drinking water quality problems overlap with deficiency of water resources. This situation can be illustrated by the settlement Zelenoborsky-1 located not far from Kandalaksha. Population of this settlement is more than 2000, including 200 children. It is supplied with water from Bezymyanny lake, with poor organoleptic quality. Average water extraction from this lake to household and communal needs is 1200 m^3/day. However, in low-water seasons this lake cannot meet water supply needs, up to full its exhaustion. For example, in winter season 2002-2003 water supply of the settlement from this lake was completely stopped, and the communal service has to transport drinking water to this settlement from the neighbouring settlement by tanks. At present, the regional authorities responsible for use of natural resources are exploring possibilities of groundwater supply for this settlement. In general, it should be noted that groundwater resources are inadequately used for drinking water needs, and only 5% of all water used in the Murmansk Oblast for drinking and household needs are extracted from groundwater sources.

Drinking and household water supply of Murmansk city is the matter of special concern. As in 1994, this city is supplied from three water sources: rivers Kola and Tuloma, and lake Bolshoye. As it is shown above, water quality in these sources do not meet sanitary standards neither according to microbiological, nor chemical variables. Water quality of Kola river, as the main source for water supply of Murmansk, needs particular attention. Bolshoye Lake, which is the source of 15% of drinking water supply for Murmansk city, is located not far from the Murmansk municipal waste incineration plant, and is affected by its environmental releases.

Besides 3.4 mln. m^3 of waste waters discharged by Olenegorsk located in the source of Kola river (Lake Kolozero), significant contamination originated from agricultural enterprises located close to the banks of Kola river upstream Murmansk. In should be noted that most of effluents entering into Kola river from these sources can be considered as unorganised distributed sources, since they are coming together with rain and filtrated waters from manure, droppings and mess collectors from the farms "Murmansk", "Prigorodny", "Kolsky" and poultry farms "Murmanskaya" and "Snezhnaya".

9 November 2002 accidental destroy of almost 30 m of the droppings collector protection dam took place at the poultry farm "Murmanskaya", due to which about 90,000 m^3 of dropping effluents have been released to the landscape and polluted an area of 3.8 hectares. Part of them entered Kola river with runoff, with corresponding effects on its water quality.

The investigation has shown that the accident has happened due to poor state of the dam, which has been constructed without the project documentation, overfilling of the collector was with dropping effluents, in combination with weather factors.

3.1.2.3.Marine waters.

Coastal waters of the Barents and White Seas are intensively polluted with waste waters of ships and enterprises belonging to the fleet, shipping companies and other branches of economy. Waste water discharge into the Kola Fjord of the Barents Sea from 72 entities in 2002 was 80.23 mln. m^3. 72.97 mnl. m^3 of them are polluted waters, including 69.72 mln. m^3 without any treatment. Most of these polluted waste waters are discharged by the enterprises of municipal service, fish industry, shipping companies and military organizations.

Kandalaksha Bay of the White Sea is polluted by waste waters of 9 enterprises, among which the largest are: Kandalaksha aluminium plant SUAL, Belomorskaya oil depot, a number of municipal water distribution systems "Vodokanal". In 2002, 14.06 mln. m^3 of waste waters have been discharged into the bay, including 6.84 mln. m^3 of polluted ones (0.46 mln. m^3 – without treatment).

3.1.3. Industrial and communal wastes.

Due to poor compatibility of data and information of industrial and communal solid wastes in the Murmansk Oblast in 1994 and 2002, it is difficult to compare the existing trends in their formation and handling. Data on formation, utilization, decontamination and dumping of solid wasted in 2001, according to the statistic reports, is presented in Table 1.9.

Table 1.9.
Industrial and communal wastes in the Murmansk Oblast in 2001.

Type of wastes	Formation	Utilization	Dumping	% of utilization
1st class of hazard, tonnes	31.7	28.4	0.0	89.6
2nd class of hazard, tonnes	10,491	10,402	0	99.1
3rd class of hazard, tonnes	150,018	145,968	3,950	97,3
4th class of hazard, tonnes	522,366	294,411	215,831	56.4
Total hazardous, tonnes	682,907	450,809	219,781	66.0
Non-hazardous from extractive industry, tonnes	178,024,568	56,080,742	121,943,826	31,5
Other non-hazardous, m^3	1,725,800	703,266	1,020,064	40.8

Mercury-containing wastes, mostly used luminescent lamps, provide main contribution to wastes of 1st class of hazard. There are two enterprises involved in treatment of spent luminescent lamps:

- "Rick-market Ltd." (Kolsky District) has a new installation with full environmentally sound utilization of mercury wastes.

"Ecord Ltd." (Kirovsky District) has an outdated installation that has been put in operation in 1994. According to the environmental protection authorities, this plant, although utilizes a part of lamps used in the Murmansk Oblast, contributes itself to mercury contamination of the environment.

It should be noted that utilization of other mercury-containing equipment and instruments, as well as metallic mercury itself, is not organized. Besides, two above plants utilize used lamps only from industrial enterprises but not from the communal sector.

Selenium-arsenic slam, which is formed in production of sulphuric acid from SO_2, is another contributor to wastes of the 1st class of hazard in the Murmansk Oblast. In total, 76 tonnes of this slam is stored at the special warehouse, 2.7 of which have been formed in 2001.

Handling of oil-containing wastes, particularly of solid ones, is another alarming environmental issue due to their large amounts. There are several technologies for their treatment, including thermal, chemical and some other. At present, Murmansk Company "Arcticeco-A, Ltd" has developed the project on construction of a special site for biological neutralization of oil-containing slams for Murmansk and Kolsky District, with capacity of 800 t/year. It is suggested to locate this biological site at the territory of one of manure collectors.

Murmansk Oblast has 39 communal/municipal waste dumps, 20 of which are illegal. These dumping sites are organized and used without any design, including engineering, geological and hydrological surveys. Impact of these sites on the environment is not monitored.

The only waste incineration plant is located in Murmansk. The 1995 NEFCO/AMAP report has considered this incinerator as one of environmental "hot spots". As a follow-up of this report, Murmansk waste incineration plant attracted attention of the Russian and international environmental experts and authorities. In particular, Finnish Ministry of Environment allocated funds for installation of some modern sensors for controlling safe operation and environmental releases from this plant. This project is to be finalized this summer. Special project on development of waste water treatment facilities and installation for waste sorting is under implementation with financial support of NEFCO. Regional Administration, in collaboration with Sweden, has started the project on development of gas emission treatment facilities. Norway has initiated the project on production of fuel from wastes. Finally, taking into account some types of waste incinerators, including those produced by the Czech Company "CzKD-Dukla" (this type is constructed in Murmansk) are likely to produce dioxins as by-products of incineration process, measurements of environmental releases of toxic compounds, including dioxins, from the plant will be made within the framework of INTERREG III programme and with assistance of Sweden. All the above project will help to make Musmansk waste incineration plant more environmentally friendly, and to clarify, what additional steps are needed in the future.

As it has been stated in the 1995 NEFCO/AMAP Report, scrapped ships dumped along the shore of the Kola Fjord possesses serious environmental threat. In recent years, the environmental non-profit foundation "Harmonious Development", in dose collaboration with the Maritime Inspection, has initiated a large-scale work on inventory and handling these scrapped ships. The inventory has shown that 122 ships and different metal constructions are situated at these "ships cemeteries". About 70% of these ships belonged to the Northern Fleet, and are currently not included into any rehabilitation programme.

Besides a special ship storage site “Belokamenka”, there is a number of illegal sites: Lavna (19 ships), Retensky (22), Mishukovo (22), Mys Zeleny (9), etc. In total, the inventory has documented 9 illegal sites. Some of these scrapped ships are dumped long ago. For example, 5 of 14 ships from the alliance convoys of the World War-2 sunk along the Kola peninsula, are located in Kola Fjord. These sunk scrapped ships possess not only environmental threat but increase navigation risk, and cause economic losses preventing from development of coastal fishing, fish-farming, rehabilitation of coastal settlements.

Sampling and analysis of bottom sediments in the areas of scrapped ships locations has shown increased concentration of all metals, as well as petroleum hydrocarbons. Tentative information indicates that bottom sediments in the areas of dumping of scraped ships have increased concentrations of PCB. As it has been documented in the PCB inventory in the Russian Federation, about 53,000 tonnes of PCBs have been used for paints and dyes production, and it may be possible that PCB pollution originates from old paints of these ships.

3.1.4. Stocks of obsolete pesticides.

Inventory data on stocks of obsolete pesticides are presented in Table 1.10. It should be noted that this information presented to by the Murmansk territorial station of plant protection was not full and, compared with the inventory under the ACAP project on obsolete pesticides, did not include a number of pesticides with total weight about 1.5 tonnes. However, organo-chlorine pesticides comprise only 13 kg.

Table 1.10.

Stocks of obsolete pesticides in the Murmansk Oblast.

Location	Total, kg	Chlorinated	Phosphorus	Mercury	Other	Mixture	Unknown	Poor state
Apatity	714		278		436			138
Tuloma, Kolsky District	995				995			
Polyarnye Zori	7589				7589			
Murmansk	195	13	75		107			
Kirovsk	77		74		3			
Murmashi, Apatitsky District	53				53			
Total:	9623	13	427		9183			138

3.2. Environmental situation in the Republic of Karelia.

3.2.1. Demographic situation.

In the beginning of 2002, population of the Republic Karelia was 756.4 thousand people. In comparison with 1996, the Republic population decreased by 27.4 thousand (3.5 %) (Table 2.1).

Table 2.1.

Trend in resident population of the Republic of Karelia, (thousand people).

Population	1991	1996	1999	2001	2002
Urban population	653.1	578.3	568.1	562.9	562.0
Rural population	145.1	205.5	203.0	197.7	194.4
Total population	798.2	783.8	771.1	760.6	756.4
0-15 years	201.3	178.9	n.d	143.9	n.d
Employable population	462.7	460.7	n.d	475.8	n.d
Disabled population	133.6	144.2	n.d	140.9	n.d

n.d. is no data

In 2001, the birth rate was 9.0 per 1000 (8.5 in 1995). The mortality rate remains high and was 16.6 per 1000 (16.3 in 1995). In 2000, life expectation was 70 years for woman and 57.4 years for men (in 1995, 69.2 and 54.7, respectively).

3.2.2. General trends in industrial pollution.

General trends in industrial pollution evaluated based on volumes of environmental releases (emissions and waste water discharges) compared to industrial production are presented in Table 2.2.

Table 2.2.

General trends in industrial production and environmental releases in the Republic of Karelia.

Parameter	Unit	Year					
		1993	1995	1997	1998	1999	2000
Industrial production	$RU \times 10^6$	1976	1607	1356	1317	1602	1730
Industrial emissions	$t \times 10^3$	176.5	150.2	109.3	106.8	113.4	111.1
	kg/1000 RU	89.3	93.5	80.6	81.1	70.8	64.2
Polluted waste waters	$m^3 \times 10^6$	149.7	136.3	117.4	109.1	124.6	134.8
	m^3/1000 RU	75.8	84.8	86.6	82.8	77.8	77.9

Data presented in the Table show that specific environmental releases per conditional production unit has a general decrease trend. In 2000, compared to 1998 (lowest level of production during 1993-2000), specific industrial emissions decreased from 81.1 to 64.2 kg/1000 RU in comparable prices. Discharge of polluted wastewaters decreased from 82.8 to 77.9 m^3/1000 RU.

3.2.3. Air pollution.

In 2002, the total atmospheric emissions from 402 industrial and agricultural enterprises (vehicles excluded) was 135.4 thousand tons, including 27.6 thousand tons (20.4 %) solid and 107.8 thousand tons gaseous contaminants.

During last 5 years (1998 - 2002), the emissions from stationary sources were reduced by 12.39 thousand tons, including SO_2 by 7.52 thousand tons, CO by 3.61 thousand tons (Table 2.3.). It is connected with usage for more environmentally friendly types of fuels: gas instead of boiler oil (Petrozavodsk HPP, JSC Factory "Avangard", JSC "Petrozavodskmash" and some other enterprises of Petrozavodsk), wood wastes instead of coal (Olonetsky, Loukhovsky and Belomorsky Districts), and also modernization of technological process at JSC "Nadvoitsky aluminium smelter".

Table 2.3.
Trend in atmospheric emissions in the Republic of Karelia in 1994-2002, thousand tons

Pollutant	Year					
	1994	1998	1999	2000	2001	2002
Total	200.8	147.8	154.9	150.1	141.5	135.4
Dust	38.2	27.6	32.8	33.41	30.35	27.6
SO_2	118.5	84.1	83.9	80.2	77.85	76.6
CO	34.2	26.4	28.6	26.8	23.95	22.8
NO_x	6.02	7.28	6.85	6.65	6.59	5.60
Other	4.01	2.11	2.64	3.05	2.79	2.73

In 2002, 165.4 thousand tons, or 55% from total contaminants (300.8 thousand tons), were trapped and neutralized by treatment facilities, 96.7 thousand tons of them were utilized.

Gas emissions from the industrial centres: Petrozavodsk, Segezha, Kondopoga, Pitkyaranta, Kostomuksha and Nadvoitsy account for 75.7% of total amount of gas emissions in the Republic (Table 2.4.).

Table 2.4.
Atmospheric emissions in major industrial centres of the Republic of Karelia in 2002, thousand tons

City	Contaminants					Total
	Dust	SO_2	CO	NO_2	Other	
Kostomuksha	6.446	32.745	1.314	1.396	0.252	42.153
Kondopoga	4.295	18.635	1.299	1.626	0.024	25.879
Petrozavodsk	0.861	3.621	1.786	0.773	0.264	7.305
Segezha	3.540	8.504	0.967	0.517	0.803	14.331
Pitkyaranta	1.225	2.690	0.766	0.228	0.357	5.266
Nadvoitsy	3.354	1.215	2.706	0.036	0.296	7.607
Total	19.721	67.410	8.838	4.576	1.996	102.541

Timber, pulp and paper and metallurgy industries are accounting for 74% of total gas emission in the Republic of Karelia. Timber and pulp and paper industries in the Republic totals 59 enterprises. In 2002, the gas emissions from these plants were 50.723 thousand tons, including 9.491 thousand tons of dust and 41.232 thousand tons of gaseous

contaminants (SO_2 - 30.892 thousand tons, CO - 6.567 thousand tons, NO_x - 2.5 thousand tons). In comparison with the previous year, the emissions decreased by 1.448 thousand tons (2.8%). Percent of treated industrial emissions treated is 67.6. Trapping of solid matter (dust) account for 91.7%. In 2002, there were trapped 0.912 thousand tons of SO_2, H_2S, H_2SO_4 and other contaminants.

There are 4 enterprises of metallurgy in the Republic of Karelia: JSC "Karel'skij okatysh', JSC "Nadvoitsky aluminium smelter", JSC "Vtormet-Karelia" and JSC "Vyartsil'sky metizny plant". In 2002, 49.489 thousand tons of contaminants were emitted by them to the atmosphere, including 9.710 thousand tons of dust and 39.778 thousand tons of gaseous compounds (SO_2 - 34.107 thousand tons, CO - 3.707 thousand tons, NO_x - 2.487 thousand tons). Total industrial emissions increased by 2.8 % in comparison with 2001. In particular, gas emissions formed by JSC "Karel'skij okatysh" were increased by 2.771 thousand tons due to elevated sulphur contents in ore and boiler oil and production growth. JSC "Nadvoitsky aluminium smelter" reduced its emissions by 1.365 thousand tons due to of production decrease and reconstruction of the electrolysis works. 47.418 thousand tons of contaminants (48.9% of total gas emission) were trapped and treated.

Five industrial enterprises are the major air polluters in the Republic of Karelia: JSC "Karel'skij okatysh" (31% of total emission), JSC "Kondopoga" (18%), JSC "Segezhsky PPCM " (10%), JSC "Nadvoitsky aluminium smelter" (5 %) and JSC "Pulp mill Pitkyaranta" (3%).

The state statistics documented reduction of industrial gas emission from the major Karelian enterprises (except for PPCM "Kondopoga") during period 1995 - 2002 (Table 2.5.). The most noticeably reduction of gas emission is documented for Petrozavodsk HPP (5% of total level of 1995) due to use of natural gas instead of boiler oil. After finalization of the gas pipeline "Petrozavodsk - Kondopoga" construction (2003) and transferring of JSC "Kondopoga" boilers for use of natural gas (2005), reduction of gas emissions is expected: SO_2 by 15500 tons/year and NO_2 by 500 tons/year.

3.2.4. Freshwater resources and drinking water

The total surface water resources of Karelia amount 195 km^3. The annual average runoff of the rivers totals 57 km^3/year. 49.7 km^3 from them is formed immediately within the territory of the Republic; the remainder (13 %) enters from adjacent regions (Finland, Arkhangelsk Oblast). About 55% of river runoff from territory of Republic flows to the White Sea, 25% to Onega Lake and 20% to the Ladoga Lake.

Water supply in Republic of Karelia in general is sourced from surface water bodies. In 2002, total water extraction from natural water sources was 223.93 million m^3, including from surface water bodies - 220.6 million m^3 and from underground sources - 3.03 million m^3.

The water resources of Karelia are widely used by all branches of economy. The greatest water user is industry - 137.79 millions $?^3$ (64.3%), including timber and pulp and paper - 120 millions $?^3$ (56 %) and by municipal services - 64.8 millions $?^3$ (30.2 %). Volume of wastewater discharged into surface water bodies in 2002 was 220.37 million m^3 that is slightly more, than in 1994 (Table 2.6.). Enterprises of Kondopoga, Petrozavodsk, Segezha,

Table 2.5.

Industrial emission of major enterprises in the Republic of Karelia in 1995 and 2002 (thousand tons)

Enterprise	Total		Dust		SO_2		CO		NOx		Specific contaminants (tones)	
	1995	2002	1995	2002	1995	2002	1995	2002	1995	2002	1995	2002
JSC Nadvoitsky Aluminium smelter	9.51	7.29	4.13	3.32	1.40	1.19	3.68	2.46	0.05	0.02	Fluorine hydride 249.5, tars 1256.0, solid fluorides 503.8, dust inorganic 2371.7, black oil ash 7.3	Fluorine hydride 288.3, tars 318.0, solid fluorides 548.3, dust inorganic 2446.7, black oil ash 5.4
JSC Pulp mill "Pitkyaranta"	4.73	4.53	0.11	0.74	2.58	2.64	1.38	0.59	0.18	0.22	Hydrogen sulphide 98.7, methylmercaptan 44.3, methyl dithiomethan 21.4, turpentine 142.3, NaOH 83.9, lime dust 78.1, sulphate dust 289.9.	Hydrogen sulphide 176.7, methylmercaptan 72.6, methyl dithiomethan 20.2, turpentine 69.9, NaOH 3.9, lime dust 226.1, sulphate dust 483.6.
JSC Segezhsky PPCM	14.46	12.82	3.74	3.35	8.72	8.25	0.03	0.02	0.48	0.40	Sulphate dust 2636.7, hydrogen sulphide 434.1, methylmercaptan 20.3, methyl dithiomethan 165.7, methyl thiomethane 129.2, soot 850.2, turpentine 578.6.	Sulphate dust 1729.3, hydrogen sulphide 271.0, methylmercaptan 1.9, methyl dithiomethan 142.5, methyl thiomethane 195.0, soot 3.3, turpentine 154.5.
JSC Kondopoga (PPCM)	23.50	25.10	3.17	4.14	17.91	18.35	0.89	0.98	1.52	1.60	Coal ash 2911.5, wood ash 148.1, black oil ash 10.8, ammonia 1.5, hydrogen sulphide 0.4.	Coal ash 3533.6, wood ash 413.0, black oil ash 20.9, ammonia 1.7, hydrogen sulphide 2.0.
Petrozavodsk's HPS	15.80	0.77	0.02	0.00	14.42	0.39	0.00	0.00	1.30	0.38		
JSC "Karel'sky okatysh"	49.96	41.98	2.75	6.38	44.58	32.74	0.54	1.23	1.26	1.40	Black oil ash 39.7, alcohol ethyl 638.9, inorganic dust 4975.2, ammonia 10.3, hydrogen sulphide 3.4, soot 23.2.	Black oil ash 26.5, alcohol ethyl 23.8, inorganic dust 6235.9, ammonia 1.2, hydrogen sulphide 0, soot 89.8.

Pitkyaranta and Kostomuksha are accounting for 92.8% of total discharged wastewater (Table 2.7).

Table 2.6.

Trends in total wastewaters discharge in 1994 - 2002, millions m^3

Characteristic	1994	1999	2000	2001	2002
Polluted waste waters	216	210	215	226	220
Incl. insufficiently treated	171	173	185	180	176
Incl. without treatment	30	22	20	20.7	21.8

Serious problems of surface water use for drinking water supply are poor water quality that does not correspond to the existing standards/guidelines, pollution of water sources, poor water treatment or a lack of water treatment facilities.

At present, there are no sewage treatment facilities in six regional centres of the Republic, where, as a rule, wastewaters are discharged into the surface waters used as a sources of drinking water supply for the population of cities Kem', Belomorsk, Medvezhegorsk, Pudozh and settlements Loukhi and Kalevala. The analysis of drinking water quality in the Republic of Karelia for last 5 years testifies to a high level of chemical and microbiological pollution (Table 2.8.). Drinking water samples do not meet national and international quality requirements and pose a serious threat to human health. The most acute situation with drinking water quality is in Loukhi settlement, cities of Olonets, Sortavala and Petrozavodsk. The unsatisfactory quality of drinking water was by the reason of dysentery outbreak among the population of Kalevalsky, Segezhsky, Muezersky, and Suoyarvsky Districts in 2001.

Table 2.8.

Percent of drinking water samples not adequate to the hygienic standards on chemical and microbiological parameters

Region	Chemical parameters					Microbiological parameters				
	1997	1998	1999	2000	2001	1997	1998	1999	2000	2001
Russian Federation	20.0	20.6	19.7	20.3	n.d.	10.3	n.d.	9.9	9.4	n.d.
Republic of Karelia	50.6	58.4	71.3	62.4	53.4	17.2	n.d.	17.3	17.6	19.1
Kalevala	83.6	100	55.6	57.7	50.6	21.9	36.8	74.2	36.2	71.2
Olonets	75.0	40.9	73.3	58.8	50.0	13.3	24.2	15.9	38.3	25.0
Landenpokh'ya	42.1	44.4	46.8	45.7	46.8	64.4	57.7	68.8	54.5	45.4
Loukhi	100	88.2	88.5	95.4	96.3	46.1	53.2	77.8	74.7	81.9
Muezersky	75.3	38.9	n.d.	53.6	47.1	42.8	46.6	n.d.	33.3	65.9
Pitkyaranta	n.d.	n.d.	n.d.	n.d.	n.d.	34.5	57.4	59.6	32.8	43.3
Pryazha	2.1	24.7	24.3	25.0	3.9	50.7	42.2	45.3	47.9	45.3
Pudozh	21.1	39.1	94.5	75.9	84.9	30.7	27.7	14.6	32.6	26.0
Suoyarvi	94.8	94.5	98.6	94.7	98.3	60.5	34.3	44.6	37.2	36.0
Sortavala	94.0	93.0	93.3	98.3	87.1	n.d.	n.d.	n.d.	n.d.	n.d.
Belomorsk's district	33.3	100	100	100	100	n.d.	n.d.	n.d.	n.d.	n.d.
Kem's district	75.0	99.7	98.2	100	95.5	n.d.	n.d.	n.d.	n.d.	n.d.
Segezha's district	76.9	100	95.3	100	84.2	n.d.	n.d.	n.d.	n.d.	n.d.

n.d. is no data

Table 2.7.

Discharge of wastewaters in selected cities and districts of the Republic of Karelia in 1994 and 2002.

City/district*	Polluted waste waters, million m^3		Contaminants discharged															
			Biodigradable organic matter (BOD_{total}), thousand tons		Petroleum hydrocarbons, thousand tons		Suspended matter, thousand tons		$N\text{-}NH_4$, tons		$N\text{-}NO_3$, tons		P_{total}, tons		Fe_{total}, tons		Detergents, tons	
Year	**1994**	**2002**	**1994**	**2002**	**1994**	**2002**	**1994**	**2002**	**1994**	**2002**	**1994**	**2002**	**1994**	**2002**	**1994**	**2002**	**1994**	**2002**
Republic of Karelia	216.0	199.0	8.19	4.62	0.05	0.03	7.51	5.28	721	329	659	730	228	210	109	99.5	30.0	18.65
Belomorsk*	4.9	1.12	0.21	0.05	0.00	0.00	0.17	0.04	26.7	10.59	0.3	0.29	4.9	1.24	4.8	3.72	0.5	0.37
Kalevela*	0.1	0.48	0.37	0.07	0.00	0.00	0.02	0.02	6.5	11.42	-	0.02	-	1.57	-	0.24	0.1	0.51
Kem'*	6.9	0.99	0.16	0.08	0.16	0.00	0.20	0.07	18.1	20.45	0.4	1.07	3.7	4.88	-	2.43	1.6	0.44
Kondopoga*	56.3	53.64	4.30	2.59	0.01	0.01	3.32	2.66	101	64.95	74	25.47	64	56.60	2.0	56.15	9.7	5.02
Lakhtenpokhsky*	0.9	1.00	206	0.03	0.00	0.00	0.10	0.02	12.3	5.29	0.7	9.68	2.2	1.37	1.5	0.96	0.8	0.13
Medvezh'egorsk*	2.0	0.95	0.45	0.17	0.00	0.00	0.26	0.20	26.3	18.40	1.6	1.58	7.5	4.07	1.7	2.56	1.6	0.63
Muezevsky *	0.3	0.22	0.01	0.00	0.00	0.00	0.01	0.00	4.5	0.30	0.6	0.37	0.1	0.08	0.1	0.07	-	0.35
Olonets*	0.9	0.64	0.02	0.02	0.00	0.00	0.02	0.02	5.5	3.17	0.8	1.06	0.7	1.91	0.2	0.063	0.1	0.14
Pitkyaranta*	16.0	23.54	0.14	0.18	0.00	0.00	0.33	0.36	15.5	1.91	4.5	5.38	6.3	4.20	-	0.38	5.4	2.38
Prionezhsky*	1.7	1.00	0.06	0.02	0.00	0.00	0.09	0.01	11.8	9.86	8.6	2.98	1.6	1.52	0.5	1.69	0.1	0.198
Pryazha*	0.5	0.46	0.00	0.01	0.00	0.00	0.01	0.01	2.8	1.38	3.6	1.25	1.0	0.39	0.1	0.67	0.1	0.06
Segezha*	44.0	38.87	0.84	0.58	0.01	0.01	0.89	0.33	346	57.47	54.7	46.08	6.6	13.26	0.9	5.93	3.1	4.49
Suoyarvi*	2.5	1.75	0.13	0.04	0.00	0.00	0.08	0.04	5.2	3.30	13.7	9.46	0.3	2.07		0.97	0.3	0.14
Petrozavodsk	53.9	47.62	0.71	0.46	0.00	0.00	1.46	1.12	47.4	54.20	411	439	116	103	96.1	7.22	3.7	2.12
Kostomuksha	15.9	21.11	0.07	0.10	0.00	0.00	0.12	0.10	22.4	26.58	80	159	-	8.89	-	9.62	0.5	0.27

3.2.5. Seawaters

The part of the territory of Karelia is washed by the White Sea. Area of the sea is 90 thousand km^2, its volume is 6 thousand km^3, mean depth is 67 m, maximal depth is 350 m. Extent of the Karelian part of the White Sea shore line is more than 850 km.

The hydrological and hydrochemical regimes of the sea are formed under the continental runoff impact (more than 200 km^3/year) and water exchange with the Barents Sea (2200 km^3/year) through a shallow strait named Gorlo (Throat) of the White Sea.

The rivers runoff influences not only over hydrochemical regime of the sea, but also on its biological productivity, as the rivers bring amount various mineral and organic matters to the sea.

The total volume of water extracted from natural water bodies of the White Sea basin was 69.5 millions m^3 in 2001. Waste waters discharged into surface water bodies of the White Sea basin totals 76.29 millions m^3, including 13.9 millions m^3 of waste waters from tailings storage of JSC "Karel'skij okatysh". 10.4 millions m^3 of wastewaters are discharged without preliminary treatment, including 0.96 millions m^3 discharged directly to the White Sea (city of Kem' and Belomorsk).

The major contaminants entering the White Sea with wastewaters are:

- organic contaminants (expressed in BOD_{total}) -1080 tons;
- suspended matter - 770 tons;
- petroleum hydrocarbons- 10.0 tons;
- nitrogen compounds -262 tons;
- phosphorus compounds - 31 tons;
- fluorides - 1.8 tons;
- potassium - 1704.1 tons;
- methanol of 6.32 tons;
- sulphates - 8490 tons;
- chlorides - 850 tons;
- iron - 26 tons.

The greatest volume of contaminants enter with insufficiently treated waste waters of JSC "Karel'skij okatysh", and also with untreated sewage of cities Kem' and Belomorsk, settlements of Louhi, Chupa and Kalevala where there are not wastewater treatment facilities.

3.2.6. Industrial and communal wastes.

Waste management (collecting, decontamination, disposal and recycling of waste products) is one of the most acute environment problems in the Republic of Karelia. In 2002, total formation of wastes was 68.411 millions tons, including 68.146 millions tons (99.6 %) wastes of 5th hazard class. The fraction of 1st-4th hazard class wastes was 0.265 millions tons (0.39 %), where only 0.0002 % (or 32.8 tons) belongs to the 1st class of hazard.

Among wastes of 1st hazard class (extremely hazardous), mercury containing wastes account for 97.6 %. In connection with lack of installations for treatment of used luminescent lamps and mercury containing instruments in the Republic of Karelia, collecting, storage and utilization of mercury is carried out by the firm "Ecological enterprise "Mercury" (St. Petersburg). In 2002, the enterprises of Republic Karelia farmed out 93030 lamps containing mercury, 124 mercury thermometers and 23.5 kg of metallic mercury for utilization.

In 2002 wastes of 2nd class (highly hazardous) were formed 5087.4 tones or 0.007 % from total waste amount. The wastes of oils and other petroleum products are almost completely recycled or burned.

Wastes of 3rd class (moderately hazardous) formed 13052.17 tons (0.02 % from total waste amount) in 2002. This class includes the following kind of wastes: metallurgical slimes, waste of emulsions and admixtures of petroleum and other waste of petroleum hydrocarbons. All formed amount of metallurgical slimes is located in the specially equipped storage of solid waste products.

Wastes of 4th class (poorly hazardous) make up 247108.24 tons (0.36 % from total waste amount). In general, they are waste products of cellulose, ash and slag from furnace installations, waste of mechanical and biological wastewater treatment. 95 % of waste products of cellulose are farmed out to other enterprises for utilisation, and the little part are located on-site dumps. 73 % of ash and slag wastes from furnace installations are also located at on-site dumps (ash ponds), 50% of wastes of mechanical and biological cleaning of wastewaters are deposited in sludge storage sites.

In 2002 was formed 68.146 millions tons (99.6% from total amount) wastes of 5th class of hazard (practically non-hazardous). This class is including the following kinds of waste:

- wastes of ore mining - 97.7 %, 95 % from them are deposited at onsite dumps (high shafts of strip-mining rock, tailings storage);
- wastes of other mineral resources mining. 73 % are located in high shafts, 27% from them will be utilized;
- green wastes and mill ends. 95% of waste are utilized, remaining mass is accumulated and stored at the enterprises;
- animal wastes, 75% of them are utilized as fertilizers by agricultural enterprises, and partially accumulated in dung-yards;
- municipal wastes, 100% are located on dumping ground of solid domestic wastes.

In 2002, 98% of hazardous wastes were formed by 7 largest enterprises of the Republic (Table 2.9). The contribution of these enterprises to formation of wastes of 1st and 2nd classes of hazard is not accounted, as the wastes of these classes are formed, basically, with luminescent lamps and waste oils. The major contribution to wastes of 3rd class of hazard (32% of total amount of this class wastes) belongs to JSC "Nadvoitsky aluminium smelter" (used electrodes, etc.).

63.9% of wastes of 4th class are formed by JSC "Kondopoga". They are lignosulfonates, coal ash, activated sludge from industrial wastewater treatment, sludge of primary sedimentation tanks for treatment of lye-containing waste waters. Wastes of 5th class of hazard almost completely are formed by waste of JSC "Karel'skij okatysh". It is strip-mining rock (53.8 millions tons), and mine refuses (12.7 millions tons).

Table 2.9.
Formation of hazardous wastes by the largest enterprises of the Republic of Karelia in 2002

Enterprise	Total (tons)	Class of hazard				
		1st class	2nd class	3rd class	4th class	5th class
JSC "Petrozavodskmash"	26999	0.2	141.0	111.0	1649	25096
JSC "Kondopoga" (PPCM)	314235	3.9	85.1	3.3	158035	156107
JSC "Segezhsky PPCM"	62469	3.9	48.2	91.9	8031	54294
JSC "PM Pitkyaranta"	46659	0.7	26.6	229.0	1051	45351
JSC "Nadvoitsky Aluminium smelter"	12138	0.1	100	4232	2078	5726
JSC "Karel'sky okatysh"	66615584	6.5	259.0	32.2	1001	66614285
JSC "LFK Bumeks"	30336	0.1	57.0	1780	512	27985
Total in Republic Karelia	68411474	32.9	5087.4	13052	247108	68146194

The major formation of hazardous wastes are contributed by enterprises of: metallurgy - 66.6 millions tons (97.4%), timber and pulp and paper industry - 0.955 millions tons, industry of building materials - 0.366 millions tons, communal and unicipal services - 0.350 millions tons.

In 2002, decontamination and utilization of the most hazardous wastes (1-4 classes) was 28.7 thousand tones. However, it is only 52%, remaining mass of wastes is located for storage on the specialized waste storage sties at the enterprises, or on dumping grounds of solid domestic wastes. In connection with an annual increasing of wastes at the enterprises, and also with growth of waste formation, a matter of decontamination and utilization of solid wastes is a top priority in Karelia.

There is the computerised "Information system for inventory and estimation of environmental conditions at landfills" in the Republic of Karelia. According to that, there are 206 landfills in the Republic, including 157 dumping sites of solid domestic wastes, which are not in line with existing regulations, so they are sources of high hazard for the environment. In connection with an annual increasing of waste bulks at the enterprises, decontamination, utilization and disposing of hazardous waste is the most acute problem.

Thereby, the following issues are of great concern:

- implementation of low-waste technologies at the acting and being built enterprises;
- improvement of infrastructures on the separate collecting, recycling and decontamination of various kinds of solid industrial and domestic wastes;
- recycling and utilization of high-tonnage wastes (mining wastes) and specific industrial wastes cumulated at the enterprises of Republic;
- utilization and recycling of oily wastes;
- rehabilitation of non-authorized and spontaneous dumping grounds, management of dumping grounds of solid domestic wastes.

The studies on estimation of waste products impact on a state of terrestrial and aquatic ecosystems carried out in 2001 at the area of Petrozavodsk's dumping ground have shown that the rivers Neluksa and Orzega have negative anthropogenic impact. Extremely high concentrations of phosphorus, nitrates, iron, aluminium, manganese and copper were

determined in waters of these rivers. Effect of urban dumping ground on ecosystems of Neluksa River is conditioned by off-flow of melioration ditches draining territory of dumping ground. It is largely noticeably on the data of bacteriological analysis.

The results of studies confirm that dumping ground of solid domestic wastes adequate to the current ecological requirements is necessary to build in Petrozavodsk in near future. Waste management and monitoring of dumping grounds in the Republic of Karelia need to be improved.

3.2.7. Stocks of obsolete pesticides.

The situation with stocks of obsolete pesticides in the Kepublic of Karelia is presented in Table 2.10. Special attention should be paid to the stock of 2500 kg DDT in JSC “Sortavala Agroservice”, which are produced in 1979 and stored in poor state. Relatively large amount (4100 kg) of unidentified mixture of pesticides is stored in JSC “Agrochimiya” since 1975 in paper bags, which are considered in a bad state.

In general, the situation with stocks of obsolete pesticides in the Republic of Karelia can raise concerns, and should be improved.

Table 2.10.
Stocks of obsolete pesticides in the Republic of Karelia, kg*

Location/enterprise	Total, kg	Chlorinated	Phosphorus	Mercury	Other	Mixture	Unknown	Poor state	Comments
“Sortavala Agroservice”	2500	2500						2500	
“Zarechnoye”	804	540			264				
“Tuksinsky”	616	400			216				
“Tolvuysky”	60		60						
“Zaitsev JSC”	662				662				
“Konchezerskoye”	40				40				
“Shoksha”	90				90				
“Dzyubenko”	1602				1602			400	
“Puikola-2”	362				362				
“Kurieki”	738				738				
“Vyalimyaki”	140				140				
“Agro-Yakkima”	1250				1250			850	
“Vozrozhdenie”	964				964				
“Inyinsky”	300				300				
“Megregsky”	650			150	500				
“Vidlitsky”	122				122				
“Agrarny”	1770				1770				
“Agrokhimiya”	5404				1304		4100	4100	
“Veldozersky”	585				585			585	
“Mayak”	500				500				
“Shun’gskoye”	140				140			140	
“Teplichny”	120				120				
“Pudozhskoye”	1000				1000				
Total	20,419	3440	60	150	12,669		4100	8,575	

* - liquid pesticides are registered in liters, in the table they are conditionally accounted in kg, taking I L and 1 kg.

3.3. Environmental situation in the Arkhangelsk Oblast.

3.3.1. Demographic and basic economic trends.

Since the previous NEFCO/AMAP Report, population of the Arkhangelsk Oblast, including Nenets Autonomous Okrug, continued to decrease. For the 10-year period (1990 – 2000) total population decreased from 1574,7 thousand to 1458,5 thousand (almost 7,4%). The State Committee for Statistics of the Russian Federation developed the demographic forecast, according to which population of the Arkhangelsk Oblast may decrease to 1380 thousand by 2005, and to 1258 thousand – by 2016. At the same time, the period after 1998 (the most critical year for the Russian economy) is characterised by growth of employment (both relative and absolute) and decrease of unemployment. General indices of socio-economic characteristics are presented in Table 3.1. According to them, the recent years are characterized by economic activities and certain stabilization of social situation.

Table 3.1.

Indices of basic socio-economic characteristics
(cost characteristics are in comparable prices, in per cents to 1997)

Socio-economic characteristics	1997	1998	1999	2000	2001
Population number	100	99	98	97	96
Mean annual number of employed	100	99	103	105	107
Total unemployment	100	117	124	102	72
Real population income	100	82	77	89	101
Real population expenditure	100	89	90	120	119
Real mean monthly salary	100	88	77	93	109
Gross regional product	100	96	107	124	-
Industrial production	100	103	126	164	174
Agricultural production	100	104	101	102	98
Retail trade turnover	100	97	89	106	134

3.3.2. Public opinion on environmental threats.

Public opinion pool clearly indicate that public concern on the state of environment in the Arkhangelsk Oblast occupies the third place after rise in prices and crime (Table 3.2). It should be noted that environmental concerns since the previous NEFCO/AMAP Report remained stable, with the exception of the default period, when cost of living became a dominant issue.

Public opinion pool of March 2000 has documented major environmental threats that concern the population (Table 3.3). However, it should be noted that the priorities among environmental threats significantly differ depending on the area of the Oblast. It can be explained by a large territory of the Oblast, and remoteness of large groups of population from environmental “hot spots”. For example, the Kotlas and Koryazhma population is much more concerned about the impacts of pulp and paper industry compared to construction of floating nuclear power plants in Severodvinsk. On the whole, based on the public opinion, the state of the environment within the last decade (1990 – 2000) became worse. Deterioration of the environment is more often stressed by urban population (63%),

and stabilization of the environmental situation – by rural one (42,2%). Improvement is noted by 5,1% only.

Table 3.2.

Trends in social tension factors (N = 1000)

Social tension factors	XI 1994	X 1995	V 1996	V 1999	III 2000	V 2001
Lack of foodstuff and everyday good in shops	15	3	2	1.4	1.0	0.7
Rise in foodstuff and everyday goods prices	85	75	48	70	56	52
Threat of unemployment	47	24	22	22	20	15.1
Falling-off of industrial (agricultural) production	41	23	31	25	4	13
Crime	54	41	39	24	33	39.6
Crisis in the spheres of morality, culture, education	35	18	21	17	20	20.1
Deterioration of the environment	36	21	25	11	16	21.3
Tensions among nationalities	13	7	12	5	7	-
Social injustice	15	21	24	25	14	17.8
Corruption	27	14	15	52	-	-

Table 3.3.

Assessment of environmental threats by the population (March 2000) N = 1000, p < 0.05%

Main environmental threat for Arkhangelsk Oblast	Total	Including						
		Small towns	Rural	Arkhan-gelsk	Severo-dvinsk	Kotlas Koryazhma	Onega	Shen-kursk
Possibility of nuclear tests resumption at Novaya Zemlya	39.1	44.8	29.6	52.9	45.6	31.5	36.7	20.0
Possibility of nuclear wastes dumping	58.9	70.1	40.3	73.6	88.9	38.9	70.0	35.0
Risk of nuclear accidents in Severodvinsk	27.5	34.0	16.5	26.4	75.6	-	33.3	-
Environmental impact of Plesetsk launching site	59.1	48.0	77.7	48.6	34.4	57.4	40.0	90.0
Possibility of NPP construction in Arkhangelsk	14.4	16.9	10.2	25.7	14.4	3.7	13.3	-
Environmental impact of pulp and paper mills	30.5	36.3	20.9	37.9	20.0	83.3	10.0	15.0
Risk of negative effects from exploration of oil, gas, diamonds, etc.	3.5	2.3	5.3	2.1	-	7.4	3.3	-

3.3.3. General trends in industrial pollution.

General trends in industrial pollution can be evaluated based on volumes of environmental releases (emissions, waste water discharges, solid waste formation) compared to industrial production. Total industrial production is calculated as the difference between cost of goods produces by industry and cost of goods and services consumed during the production process. NEFCO/AMAP expert group estimated the existing trends based on data of state statistics and yearbooks on the state of the environment. It should be noted that information on data quality control of state statistics data is not available, and data for some years seams to be questionable. However, general trends can be clearly seen (Table 3.4).

Table 3.4.

General trends in industrial production and environmental releases in Arkhangelsk Oblast.

Parameter	Unit	Year			
		1998	1999	2000	2001
Industrial production	Ru x 10^6	13,263	27,185	42,821	43,512
Ibid., with inflation index	-"-	13,263	21,748	33,054	31,386
Industrial air emissions	t x 10^3	240.3	330.3	268.3	280.5
Polluted waste waters	m^3 x 10^6	439.0	522.0	543.5	541.2
Toxic wastes	t x 10^3	395.6	523.4	382.3	322.1

Data presented in the table show that specific environmental releases per conditional production unit has a general decrease trend. In 2001, compared to 1998, specific industrial emissions decreased from 18.1 to 8.9 kg/1000 Ru in comparable prices. During the same period, toxic wastes formation was reduced from 29.8 to 10.2kg/1000 Ru. Discharge of polluted waste waters decreased less significant: from 33.1 to 17.2 m^3/1000 Ru. It can be concluded that pollution control in Arkhangelsk Oblast to the reporting period became more efficient, however, absolute numbers are still high, and particular attention should be paid to reduction of waste water discharges.

3.3.4. Air pollution.

As earlier, four cities (Arkhangelsk, Koryazhma, Dovodvinsk and Severodvinsk) contribute the largest part of total emissions. Plesetsky and Lensky Districts (rayons) should be added to them. Their contribution comprises about 75% of total emissions in Arkhangelsk Oblast. (Table 3.5).

Table 3.5.

Dynamics of industrial gas emissions from stationary sources in Arkhangelsk Oblast (thousand tonnes)

	Year					
	1993	1998	1999	2000	2001	2002
Total in Oblast (without NAO)	457.1*	240.3	330.3	268.3	280.5	264.7
Arkhangelsk	67.0	40.9	41.5	44.4	53.1	55.2
Koryazhma	19.0	26.3	18.9	27.8	22.3	13.8
Novodvinsk	48.0	49.0	55.3	60.3	54.2	52.2
Severodvinsk	62.2	49.0	55.3	60.3	54.2	52.2
Lensky District	-	49.4	46.9	9.3	22.1	7.2
Plesetsky District	-	8.8	8.3	8.9	9.1	17.3

* - including NAO.

Facilities of the space launch site “Plesetsk” is the main gas emission source in Plesetsky District. The large compressor station at the gas pipe line is responsible for gas emissions in Lensky District. Taking into account that gas releases from the compressor station are not regular, its emissions vary significantly from year to year. Information on major pollutants in gas emissions in the above cities is presented in Table 3.6.

In general, state statistics data document noticeable reduction of industrial gas emissions in major polluting cities, except Novodvinsk. It documents particularly strong reduction of emissions of specific contaminants, mostly related with pulp and paper industry (up to 10 times and more). It has been explained to the expert group by the environmental protection authorities that, in spite of measures taken by the polluters and improvement of pollution control efficiency, such drastic reduction is mostly explained by changing of emission estimate methodology. Based on their opinion, current emission data on specific contaminants is more reliable. However, significant difference in changes of some specific contaminants in different cities requires more detailed study of effectiveness of control and data reliability.

Information on emissions from major polluting enterprises in the above cities is presented in Table 3.7. In spite of measures taken since the first NEFCO/AMAP Report, air pollution issues remain critical in Arkhangelsk Oblast. Data in the tables clearly document that major air pollution issues originate from two types of sources: heat and power plants and pulp and paper mills. The first case is characterised by large amounts of acidifying compounds. In spite of the absence of CO_2 emission data in the state statistic reports, these enterprises should be considered as significant contributors of this greenhouse gas. It should be also noted that in spite of comparable amount of SO_2 emissions, heat and power plants differ significantly in dust emissions (see Table 3.7, Severodvinsk). Such a difference can be explained by different fuel used (HPP-1 uses coal, while HPP-2 – mazut).

Pulp and paper industry creates major air pollution problems in Arkangelsk and; particularly, in Novodvinsk and Koryazhma. This type of industry causes special public concern, since specific contaminants emitted by the mills, besides toxic effects, have clear organoleptic characteristics. Arkhangelsk pulp and paper mill in Novodvinsk is the matter of particular concern, since industrial emissions from this enterprise continue to grow. At the same time it should be stressed that Novodvinsk and Koryazhma are the cities which economy and wellbeing totally depend on these enterprises.

3.3.5. Freshwater resources and drinking water.

Freshwater quality remains a serious problem for Arkhangelsk Oblast. Taking into account that drinking water quality depends on three major components (water quality in a water source, water treatment and state of water supply network), all these components have been considered by the expert group.

Discharge of polluted waste waters into surface water bodies mostly corresponds to trends of economic activities, rather than environmental protection measures (Table 3.8). The growth of a share of polluted waste waters that are discharged without any treatment is an alarming trend. Amounts of contaminants discharged with waste waters into water bodies (selected general variables) are presented in Table 3.9. Taking into account that pulp and paper industry is a large water consumer (more than 80% of total water use) that usually discharge

Table 3.6

Industrial emissions in major pollutant cities of Arkhangelsk Oblast in 1993 and 2002 (thousand tonnes)

City	Total		SO_2		NO_x		Dust		CO		Specific contaminants (tonnes)	
	1993	2002	1993	2002	1993	2002	1993	2002	1993	2002	1993	2002
Arkhangelsk	67.0	55.2	32.3	29.3	6.8	3.6	17.7	14.2	9.0	7.3	Ammonia-4.8; acetic acid -42.9; H_2S-100.4; methanol-79.6; ethanol-559.2; toluene-43.5; formaldehyde-32.2; xylol -53.2; ethylacetate-36.1; white spirit-50.1; furfurol -46.9; methylmercaptane-82.1; turpentine-45.8	Ammonia-4.8; acetic acid-4.8; H_2S-19.0; methanol-4.9; ethanol-32.5; toluene-25.5; formaldehyde-0.2; xylol -27.3; ethylacetate-3.5; white spirit-18.9; furfurol -1.1; methylmercaptane-7.1; turpentine-0.3
Koryazhma	19.0	13.8	4.3	1.3	4.2	3.7	4.8	3.8	2.0	3.4	Dimethyldisulphide-314.9; Cl_2-30.7; H_2S-1524; turpentine-248.8; methanol-648.4; ethanol-46.6; methylmercaptane-504.8	Dimethyldisulphide-216.2;; Cl_2-10.6; H_2S-414.8; turpentine-100.0; methanol-119.0; ethanol-57.3; methylmercaptane-85.8
Novodvinsk	48.0	52.2	8.8	22.0	4.3	4.5	26.1	19.3	7.1	5.0	H_2SO_4-35.0; H_2S-761.2; turpentine-150,8; methanol-66.2; ethanol-186.7; methylmercaptane-193.0	H_2SO_4-11.0; H_2S-85.4; turpentine-246.0; methanol-67.6; ethanol-0.04; methylmercaptane-20.4
Severodvinsk	62.2	53.0	44.4	36.3	5.2	5.0	11.0	10.7	1.3	0.7		

Table 3.7.

Industrial emissions from major enterprises of the Arkhangelsk Oblast in 2002.

Enterprise	Share in city, %*	Emissions, t					
		Total	Dust	SO_2	CO	NO_x	Specific contaminants
Arkhangelsk							
Heat and power plant	44.4	24,525	60.5	21,952	54.1	2420	
Solombala pulp and paper mill*	18.9	10,415	5,083	3,381	1,081	867	H_2S-18.8; Cl_2-0.7; methanol-9.2; ethanol-2.5
Koryazhma							
Kotlas pulp and paper mill	98	13,621	3,825	1,237	3,422	3,710	H_2S-415; Cl_2-10.6; methanol-119; ethanol-52.4;dimethyldisulphide-216; dimethymcylphide-150; methylmerkaptane-85.8; turpentine-100; lignosulphonates -91.5
Novodvinsk							
Arkhangelsk pulp and paper mill	99	51,999	19,228	21,993	4,999	4,478	H_2S-85.4; methanol-67.6; methylmerkaptane-20.4; turpentine-246; dimethyldisylphide-126; dimethylsulphide-716
Severodvinsk							
Heat and power plant-1	71	37,840	10,273	23,867	305	3,395	
Heat and power plant-2	24	12,803	29.6	11,352	15	1,406	

* - state statistic report from this enterprise contains no data on the presented specific contaminants. However, most of the specific contaminants presented in the state statistic report from the city, based on expert opinion, originate from this enterprise.

Table 3.8.

Trends in total waste water discharge, mln. m^3

Characteristic	1994	1995	1996	1997	1998	1999	2000	2001	2002
Polluted waste waters	570.2	574.3	464.8	478.9	439.0	522.0	543.5	541.2	538.9
Incl. without treatment	37.3	38.1	40.4	45.4	34.1	46.1	49.8	55.5	55.7
Incl. insufficiently treated	532.9	536.2	424.4	433.5	404.9	475.9	493.7	485.7	457.6

Table 3.9.

Discharge of waste waters in selected cities and districts (rayons) of the Arkhangelsk Oblast in 1994 and 2002, tonnes.

City/district	Polluted waste waters, mln. m^3		Contaminants discharged, tonnes															
			Biodagradable organic compounds (BOD)		Petroleum hydrocarbons		Suspended matter		Mineralization (dry residue)		P_{total}		$N\text{-}NH_4$		$N\text{-}NO_3$		Detergents	
	1994	2002	1994	2002	1994	2002	1994	2002	1994	2002	1994	2002	1994	2002	1994	2002	1994	2002
Oblast total	570	539	36560	18020	258	30	53140	20910	48070	103600	613	331	4141	823	307	194	70.3	35.7
Arkhangelsk	77.1	81.8	3660	1460	28	0.0	4430	3170	2150	1390	118	72.8	1516	184	14.1	12.8	7.1	1.6
Koryazhma	235	208	14650	10830	150	10	29418	11010	0.0	0.0	230	53.5	1479	148	0.0	0.0	22.1	20.8
Novodvinsk	163	146	15660	4560	60	5.2	11376	5240	0.0	0.0	16.6	32.6	1479	148	0.0	0.0	11.5	5.3
Severodvinsk	95.0	49.5	390	300	20	0.0	1180	570	18260	86130	138	100	259	118	141	48.8	5.4	3.7
Kotlas	0.87	11.1	180	170	0.0	0.0	160	160	4590	4020	7.56	10.4	90.7	105	1.49	43.9	11.5	1.72
Plesetsky d.	27.2	17.5	320	30	0.0	0.0	440	140	8150	1110	11.4	1.34	93.1	2.01	114	2.01	0.1	0.7
Onega	4.42	4.57	610	220	0.0	0.0	630	150	6150	5910	26.4	6.77	408	92.6	0.08	0.0	0.02	0.0
Velsky d.	3.81	2.93	190	130	0.0	0.0	190	120	1860	1150	17.9	16.8	49.8	30.7	7.58	30.4	4.38	0.09

Table 3.10.

Waste water discharges from major pulp and paper mills of the Arkhangelsk Oblast in 2002.

Enterprise	Waste water discharge, mln. m^3						Specific contaminants							
	Total		Without treatment		Insufficiently treated		Turpintine		Methanol		Formaldehyde		Lignosulphonate	
	1994	2002	1994	2002	1994	2002	1994	2002	1994	2002	1994	2002	1994	2002
Solombala PPM, Arkhangelsk	70.7	69.4	0.8	0.35	69.9	69.1	21.2	8.1	32.1	6.3	4.9	1.4	905.8	1006
Arkhangelsk PPM, Novodvinsk	244.2	171.8	6.6	4.1	156.6	142.1	61.6	65.3	342.9	48.7	51.3	7.8	56904	4710
Kotlas PPM, Koryazhma	292.3	261.7	12.4	9.6	222.3	184.9	68.1	15.8	2644	1013	55.8	78.8	11285	30689

considerable amounts of specific contaminants, Table 3.10 presents data on discharge of specific contaminants by large mills.

In general, the situation with waste water discharges into the surface water bodies has improved since 1994. However, in some cases (Severodvinsk) the data document significant (up to 4.7 times) increase of contaminant load with waste waters, in particular, dissolved salts.

In spite of a noticeable improvement of the situation with waste water discharges from pulp and paper industry, their impact of surface water bodies remain strong. It should be also taken into account that waste water treatment of these enterprises are used for treatment not only industrial effluents, but communal waste waters as well, with all corresponding consequences.

For the beginning of 2001, Arkhangelsk Oblast had 2144 surface and ground water supply sources., 386 of which were use for centralized water supply system, and 1758 – for decentralized (distributed) water supply. 23.8% of water supply sources of the centralized system have no sanitary protection zones (in 1996 – 30.5%). Compared to the Russian average, this number is 1.5-2.5 times higher. Almost every fourth source of the centralized, and every second of distributed water supply systems dies not meet the sanitary regulations.

In 2000, 59.9% of water samples from the sources of the centralized water supply system do not correspond to chemical guidelines (compared to 57.9% in 1995), and correspondingly 24.8% and 24.3% to microbiological guidelines. The situation with distributed water supply sources is even worse.

More that 40% of tap water samples in Arkhangelsk Oblast in 2001 did not meet the guidelines on chemical variables, and 16% - on microbiological variables. High warn-out of water supply pipelines (70-100%) is a serious problem. There were 930 accidental large-scale pipeline breakdowns in Arkhangelsk Oblast in 2001. On the opinion of local medical scientists, mouth part of the Northern Dvina river cannot any more be used for household and drinking purposes by Arkangelsk and Novodvinsk population.

3.3.6. Industrial and communal wastes.

Temporal trends in formation of toxic solid wastes is presented in Table 3.11. Based on data presented, it would be possible to conclude that there is a general trend on reduction of solid waste formation. However, after introduction of new forms of state statistic reports on solid waste formation in 2002, new data on annual toxic solid waste formation became

Table 3.11.

Temporal trends in formation of toxic solid wastes in Arkhangelsk Oblast, thousands tonnes

	1994	1996	1998	2000
Total annual formation	486.6	608.7	395.6	382.3
Used and treated	21.2	39.3	72.5	64.0
Deposited	428.7	403	310.9	315.5

incomparable with previous reports. For example, according to State statistic report for 2002, total annual amount of toxic wastes (Hazardous classes 1-4) is 2235.2 thousands tonnes. It is beyond the responsibility of the NEFCO/AMAP expert group to analyse the reasons for such an incompatibility, however, it is necessary to state that the waste management system in Arkhangelsk Oblast has serious deficiencies.

It would also necessary to point out strong disbalance between formation and treatment of wastes. As the result, total amount of solid wastes since the previous NEFCO/AMAP Report increased more than three times, and reached 12.2 million tonnes. Most of wastes (89%) is formed by industrial enterprises, among which heat and power plants (44.7%) and pulp and paper industry (32.4%) are the leaders. Total area of deposition sties is 1,422 ha.

3.3.7. Land pollution.

Among all issues of land and soil pollution in Arkhangelsk Oblast, land contamination due to military activities is a special case. Military units occupy an area of 4,889.1 thousands hectares (12% of all land funds of Arkhangelsk Oblast). At present, 58 land sites, with total area of 1,748.42 hectares should be transferred to Oblast for economic use. However, according to information from the environmental protection authorities, their pollution state does not allow local authorities to accept this transfer before their decontamination. Some examples are presented below.

Kumbysh Island is located in the Northern Dvina delta, and is a component of the Dvina state biological zakaznik. After evacuation of a military unit, Land rehabilitation has not been done, and large amounts of metal scrap, construction wastes and chemical containers is located at this site.

Garrison "Letneozersk":

- Accidental release of 1000 tonnes of aviation fuel on landscape due to destruction of a fuel tank;
- Due to drawbacks of local waste treatment facilities, there was a repular discharge of oily waste waters on landscape;
- In the area of petroleum products depot, mean soil contamination at depth of 30 cm is 194 mg/kg.

It should be noted that this storage facilities are located directly over the Permilov ground water deposit, and development of karst events create conditions for penetration of oily waters into this valuable aquifer.

Depots of petroleum products is coastal areas of the Arctic Seas (Nizhniaya Zolotitsa, Letny Navolok, Mezen, Morzhovets Island) have high levels of contamination with petroleum hydrocarbons (up to 90 mg/kg at depth of 1 m). Petroleum hydrocarbons are permanently washed-out to the White Sea.

Garrison "Savvatia", Kotlassky Rayon:

Under the three military petroleum depots, more that 2000 tonnes of petroleum products are present as "lenses" on the upper layer of ground waters, and even larger amount are dissolves and bounded with soils. These highly contaminated ground waters are discharged into the Limenda river, in the mouth of which the source of water supply for Kotlas city is located.

Frantz Jozef Land (FJL) is the matter of a special concern. By the decree of the Russian Government, the federal preserved territory ("zakaznik") with the area of 42,000 hectares has been organized there in 1994. However, the territories of the closed polar meteorological stations and, particularly, of military units are highly contaminated. In total, about 30-40 thousand tonnes of aviation fuel and spent lubrication oils are deposited at the areas that previously belonged to the Ministry of Defence. Some of them are stored there since 60-70th. The containers are corroded, and are leaking. This situation is particularly alarming- since FJL is located in the High Arctic, and environmental release of petroleum hydrocarbons and, particularly, spent lubricating oils can cause strong impact of the whole vulnerable Arctic environment. It should be noted that, among 180,000 tonnes of PCB produced in the former USSR, 53,000 tonnes have been used for production of varnish, paint and, possibly, lubricators. It is impossible to exclude that spent lubrication oils for aviation engines did does not contain PCB as lubricator. In this case, circumpolar threat from FJL contamination sources can be extremely high.

It should be noted that the Administration of the Arkhangelsk Oblast has developed the Oblast Targeted Program "Works on protection, localisation and elimination of oil and petroleum products spills at the territory of Arkhangelsk oblast in 2003-2007" with the total budget of 45 million Roubles, including 10 million Roubles from the oblast budget and 35 million from industrial enterprises. Monitoring and management of oil contaminated area, including due to former and current defence activities, is one of main goals of this program. At the same time, financial resources planned to be spent for implementation of this program, does not look sufficient for solving this problem in the region.

Issues of spent motor oils are closely linked with soil pollution in general and oil contamination in particular. Within the last 10-12 years, there is a stable trend of reduction of collection and treatment of spent motor oils Table 12. To solve this problem, the Oblast Administration has developed the targeted program "Collection and treatment of spent motor oils". However, this program is not approved by the Head of Administration yet.

Table 3.12.

Trends in collection of spent motor oils, tonnes

1991	1992	1993	1994	1995 and later
16,659	13,821	5,182	1,166	0

3.3.8. Persistent Organic Pollutants.

3.3.8.1.Dioxin pollution.

Traditional technologies of pulp and paper industry, which are used in Arkhangelsk Oblast, include using of cellulose bleaching with molecular chlorine. This technology creates favourable conditions for generation of dioxins as by-products. Besides, using of chlorinated phenols with high levels of dioxins and furans for anti-septic timber treatment was widely applied in the past. Main enterprises of pulp and paper and wood processing industries are located in the basins of Northern Dvina and Onega rivers.

The first screening of dioxin/furan contamination, in connection with these economic activities was made in 1993, and is briefly covered in the NEFCO/AMAP Report of 1995.

Since 1997, an integrated assessment of levels and spatial distribution of dioxin contamination have been and is being performed within the framework of the Federal targeted programme “Protection of the environment and population from dioxins and dioxin-like toxicants in 1996-1997” and for the expense of the polluting enterprises. The list of enterprises that can be former, actual or potential sources of dioxin contamination is presented in Table 3.13.

Table 3.13.

Main enterprises that can form dioxin and dioxin-like by-products in the basins of Northern Dvina and Onega rivers.

City/settlement	Enterprises	
	Timber processing	Pulp and paper
Arkhangelsk	Solombala TPCP, TPCP-1, TPCP-2, TPCP-3, TPCP-1, Tsiglomen TPCP, Kegostrov TPCP, Kuznechevsky TPCP TP-2, TP-3. TP-12, TP-14	Arkhangelsk PPCM (Novodvinsk)
Kotlas	Kotlas TPCP	
Koryazhma		Kotlas PPCM
Konosha		Cellulose Plant-5
Onega	Onega TPCP	
Shaluksha	Shaluksha TP	
Permilovo	Permilovo TP	
Mezen	Mezen TPCP	
Pechora	Pechora TP	
Shangaly	Shangaly TB	
Ezhva (Rep. Komi)		Syktyvkar TICP, Northern Dvina basin

TPCP – Timber processing combined plant; PPCM – pulp and paper combined mill; TP – timber plant; TB – timber base; TICP – Timber industrial combined plant.

Surveys made in Solombala TPCP, Onega TPCP, Shalakusha TP and TP-2 has shown that soil pollution at these enterprises, which used sodium pentachlorophenol reached 1.1 mg/kg of this toxicant. Dioxin levels are also high. For example, dioxin levels at the territories of Onega TP and TP-2 at the surface layer (0-10 cm) is =.2000-830.0 µg/kg in TE, and 69.4-117.0 µg/kg at the depth of 60-80 cm. According to tentative estimates, total amount of dioxin and furans in soil in 1999 was 1.3 kg, including 0.8 kg in Arkhangelsk.

3.5.2. Stocks of obsolete pesticides.

Inventory data on stocks of obsolete pesticides, according to the information available from the Arkhangelsk Branch of the Ministry of Natural Resources are presented in Table 3.14. In spite of a large total amount of obsolete pesticides in the Oblast, the amount of chlorinated pesticides that are the matted of special environmental and human health concern do not exceed 2 tonnes. At the same time, taking into account a poor state of storage of obsolete pesticides (around 50% of them are stored in unsatisfactory, or even bad conditions), stock of obsolete pesticides should be considered as one of environmental “hot spots” for this area, particularly for such districts as Krasnoborsky, Ustyansky, Kholmogorsky, Pinezhsky.

Table 3.14

Stocks of obsolete pesticides in Arkhangelsk Oblast, kg*

District (rayon)	Total, kg	Chlorinated	Phosphorus	Mercury	Other	Mixture	Unknown	Poor state	Comments
Verkhnetoemsky	556	22	60	-	224	150	100	90	
Vilegodsky	318	24	-	-	294	-	-	125	
Vinogradovsky	2889	-	-	80	2442	322	-	1590	
Kargopolsky	1580	95	330	-	1003	-	-	593	
Kotlassky	1599	75	277	-	1247	-	-	-	
Krasnoborsky	8073	80+160 HCH packs	125	75	5027	-	2552	4358	
Lensky	1225	-	220	-	475	350	180	-	
Nyandomsky	1940	180+168 HCH packs	-	-	1760	-	-	1670	
Pinezhsky	4871	37	32	-	4377	-	425	1130	
Plesetsky	1551	50	85	125	1221	-	70	1521	
Primorsky	3016	67	842	28	1389	-	690	570	
Ustyansky	7801	472	108	-	4581	-	1979	6668	4689 kg are re-packed and prepared for utilisation
Kholmogorsky	4895	877	-	-	3078	1000	-	2548	
Shenkursky	1957	-	180	-	1722	-	55	657	
Total	42.220	1879+328 HCH packs	2259	308	28840	1822	6051	21547	

* - liquid pesticides are registered in liters, in the table they are conditionally accounted in kg, taking 1L as 1 kg.

It should be noted that implementation of the ACAP Obsolete Pesticides project in the Russian Federation, in which Arkhangelsk Oblast is considered as one of pilot areas, has promoted some steps for improvement of the situation. For example, Ustyansky District has already re-packed more than 4.5 tonnes of pesticides, and prepared them for further handling. However, it is questionable, whether the local bodies responsible for handling stocks of obsolete pesticides would be able to solve this problem without an external support.

3.4. Environmental situation in the Nenets Autonomous Okrug (NAO)

3.4.1. Demographic situation.

According to the State Statistics of Russian Federation, resident population of NAO was 44.9 thousand people in 2002. In comparison with 1998, NAO population decreased by 0.8 thousand (1.8%) (Table 4.1).

In 2001, the birth rate 13.3 per 1000 was higher than in 1998 (12.4). However death rate was higher too in 2001 compare with 1998 (12.4 and 9.5 per 1000, respectively). In 2001, life duration was 71 years for womankind and 56 years for mankind. In 1998, these parameters were 70 and 61 years, respectively.

Table 4.1.
Trend in resident population of Nenets Autonomous Okrug, thousands

Year	1998	1999	2000	2001	2002
Total population	45.7	45.5	45.2	45.0	44.9
0-15 years	26.2	25.3	24.5	23.7	23.1
Employable population	61.3	62.1	62.8	63.4	63.7
Disabled population	12.5	12.6	12.7	12.9	13.2

n.d. is no data

3.4.2. General trends in industrial pollution.

General trends in industrial pollution can be evaluated based on volumes of environmental releases (emissions and waste water discharges) compared to industrial production. NEFCO/AMAP expert group estimated the existing trends based on data of yearbook on the state of the environment and State Committee of Russian Federation of Statistics. General trends are presented in Table 4.2.

Table 4.2.
General trends in industrial production and environmental releases in NAO

Parameter	Unit	Year				
		1997	1998	1999	2000	2001
Industrial production	$RU \times 10^6$	3992.6	4017.8	4447.4	5475.1	5710.9
Industrial emissions	$ton \times 10^3$	32.7	25.2	20.8	36.1	36.6
Specific emission	kg/1000 RU	8.2	6.3	4.7	6.6	6.4
Polluted waste waters	$m^3 \times 10^6$	1.007	1.081	no data	1.121	0.873
Specific pollution	m^3/1000 RU	0.25	0.27		0.20	0.15

Data presented in the table show, that specific environmental releases per conditional production unit has a general decrease trend. In 2001, compared to 1997, specific industrial emissions decreased from 8.2 to 6.4 kg/1000 RU in comparable prices. Discharge of polluted wastewaters decreased from 0.25 to 0.15 m^3/1000 RU.

3.4.3. Air pollution

In 2002, air emissions from stationary and mobile pollution sources were 35.1 thousand tons (in 2001 total amount of emissions was 36.6 thousand tons), including 1.47 thousand tons of dust and 33.6 thousand tons of gaseous and liquid pollutants. Associated gas emissions during oil extraction are a very high, and methods of associated gas utilisation are not developed in NAO. The low development of associated gas utilization is explained by remoteness of NAO fields from the consumers, that create difficulties in its technically and economically feasible use.

In 2002, 24.5 thousand tons of pollutants were emitted in the atmosphere by stationary pollution sources. The basic components of air emissions are: ashes (0.72 thousand tons); soot (0.72 thousand tons); SO_2 (3.75 thousand tons); CO (12.2 thousand tons); NO_2 (4.6 thousand tons) and hydrocarbons (2.4 thousand tons). The major polluters of atmosphere are energy producer companies. They are "Total RRR", JSC "Varandeygaz", JSC "Arcticneft", "Kompaniya Polyarnoye Siyanie" Ltd, JSC 'Pechoraneft' and "Lukoil-Komi" Ltd (Table 4.3).

The main pollution source of atmosphere in NAO is torch burning of mineral oil and associated gas. According to 2000 data, emissions of open torch fires of associated gas and mineral oils contain soot, SO_2, CO, NO_2 and hydrocarbons, which amount to 7%, 13%, 70%, 2% and 8% of total emission of these pollutants respectively. In total there are 1700 exploration wells in NAO. A lack of control of exploratory wells operation by the environmental protection authorities is one of the most urgent environmental problems of region. Most of wells are in need of serious maintenance . About 20 of them are environmentally unsound. During surveys by the service of the Ministry of Emergency Situations in 2002 at Korovinskoe and East -Korovinskoe fields, and also on earlier observations it was found that at some inhibited and abandoned wells on these fields there is a free excretion of a hydrogen sulphide in concentrations from 0,04 up to 0,008 %. It is known, that hydrogen sulphide with concentrations from 0.0013 % (20 ??/? ^{3}) and more is a harmful admixture causing intensive corrosion of drilling equipment, and, as a consequent, emergency situations. For safe exploitation of well and development the recommendations for further use of wells more detailed examination on hydrogen sulphide effects, data on design features of downhole equipment and terms of its presence in a zone of hydro-sulphuric impact are required.

In the early 1980s, the was an explosion of natural gas and condensate during the drilling operation at well #9 of the Kumzhinskya field and disaster lasted from November 1980 until May 1987. A huge torch went up in flames and the accident was so enormous that in May 1981 a nuclear charge was blasted to shift the layers and to seal the gas outburst off. However, this measure failed. For six and half years running, this well's daily eruption amounted to two million cubic meters of gas and hundreds of tons of condensate. When the fire-belching torch died it was built a filling dam on accident site. Over 10 billion rubles were spent for well #9 during the seven years period. However, consequences of an accident have not been eliminated yet. It should be noted that since December 1997 the area, where well #9 and other 15 abandoned wells are located, belongs to the Nenets Nature Reserve. These wells are situated in the vicinity of Korovinskaya Bay - the breeding and feeding area of many commercial fish species. In 2001-2002 surveys elevated levels of metals (chromium, mercury, lead, nickel) were found in this area. In the pit formed by explosion there is a jelly-like substances with a high content of oil hydrocarbons. Levels of oil

hydrocarbons in the pit water exceeded MAC in 191 times. More detailed survey is required in order to evaluate the current status and to develop measures for elimination of accident consequences in this area.

Table 4.3.

Industrial emission of major enterprises in NAO in 2002, tons

Enterprise	Total	Dust	SO_2	CO	NO_2	Hydro-carbons	Specific contaminants
"Total RRR" (Survey, exploitation, development)	4472.7	0.0	2126.8	1154.8	533.6	158.5	H_2S 1.1; methane 2.7
JSC "Varandeygaz"	2597.7	210.5	50.2	1735.2	183.2	218.7	Acrolein 2.1
JSC "Arcticneft"	2576.2	101.2	66.6	1718.1	246.3	203.2	Acrolein 2.4; vopours of benzine 33.9; V_2O_5 1.2; methane 23.2
Company “Polyarnoye Siyanie" Ltd	1868.0	8.3	10.7	1350.3	304.0	193.7	Acrolein 1.1.
JSC 'Pechoraneft"	1686.2	170.1	5.0	14.8	55.8	1440.0	Acrolein 0.6;
"Lukoil-Komi" Ltd	1528.2	59.7	0.0	715.6	332.7	311.1	Xylol 1.3; toluene 1.1; acetone 0.16; butanol 0.23; methane 104.7
Municipal service of the Nenets district	1210.8	324.5	297.6	160.3	379.7	48.7	
State industrial combine "AMNGRE"	1018.4	7.6	18.2	7743.9	203.5	26.3	Acrolein 2.3; methane 16.5
JSC "Severgeoldobycha"	957.0	33.2	73.4	178.2	586.0	78.3	Acrolein 7.7.
Naryan-Mar heat and power plant	617.6	10.0	20.1	315.8	244.4	24.7	Actrolein 2.4; methane 0.3

In 2002, the atmospheric emissions from mobile pollution sources were 10.6 thousand tons (9.7 thousand tons in 2001) Increase of gas emissions from mobile sources is connected to expansion of oil- and gas-fields development. Mobile sources emitted soot (25.2 tons); SO_2 (516.2 tons); CO (7.2 thousand tons); NO_2 (1.2 thousand tons); hydrocarbons (1.6 thousand tons); lead (1.06 tons) and acrolein (0.66 tons).

The decrease trend in air emissions took place during 1996-2000 (Table 4.4.). However, in 2001 their volumes have increased. As the data on air emissions were given by not all enterprises of NAO in 2002, these data not quite reflect a matter of fact. Therefore, it is possible to assume, that atmospheric emissions have increased in 2002 in comparison with 2001 or have remained at the same level.

Table 4.4.

Trends in atmospheric emissions in NAO during 1996-2002, thousand tons

Pollutant	Year						
	1996	1997	1998	1999	2000	2001	2002
Total	32.7	21.0	25.3	20.8	36.1	36.6	35.2
Dust	1.6	1.5	1.3	1.3	2.4	1.9	1.5
SO_2	1.0	n.d.	1.2	0.9	4.3	4.9	3.8
CO	14.0	n.d.	12.1	12.5	22.7	20.5	16.6
NO_x	3.2	n.d.	3.5	2.8	3.1	5.0	4.8
Hydrocarbons	12.9	n.d.	7.1	3.0	3.5	4.1	5.0
"n.d." is no data.							

The increase of a number of small companies creates significant environmental challenge in NAO. As a rule, they do not industrial gas treatment facilities and environmental control services, therefore do not meet the environmental legislation of Russian Federation.

3.4.4. Freshwater resources and drinking water

In 2002, total water intake from water bodies of Nenets Autonomous Okrug amounts to 6.76 millions m^3, including 2.67 millions m^3 extracted from underground sources. Compare to 2001, water intake increased by 1.57 millions m^3 due to increase of water consumption by oil and gas production and municipal enterprises.

In total 1.11 millions m^3 of waste waters were discharged into the surface water bodies including to:

- Pechora river (close to Naryan-Mar city) - 0.944 millions m^3 (Naryan-Mar city municipal service);
- Kolva river (close to Kharyaga settlement) - 0.137 millions m^3 ("Lukoil-Komi" Ltd);
- the lakes - 0.031 millions m^3 (JSC "Pechorsky fishing combine").

In comparison with 2001, waste waters discharge was increased by 0.25 millions m^3 (Table 4.5.).

Table 4.5.

Trends in total wastewaters discharge in NAO in 1998 - 2002, million m^3

Characteristic	Year			
	1998	2000	2001	2002
Waste waters discharge:	1.356	1.370	1.245	2.31
Normative clean (without treatment)	0.275	0.250	0.237	1.19
Polluted waste waters: Including:	1.081	1.120	0.873	1.11
Insufficiently treated	1.067	1.095	0.871	1.11
Without treatment	0.013	0.026	0.002	-

0.384 millions m^3 of wastewaters were disposed into the groundwater aquifers by the "Lukoil-Komi" Ltd.

Main contaminants discharged into the surface water bodies are suspended matter, detergents, phosphates and petroleum hydrocarbons. In comparison with 2001, the increase of the following pollutant amount was observed: petroleum, detergents and suspended matters by a factor of 50, 4.7 and 8 respectively (Table 4.6)

Table 4.6.
The main contaminants discharged into the surface water bodies in NAO, tons

Conaminants	Year	
	2001	2002
Petroleum hydrocarbons	0.004	0.200
Suspended matter	16.0	134.5
P_{total}	3.00	2.439
Phenol	0.003	0.002
Detergents	1.0	4.707
Iron	1.0	0.794

There are nine biological and one physico-mechanical wastewater treatment facilities in NAO. Their total capacity is 1.16 millions m^3/year. The capacity of the central wastewater treatment facilities of Naryan-Mar city is not sufficient for treating of all effluents from the central part of the city. The technology used for biological treatment does not correspond to the requirements of surface waters protection (residual levels of pollutants are higher than MAC levels). Therefore their reconstruction is needed. Actually the project documentation for reconstruction of the Naryan-Mar central wastewater treatment facilities is developed. The project provides increase of capacity up to 5000 m^3/day and improved level of treatment.

The problem of drinking water supply with the quality that meets the existing guidelines is one of the most important social tasks for NAO. Poor situation with drinking water supply is caused by a number natural and anthropogenic factors, including climatic and geographical location, large bogginess of territory, small population density, influence of the sea in estuarine areas of the rivers, and also impact of industrial and agricultural enterprises.

Table 4.7.
Drinking water quality in some settlements of NAO

Name of settlement	Water supply type	Parameters of water quality exceeding MAC
Naryan-Mar city	Ground	Ground water: Fe-6 MAC, turbidity-5.5 MAC; colour-3.5 MAC.
Velikovisochnoye settlement	Ground and surface (Viska river and Vadega lake)	Surface water: colour-25 MAC, turbidity-12 MAC, Fe-70 MAC, BOD-2 MAC, NH_4 and nitrates-7-8 MAC, chlorides-1.7 MAC.
Nes' village	Ground/surface	Ground water: colour-2 MAC, Fe-1.3 MAC.
Kotkino village	Ground and surface (Sula river)	Surface water: colour and BOD-3.5 MAC, turbidity-20 MAC, Fe-15 MAC, NH_4-2 MAC.
Nizhnyaa Pesha village	Ground and surface (Pesha river)	Ground water: colour-1.8 MAC, Fe-2 MAC, NH_4-20 MAC.
Krasnoye settlement	Ground and surface	Ground water: colour-7 MAC, turbidity-11 MAC, Fe-2 MAC, NH_4-1.5 MAC.
Oksino village	Ground and surface (Pechora river)	Surface water: colour-3.5 MAC, turbidity-3-5 MAC, Fe-4.5-17 MAC, BOD-3 MAC; Ground water: Fe-2-11 MAC, NH_4-1.5 MAC.
Khongurey settlement	Surface (Pechora river)	Surface water: colour-3.5 MAC, turbidity-3-5 MAC, Fe-4.5-17 MAC, BOD-3 MAC.
Telviska village	Ground	Ground water: Fe-2 MAC.
Kharuta settlement	Ground	Ground water: Fe-6-8 MAC.
Amderma settlement	Surface (Bol'shoye Tuin-To lake)	Surface water: Fe-2 MAC.
Andeg village	Surface (Pechora river)	Surface water: Fe - 3 MAC, colour-2 MAC, turbidity-2.0-2.5 MAC, BOD-1.8 MAC.

Sources of drinking water supply in NAO are ground and surface water bodies:

- ground water supply only 14 settlements 68 % of the NAO population
- surface water supply only 16 settlements 17 % of the population
- mixed (ground and surface) water supply 11 settlements 15 % of the population

Potable water quality meets sanitary guidelines only at one settlement (2% of the population), does not meet sanitary guidelines at 19 settlements (86% of the population) (Table 4.7). The is no information on water quality at other 8 settlements (13 % of the population).

The increased iron concentrations in ground waters is associated with the natural factors. The increased contents of other pollutants is a result of anthropogenic impact and is caused by poor safety of aquifers and absence of sanitary protection zones of existing water intakes. For example, pollution source of ground waters used for supply of Naryan-Mar population, is the municipal dumping ground, which is located close to the water intake. The water supply for Naryan-Mar is aquifer "Ozernoe", which is under exploitation since 1978. Term of exploitation of ground water reserves was counted for 25 years, at a daily water intake of 5800 m^3. According to the specifications, on expiration of the given term it is required to reassess the reserves. At present, only 12-14 of 24 ground water wells are exploited, other are under reparation or suspended. Daily need of potable water in Naryan-Mar is 4500-5000 m^3 in winter and about 3000 m^3 in summertime. The city is developing continuously and in the nearest future water consumption will increase. In May 2003 Administration of NAO made a decision to conduct exploitation survey to find the new locations of water supply wells. Under consideration is site "Tel'visochny", located near settlement Telviska, where exploration surveys have been conducted in the 80s.

3.4.5. Industrial and communal wastes.

In 2002, solid and liquid domestic waste were disposed at authorized landfills. Available landfills do not meet environment and sanitary requirements:

- there are no any sanitary protection zones,
- there are no rain waters landfills filtrate removal and treatment systems;
- there are no waterproof screens.

Landfills in the NAO are located in adverse geological and hydrological sites (of ground waters exit, sandy and peat soils, at the territories flooded during a spring high water, water protection zones of rivers and lakes). In the majority of landfills the waste dumping technology is not followed: there are no records of waste delivery, radiation control of wastes is not organized. The collection system also does not provide separation from SHW the secondary raw materials (scrap metal, wood, paper, etc.).

In 2002, 392 thousand tons of hazardous wastes were generated, including 0.387 thousand tons of especially hazardous wastes (1^{st} and 2^{nd} hazard classes) (Table 4.8). Used mercury-containing luminescent lamps (1.334 tons), the phased-out accumulators (11.7 tons), used motor oil (333.7 tons) and drilling sludge (11254 tons) are the most hazard and widespread waste products in NAO.

The absence of mercury containing waste-handling system remains the problem for NAO. Actually, such wastes are stored at the enterprises and probably are illegally taken out on dumping grounds.

The most part of other toxic wastes are accumulated at the enterprise territories (Table 4.9) or is burnt because of absence of waste processing productions. The low level of use and neutralization of industrial wastes is explained by:

- absence of necessary capacities,
- low level of application of modern technologies,
- deficiency of the equipment on waste processing,
- poor economic interest of the enterprises in processing and recycling of waste.

Table 4.8.

Waste products formed by various branches of industry of NAO in 2002, tons.

Branch of industry	Class of hazard					
	1st	2nd	3rd	4th	5th	Total
Electric-power industry	0.026	42.0	0.6	420		463
Fuel industry	0.312	25.1	9905.3	24695		34626
Consumer goods industry	0.002			143		143
Food processing industry	0.100	1.5	1025.9	4225		5253
Printing trade	0.004		0.1	1		1
Agriculture	0.212	174.4	400.6	11862		12438
Transportation	0.101	25.8	23.5	5417		5466
Municipal service	0.071	11.5	418.7	299597		300027
Others	0.506	105.7	4984.3	28156		33246
Total	1.334	385.9	16759	374518		391665

Table 4.9.

Formation, use, neutralizing and disposal of solid wastes, tons

Class of hazardous and pollutant	Availability beginning of 2002	Formed during 2002	Used and neutralized	Transferred for using neutralizing and disposal	Storage at enterprise territories	Availability for 2002 end
In total the 1st class	3.20	1.33		0.87	2.70	3.67
Mercury	3.20	1.33		0.87	2.70	3.67
In total 2nd class	1482	386	102	105	1587	1663
Petroleum hydrocarbons	1290	334	98	108	1347	1423
H_2SO_4	192	52	4	0	240	240
Others	0.056	0.297		0.048	0.305	0.245
In total 3rd class	970	16759	11527	5638	1185	1217
Accumulator lead	14.2	11.7	2.8	5.5	13.8	16.2
Drilling sludge	612	11254	9568	2346	612	612
Others	345	5493	1956	3286	560	589
In total 4th class	2525218	374518	11528	35218	1875724	1385764
Coal dross	186	4358	958	3193	361	385
Others	2525032	370161	10569	32025	1875362	1385379
In total for all classes	2527673	391665	23156	40962	1878499	1388648

The currently existing in Naryan-Mar handling system of solid domestic waste consists of gathering waste into containers, cesspools and tippers and their transportation by specialized and other motor transport to landfills. Besides, household waste waters are also transported to dumping grounds since most of existing housings are not canalized and capacities of existing treatment facilities are insufficient. However, due to recent commissioning of new treatment facilities and increasing capacity of existing ones volume of household wastewater entering the landfills decreases every year. In other NAO settlements removal of solid and liquid household waste is carried out to authorized and illegal landfills.

The system of solid domestic waste collection does not provide separation of hazardous wastes (mercury-containing, power sources, plastics, etc.), storage of such wastes at landfills results, particularly in case of fire, in environmental contamination by hazardous toxic substances. Disposed solid domestic waste, together with hazardous wastes, are exposed to the influence of atmospheric precipitation that results in penetration of pollutants into soil depth and subsequent transport with ground waters. The situation is aggravated with a lack of solid domestic waste dumping grounds equipped with environment facilities, and low capacities of waste treatment facilities in Naryan-Mar and settlements of NAO. There are no enterprises on processing or incineration of solid domestic waste in NAO, only small amounts of solid domestic wastes are incinerated at industrial sites, basically of oil-and-gas branch.

3.5. Environmental situation in the Republic of Komi.

3.5.1. General information.

The total land area of the Republic of Komi is 416.6 thousand km^2 (2.4% of Russia total land area). The longest way is from Southwest to Northeast - 1275 km the distance from Moscow to Syktyvkar is 1200 km. The region is wooded lowland, stretching across the Pechora and the Vychegda river basins and the upper reaches of the Mezen River. The northern part is permanently frozen, wooded tundra.

Today in the Republic of Komi there are 179 nature reserves, and 106 nature monuments. They together cover 6 082, 241 ha, i.e. 14,6 % of the total area of the Republic of Komi. The largest specially protected areas are the Pechoro-Ilychsky Nature Reserve (721 322 ha) and the National Park "Yugud va " (1 891 701 ha) situated on the western slopes of the Northern and Sub-arctic Ural and lowlands of the right bank of the Pechora River. This largest virgin taiga forest is included in the World Heritage List of UNESCO.

The Republic of Komi possesses the state power and sovereignty on its territory to full extent, excluded the rights delegated to the Russian Federation. It is an independent participant in foreign economic affairs, has the right to foster foreign loans and to implement industrial and trade programs with western financial participation under guarantee of the republican budget, to give privileges to the foreign companies, to register joint ventures.

3.5.2. Demographic situation

The Republic of Komi is multinational - the region is the most ethnically diverse in Russia. The population of the Republic is 1.1 million citizens. About 50% of population are Russians, and, in addition, there are 263 000 Komi, as well as other nationalities. The Komi, formerly called Zyrians, speak a Finno-Ugric language and adhere to the Russian Orthodox religion. Population density is 3 inh's/km^2. The largest population centres are presented in Table 5.1.

Table 5.1.

Largest Population Centres in the Republic of Komi as of 01.01.2000

Rank	Town	Population (1000)
1	Syktyvkar	246,6
2	Vorkuta	168,9
3	Ukhta	125,6
4	Pechora	83,5
5	Usinsk	59,7
6	Inta	59,4
7	Sosnogorsk	58,3
8	Vuktyl	24,8

By the beginning of 2002, resident population of the Republic of Komi was 1117 thousand people. It was declining continuously since the beginning of 90s (Table 5.2). In comparison with 1995, a population of the Republic decreased by 84 thousand (7.0 %). The decrease in population in the Republic of Komi is a cause of several factors – a falling of birth and a rising of death rates, and growing net emigration. The death rate has exceeded the birth rate

in the Republic of Komi since 1992. In 2001, the birth rate was 9.2 per 1000 (9.3 in 1995). The death rate remains high and was 12.5 per 1000 (12.6 in 1995).

Table 5.2.

Trend in resident population in the Republic of Komi (1992-2002)

Population, thousand	1990	1995	1997	1998	1999	2000	2001	2002
Urban	959	900	874	862	853	842	831	824
Rural	306	302	300	299	296	293	293	291
Total	1255	1201	1176	1163	1151	1137	1126	1117
0-15 year	350	304	281	268	254	239	226	214
Working age	777	747	739	737	738	739	742	743
Above working age	128	150	156	158	159	159	158	160

In 1989-90 the average life expectancy in all regions of the northwest Russia, including the Republic of Komi, was the same as in the Russian Federation as a whole, 69.4 years, the lowest life expectancy was observed in Komi in 1994 (61.1 years). As a comparison, average life expectancy in west countries such as Finland is 73-78 years. In 2001, life duration was 71.2 years for woman and 59.4 years for men (in 1995, 69.1 and 55.7, respectively).

3.5.3. Natural resources

In the Republic of Komi there are numerous deposits of solid minerals (Fig. 7). Assessed and explored minerals make up a significant quota in Russia's total stock of natural resources, some of them occupy key position in Russia's total stock. In the first place it refers to bauxite deposits (their stock makes up one third of Russia's reserves) and to the Yaregskoye titanium ore deposit, which is the major deposit in Russia. There are also deposits of manganese, non-ferrous metals (copper, lead, zinc), precious metals (gold, silver, platinum), as well as resources of rare-earth metals – vanadium, gallium, scandium, tungsten, molybdenum, niobium, tantalum, cerium. There also is a significant stock of mining and chemical primaries: barite, rock and potash-magnesium salt, basalt, kaolin, quartz (rock crystal, pieso-quartz, vein quartz) and quartz sand. The Polar Urals contain such semi-precious stones as amethyst, jade, nephrite and serpentine. The Republic has unique stocks of mineral resources represented by combustible minerals, oil and gas, metal ores, and minerals resources. The Republic has thermal and mineral water of different composition, sulphuretten mud and saproryle silt. About 93% of the republic's territory is covered by forest.

The fuel resources are represented by oil and gas of Timano-Pechorsky oil field, coke and energetic coals of Pechorsky coal deposits, oil shale of Vychegodsky and Timano-Pechorsky deposits, peat and timber resources, hydro resources of Pechora and Vychegda river basins. Coal resources of the Pechorsky coal field make about 240 billion tons, 9 of which are balance reserves. The major resources are concentrated in Intinskoye (~26%), Vorgashorskoye (~23%) and Usinskoye (18%) deposits. Coal reserves of the Seidinskoye deposit make 0.8 billion tons. There are also considerable reserves of brown coal on the Nechenskoye and Sharyu-Zaostrenskoye deposits. 41% of the total balance reserves are coking coal. Coking (generally of "Zh" grade, raw material for production of metallurgical coke of high quality) and power-generating coal is extracted in Vorkutinskyi mining region; power-generating high-ash coal is extracted in Inta.

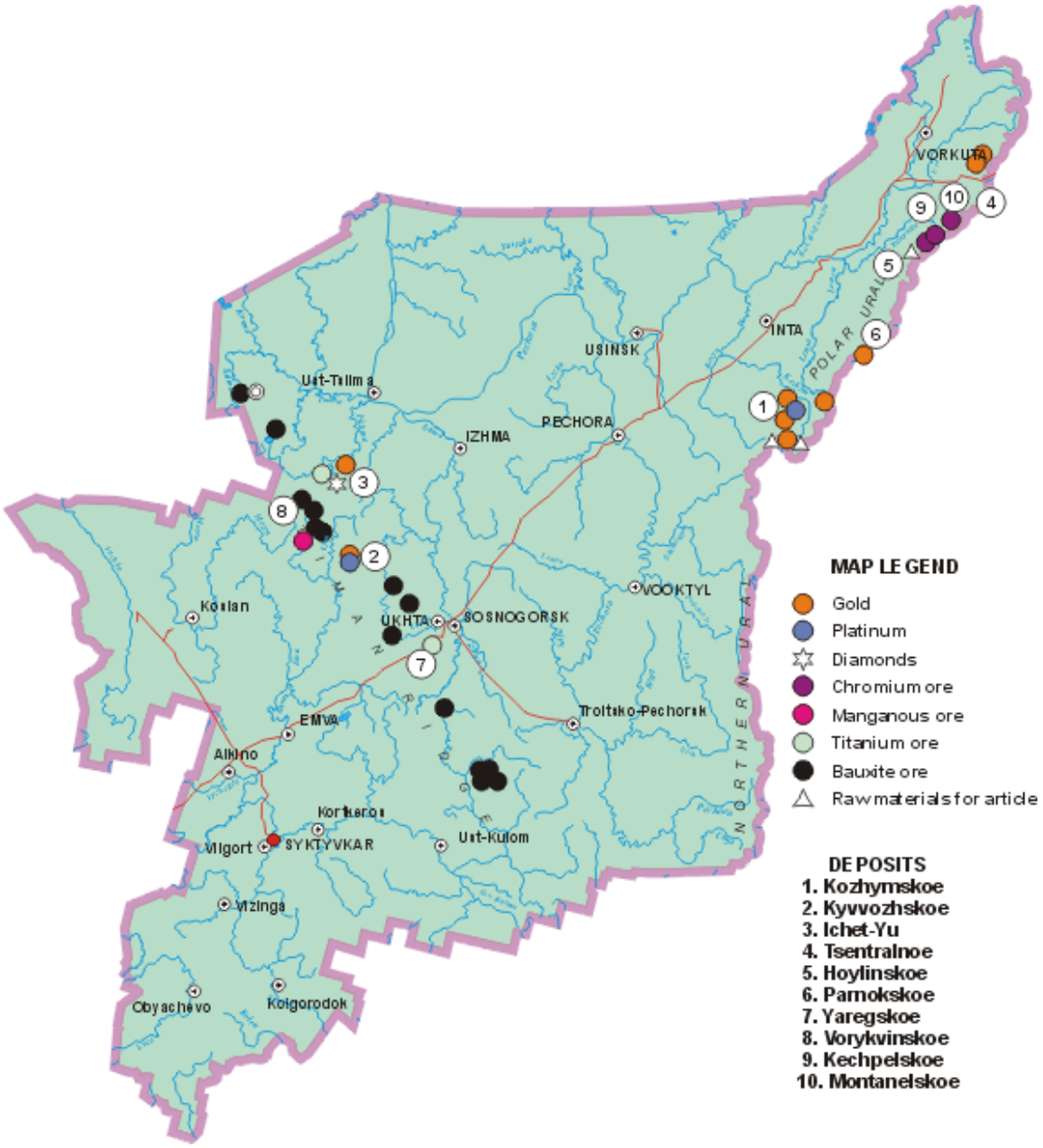

Fig. 7. Solid mineral resources in the Republic of Komi

The Republic of Komi contains about two thirds of oil and gas deposits concentrated at the continental part of the Pechora-Timan Province, that accounts to the half of oil deposits and one thirds of gas deposits available in Russia's European north. Geological stocks are represented by oil – 4 million tons, natural gas – about 3 billion m^3. 120 oil and gas fields have been explored, the most part of which belongs to oil deposits amounted 90. Thirty of oil fields are currently in commercial operation (Fig. 8).

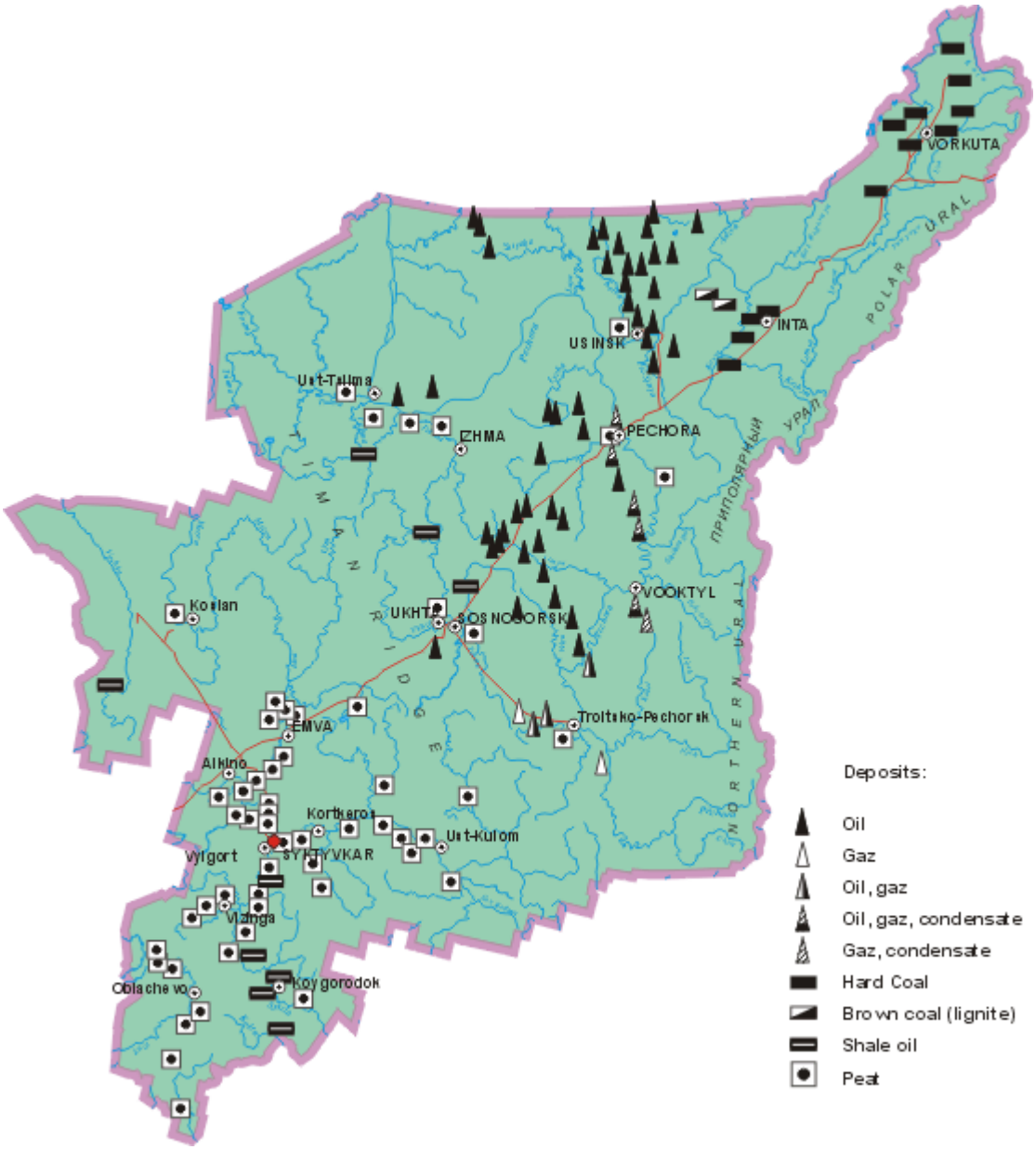

Fig. 8. Oil and gas deposits in the Republic of Komi

3.5.4. Industry

The industry of the Republic of Komi is composed of more than 30 branches. Fuel and raw material branches dominate and produce about 80% of the total industrial products. The main branches are gas and oil industry (46.6% of GNP), timber, wood processing and paper production industry (17.7% of SNP), energetic (19.7% of GNP). The industry employs 31% of the population. Syktyvkar, the capital, is a major lumber centre; Vorkuta is a coal-mining centre.

The Republic of Komi produces today 22 million tons of coal per year (including 14 million tons of coke), 7 million tons of oil and gas condensate, 4 billion m^3 of gas, 8 million m^3 of wood, 1 million m^3 of sawn timber, 380 thousand tons of paper, 170 thousand m^3 of chip boards and other goods. There is also fishing and hunting in the Republic.

3.5.5. General trends in industrial pollution.

General trends in industrial pollution can be evaluated based on volumes of environmental releases (emissions and wastewater discharges) compared to industrial production. NEFCO/AMAP expert group estimated the existing trends based on data of yearbook on the state of the environment. General trends can be clearly seen in (Table 5.3.).

Table 5.3.
General trends in industrial production and environmental releases in Komi Republic.

Parameter	Units	Year			
		1999	2000	2001	2002
Industrial production	$RU \times 10^6$	48529	54643	68978	62360
Industrial emissions	$t \times 10^3$	843.6	686.5	689.4	664.8
Specific emission	kg/1000 RU	17.4	12.6	10.0	10.7
Polluted wastewaters	$m^3 \times 10^6$	602.8	613.5	596.3	571.8
Specific pollution	m^3/1000 RU	12.4	11.2	8.6	9.2

Data presented in the table show, that specific environmental releases per conditional production unit has a general decrease trend. In 2002, compared to 1999, specific industrial emissions decreased from 17.4 to 10.7 kg/1000 RU (decline by 38.7%). Specific discharge of polluted wastewaters decreased from 12.4 to 9.2 m^3/1000 RU (decline by 26.2%) in comparable prices. However, these parameters were higher in 2002 in comparison with the previous year by 6.7 and 6.1%, respectively.

3.5.6. Air pollution.

In 2002, , the total industrial emissions in the Republic of Komi from stationary pollution sources (410 enterprises) have amounted to 664.8 thousand tons. In comparison with 2001, the volumes of emissions decreased by 24.6 thousand tons due to decline in production of some enterprises and environmental protection measures performed by the enterprises.

In 2002, the contents of solid matters (dust), $S0_2$, hydrocarbons and CO was reduced, in comparison with 2001, by 6.3, 2.2, 7.4 and 9.8 thousand tons, respectively. However NO_x emissions increased by 0.45 thousand tons (Table 5.4).

The greatest reduction of gas emissions (12.5 thousand tons) was observed at the Vorkuta district because of decreasing of fuel consumption at Vorkuta HPP-2 and decline in production of JSC "Vorkuta cement plant". The performance of measures on reduction of gas emissions at JSC 'Neusiedler Syktyvkar" (decrease of SO_2 emissions), JSC "Severnaya neft" (utilization of associated petroleum gas), Intinskaya HPP (reduction of NO_x and ash by 20 % per one year on the average), "Zheshartsky plywood combine Ltd" (emissions of a grinding dust) has allowed to decrease of total amount of air emissions by 2618.4 tons.

At the same time emissions of some pollutants were above the maximum permitted volumes at the following enterprises:

- Vorkuta HPP-2 (JSC "AEK"Komienergo"") - coal ash;
- JSC " Vorkuta cement factory " - inorganic dust;
- Intinskaya HPP (JSC "AEK "Komienergo") - coal ash and SO_2;
- JSC "Lukoil-Ukhtaneftepererabotka" - hydrocarbons;

- JSC "Noyzidler Syktyvkar"" - methylmercaptan.

In 2002, the share of trapped pollutants from total industrial emissions has amounted 39.4% (in 2001 - 40.1%), including solid matters - 82.9 % (82.9 %) and gaseous matters - 8.8 % (7.7 %).

The contributions of the leading branches of industry in total volume of gas emissions (thousand tons) were for coal-mining industry - 255.6 (in 2001 - 259.2); gas industry - 92.1 (102.0); oil producing industry - 120.6 (121.3); energy - 96.0 (96.5); building industry - 15.2 (21.4); oil processing - 7.61 (7.6); timber and pulp and paper industry- 28.7 (34.5).

The leading industry branches are responsible for 92.6% of all gas emissions in the Republic. In 2002, the volumes of the major kinds of pollutants (in percentage of total emissions of the given pollutant) were:

- coal-mining industry: dust - 9.2; SO_2 - 7.4; methane - 74.2.
- gas industry: CO - 27.5; NO_2 - 19.
- heat and power stations: dust (ash) - 44.0; SO_2 - 59.4; NO_2 - 44.4.
- oil producing industry: dust - 8.2; SO_2 - 15.1; CO - 43.3; hydrocarbons - 8.7.
- timber and pulp and paper industry (specific pollutants): methylmercaptan - 100, hydrogen sulphide 56.4, sulphuric acid 98.3, chlorine 100 %.

Coal industry is one of the most significant contributors to greenhouse gas (GHG) emissions to the atmosphere. Combustion of coal is a major source of carbon dioxide (CO_2) being emitted worldwide. Moreover, in the process of coal production another important greenhouse gas, methane (CH_4), is being released. Methane is a particularly strong GHG, its greenhouse potential is 21 times higher than that of CO_2. In the same time methane gas resources, such as coal bed methane gas and methane hydrate, are being recognized in these days as an alternate clean energy resources. If the methane gas is extracted with environmentally friendly technologies, the process brings benefits in terms of increased productivity and economic gains. New technologies developed in the local research institutes have been tested and implemented at some Vorkuta mines. Industrial degassing of mines in Vorkuta started since 1956. Of 30 mines in the whole Russia, where degassing of mines is carried out, 6 belong to Joint Stock Company "Vorkutaugol". After 1988 there was a reduction of bulk of the extracted methane, which was stabilized at a level 130 million m^3 per year during the last years. Utilization of mine methane has started in 1975, when on methane began to be used as the boiler fuel. In 1999 in boiler-houses with cumulative power of boiler 150 ? of a steam per hour was recovered 16,3 million m^3 of methane, that corresponds 21.2 thousand tons of conditional fuel.

The major polluters of atmosphere are :JSC "Severgazprom" (Ukhta and Sosnogorsk cities), mines in Vorkuta: "Komsomol'skaya", "Severnaya", "Vorkutinskaya", "Vorgashorskaya" and pulp and paper combined mill" Neusiedler Syktyvkar" (Syktyvkar) (Table 5.5.).

3.5.7. Freshwater resources and drinking water

In 2002, total amount of water intake in the Republic of Komi was 673.81 millions m^3 (in 2001 - 696.82 millions m^3), including from surface water bodies - 565.92 millions m^3. The water intake from ground sources was 107.89 millions m^3.

Table 5.4.

Industrial emissions from stationary pollution sources in the Komi Republic in 2000 - 20002, thousand tons.

City, district	Total			Dust			SO_2			CO			NOx			Hydrocarbons		
Year	2000	2001	2002	2000	2001	2002	2000	2001	2002	2000	2001	2002	2000	2001	2002	2000	2001	2002
Vorkuta	359.24	344.82	331.92	57.93	53.24	44.76	38.73	33.66	34.02	9.36	8.61	8.24	6.97	6.90	6.33	*246.2	*242.4	*238.5
Usinsk	74.80	95.37	98.94	5.35	4.93	5.45	8.71	12.05	9.83	45.58	59.84	60.22	1.57	2.05	1.98	13.50	16.12	21.23
Ukhta	55.20	51.64	55.51	1.41	1.36	1.42	0.24	0.27	0.24	8.87	9.22	8.07	2.96	2.56	2.82	41.54	37.96	42.22
Sosnogorsk	43.80	49.50	49.48	2.01	1.74	1.56	0.85	0.98	0.77	31.76	41.10	40.51	2.45	2.55	3.02	6.66	3.07	3.54
Syktyvkar	32.95	33.16	28.44	3.30	3.21	3.96	1.26	1.78	1.45	23.09	23.29	19.07	3.79	3.40	3.32	0.39	0.40	0.32
Inta	26.75	26.66	26.96	8.84	8.93	9.37	12.70	12.57	12.40	4.11	4.10	4.06	1.04	1.00	1.08	0.01	0.01	0.01
Pechora	30.90	29.75	25.84	2.65	2.47	1.93	0.86	0.39	0.54	13.44	15.71	12.08	4.65	4.69	4.91	9.29	6.48	6.32
Vuktyl	17.77	14.08	9.35	0.47	0.22	0.23	0.38	0.10	0.20	4.35	3.68	3.92	1.49	1.31	1.55	11.06	8.74	3.42
Ust'-Vymsky	9.41	8.49	9.23	0.60	0.70	0.63	0.42	0.43	0.28	3.29	3.31	4.23	1.23	0.99	0.86	3.86	3.06	3.24
Knyazhpogostsky	16.08	15.97	8.19	0.71	0.80	1.18	0.55	0.42	0.44	3.56	3.60	3.00	1.15	1.42	1.64	10.12	9.74	1.93
Ust'-Tsylemsky	2.16	2.57	2.95	1.01	1.25	1.34	0.37	0.61	1.01	0.71	0.63	0.48	0.07	0.08	0.12	0.00	0.00	0.00
Troitso-Pechorsky	2.35	2.03	2.68	0.57	0.64	0.79	0.43	0.57	0.63	0.85	0.70	0.76	0.13	0.12	0.14	0.34	0.01	0.34
Syktyvdinsky	2.21	2.49	2.58	0.89	1.03	1.07	0.26	0.30	0.33	0.70	0.76	0.77	0.09	0.12	0.12	0.01	0.02	0.01
Kortkerossky	2.38	2.30	2.41	0.78	0.72	0.77	0.83	0.94	0.94	0.68	0.55	0.60	0.08	0.09	0.09	0.00	0.00	0.00
Udorsky	2.60	2.67	2.29	0.56	0.62	0.52	0.54	0.55	0.53	1.30	1.36	1.04	0.19	0.13	0.18	0.02	0.01	0.01
Ust'-Kulomsky	2.09	2.12	2.23	0.64	0.61	0.70	0.46	0.48	0.49	0.90	0.97	0.96	0.09	0.06	0.07	0.01	0.00	0.00
Priluzsky	2.33	2.10	1.84	0.78	0.64	0.74	0.49	0.49	0.40	0.99	0.89	0.62	0.07	0.08	0.07	0.00	0.00	0.00
Izhemsky	1.50	1.55	1.54	0.78	0.77	0.88	0.44	0.53	0.36	0.23	0.21	0.25	0.05	0.05	0.04	0.00	0.00	0.00
Sysol'sky	1.00	1.07	1.42	0.20	0.24	0.30	0.22	0.20	0.24	0.54	0.57	0.81	0.04	0.05	0.06	0.00	0.00	0.00
Koygorodsky	0.99	1.09	1.03	0.32	0.39	0.35	0.17	0.21	0.22	0.47	0.45	0.42	0.03	0.04	0.04	0.00	0.00	0.00
Komi Republic	686.51	689.40	664.80	89.79	84.49	77.96	68.90	67.51	65.31	154.77	179.56	170.12	28.14	27.68	28.42	343.06	328.01	321.14

* methane included

Table 5.5.

Industrial emissions of major enterprises of Komi Republic in 2002 (tons)

City	Enterprises	Total	Dust	SO_2	CO	NO_x	Hydrocarbons	Specific contaminants
Ukhta	JSC "Severgazprom"	91938.7	523.7	116.5	46721.5	5377.8	39065.1	methane 37651.2; H_2SO_4 14.3; benzene 31.2; xylol 25.9; toluene 28.2; methylene 18.8;
Ukhta	JSC Lukoil "Ukhtaneftepererabotka"	7601.2	119.7	46.7	950.8	109.6		benzene 100.3; xylol 85.7; toluene 112.2; H_2S 21.0; phenol 4.08.
Ukhta	JSC "Bitran"	7435.4	4.8	18.9	1186.0	381.1	5832.6	methane 4885.3; H_2S 5.5.
Sosnogorsk	"Severgazprom Ltd"	30993.0	0.7	39.0	3738.0	1505.0	25686.0	methane 25686.0; benzene 5.0; xylol 5.0; toluene 5.0; H_2S 0.3.
Vorkuta	JSC "Vorkutinsky cement plant"	13037.9	11304.7	233.0	1311.9	180.5	7.7	
Vorkuta	Vorkutinskaya HHP-1	7569.2		5013.5	1959.6	596.0		
Vorkuta	Vorkutinskaya HHP-2	3463.7		146.5	3317.2			
Vorkuta	Mine "Severnaya"	48252.8	74.8	7.1	204.7	52.1	47910.6	
Vorkuta	Mine "Vorkutinskaya"	43546.0	61.6	87.5	176.5	65.6	4315.1	
Vorkuta	Mine "Komsomol'skaya"	51912.1	66.1	397.8	599.2	292.2	50544.9	
Vorkuta	Mine "Oktyabr'skaya"	15017.1	1229.3	198.0	249.3	107.0	132431.7	
Vorkuta	Mine "Zapolyarnaya"	32955.8	258.2	224.7	597.7	309.8	31565.3	
Vorkuta	Mine "Vorgashorskaya"	33658.3	106.2	1225.8	448.6	237.3	31640.4	
Suktyvkar	" Neusiedler Syktyvkar"	20626.2	35.6	594.2	16997.3	2575.6		H_2SO_4 22.6; H_2S 301.3; Cl 1.5; mercaptan 83.5; turpentine 1.3; acetone 3.5; dioxide of chloride 1.6; white spirit 3.9; xylol 7.6; toluene 11.8.
Syktyvkar	"Syktyvkarsky timber combine"	522.5	2.0	6.8	486.3	27.3		
Usinsk	"Baytek Silur"	2670.0	221.5	199.0	1869.5	109.3	270.4	
	"Yenisei Ltd"	8904.2	850.4	0.3	7092.1	60.9	900.0	
	"Lukoil-Komi"	44562	1397.0	3644.4	29713.5	632.6	9093.6	
	"Lukoil-UPZ"	3522.5	45.7	1.5	373.5	22.8	3075	
	"Mineral-M"	9545.9	534.6	679.3	4482.2	35.7	3769.3	
	"Komineft'"	2437.9	112.0	64.9	1607.4	52.6	591.5	
	"Nobel' Oil"	2692.9	10.0	179	2119.6	125.5	256.6	
	"Severnaya neft'"	14136.5	1309.7	137.4	10869.4	430.3	1385.7	
	"KomiArcticOil"	6251.8	132.9	4628.6	1106.1	14.2	279.6	

In 2002, use of water resources in the Republic of Komi was 616.75 millions m^3 (96.1 % of 2001 level), including 474.78 millions m^3 that was consumed for industrial needs (77% from total amount); 122.62 million m^3 - for municipal-potable needs (19.9%); 14.45 millions m^3 - for maintenance of formation pressure (2.3%); 2.21 millions m^3 - for agricultural needs (0.4%); 2.69 millions m^3 - for other needs (0.4 %).

The largest water consumers are Vorkuta, Inta, Ukhta, Syktyvkar and Sosnogorsk industrial centres, in which the major water consumption branches of industry are located:

- electric power industry - 295.69 millions m^3 (43.9 %);
- timber, pulp and paper industry - 156.22 millions m^3 (23.2 %);
- coal-mining, gas and oil industry - 64.57 millions m^3 (9.6 %);
- municipal services - 148.96 millions m^3 (22.1 %);
- other - 8.37 millions m^3 (1.2 %).

In 2002, wastewater discharge into surface water bodies was 571.95 millions m^3 (95.9% of 2001 level), including 15.63 millions m^3 without treatment; 129.19 millions m^3 insufficiently treated waters; 329.01 millions m^3 of conditionally clean waters (without treatment); 81.14 millions m^3 of normative-treated waters (with biological treatment); 11.51 millions m^3 of normatively-treated waters (with physico-chemical treatment) and 5.47 millions $m^3$of normatively-treated with mechanical treatment.

94.5% of total wastewater volume was discharged by enterprises located in Vorkutinsky, Syktyvkarsky. Sosnogorsky, Ukhtinsky and Intinsky districts of the Republic (Table 5.6).

Basic reduction of wastewater discharges was documented at the enterprises of electric power industry (from 284.07 millions m^3 in 2001 up to 259.01 millions m^3 in 2002) due to a drop of electrical loads in nets at Vorkuta HPP-2 (-21.6 millions m^3) and Sosnogorskaya HPP (-2.2 millions m^3). The increase of conditionally clean water discharge was observed at JSC " Neusiedler Syktyvkar" (+5.0 millions m^3).

In 2002, 223 wastewater treatment facilities operated in the Republic of Komi. Their total treatment capacity was 361 millions m^3/year. There is still a need on additional treatment capacities about 2.6 millions m^3. In a very poor state (practically absence) are the sewage water treatment facilities in small settlements (e.g. Izhma, Ust'-Tsil'ma and Koygorodok). The urgent measures need to be undertaken because untreated sewage waters enter the Izhma, Pechora and Sysola rivers, pose threat to the aquatic environment and human health.

Volumes of polluted wastewaters discharged by the enterprises of following industry branches are as follow:

- without treatment: municipal services - 63.3%; a coal-mining industry - 29.5%, timber and pulp and paper industry - 3.9%, electric power industry - 2.4%, other - 0.9%.
- insufficiently treated: timber and pulp and paper industry - 82.4%, municipal services - 8.1%; coal-mining industry - 5.7%; electric power industry - 0.8%; other - 3%.

Table 5.6.
Waste water discharges in districts of the Republic of Komi in 2002

City, district	Waste waters discharges, million m^3		
	Total	Without treatment	Insufficiently treated
Vorkutinsky	191.050	8.510	2.140
Syktyvkarsky	181.960	5.490	104.770
Sosnogorsky	127.970		3.490
Ukhtinsky	20.530	0.640	1.150
Intinsky	18.720		9.660
Pechorsky	9.480		0.620
Usinsky	8.020	0.360	0.130
Ust'-Vymsky	4.560	0.620	3.920
Knyazhpogostsky	3.610		0.130
Vuktyl'sky	2.320		0.010
Udorsky	1.220		1.120
Syktyvdinsky	0.630	0.010	0.230
Troitsko-Pechorsky	0.600		0.570
Sysol'sky	0.320		0.320
Kortkerossky	0.320		0.320
Priluzsky	0.240		0.240
Ust'-Kulomsky	0.100		0.100
Izhemsky	0.060		0.060
Ust'-Tsilemsky	0.040		0.040
Koygorodsky	0.010	0.005	0.005
Komi Republic	571.790	15.630	129.030

Main volume of wastewaters (570.72 millions m^3, 99.7%) is discharged into basins of the rivers Vychegda and Pechora including 143.68 millions m^3 of untreated wastewaters. In 2001, the following contaminants exceeded MAC in these rivers:

- basin of Vychegda river: BOD_5, iron, cooper, phenols, lignosulfonates, nitrites;
- basin of Pechora river: BOD_5, iron, cooper, DDT, petroleum hydrocarbons, lignosulfonates, phenols, nitrites, $N\text{-}NH_4$, sulphates.

Information on amounts of pollutants discharged with wastewaters into freshwater bodies is presented in Table 5.7.

Drinking water supply in the Republic of Komi is carried out from 270 water bodies, including 22 surface and 248 groundwater intakes. Water from the centralized water supply systems ensures 73% of the Republic populations, from them only 32.7% receive drinking water from the most protected groundwater sources.

Poor state of water distribution network and water-treatment installations to treat potable water quality up to the hygienic guidelines SanPiN 2.1.4.559-96. The high chemical and microbial pollution of drinking water is observed in Syktyvkar, Pechora, Ukhta and Usinsk cities, Knyzhpogostsky, Kortkerossky, Koygorodsky, Ust'-Vymsky districts (Table 5.8).
In 2001, virus contamination of drinking water was found in plumbing of Usinsky, Knyazhepogostsky and Kortkerossky districts. Drinking water of poor quality on organoleptic properties enters to the consumers in Pechora, Vuktyl' cities, Ust'-Tsilemsky and Priluzsky districts.

Table 5.8.
Percentage of drinking water samples not adequate to the hygienic guidelines on sanitary-chemical and microbiological parameters

Cities and districts	Sanitary-chemical parameters			Microbiological parameters		
	1996	1998	2000	1996	1998	2000
Syktyvkar	65.9	77.3	75.2	5.5	5.7	7.1
Vorkuta	21.5	33.1	22.1	4.1	7.8	6.0
Inta	38.0	36.5	24.3	8.2	9.3	2.0
Ukhta	34.4	42.5	29.5	2.0	1.3	3.8
Pechora	54.0	64.0	49.2	1.6	4.1	6.4
Usinsk	78.7	40.3	28.0	3.4	5.9	7.3
Vuktyl	7.0	0.0	31.4	5.5	0.5	0.0
Sosnogorsk	17.7	21.0	9.1	8.7	2.4	2.1
Syktyvdinsky	45.8	53.8	18.2	1.6	4.0	15.2
Sysol'sky	38.0	42.5	45.1	0.0	0.0	0.0
Ust'-Kulomsky	4.4	38.1	22.2	5.4	0.7	2.4
Kortkerossky	66.7	47.9	63.6	18.9	9.4	7.2
Udorsky				22.4	4.5	7.3
Troitso-Pechorsky	13.9	0.0	6.5	2.0	8.4	8.5
Priluzsky	51.4	59.2	41.8	5.7	0.8	3.7
Knyazhpogostsky	20.6	20.5	27.3	2.3	6.4	1.7
Izhemsky	0.0	0.0		27.3	5.2	6.0
Ust'-Tsilemsky	11.1	12.5	58.0	0.0	0.0	0.0
Koygorodsky	20.0	35.7	83.9	5.3	39.7	16.9
Ust'-Vymsky	72.5	58.9	51.0	21.4	17.9	23.2
Komi Republic	37.7	40.2	38.9	6.6	6.3	6.0
Russian Federation	20.6	19.7		10.3	9.9	

Analysis of drinking water quality, performed by the Republican State sanitary-epidemiological control authority in 2002 has shown presence of phenols, DDT and lindane in majority of drinking water samples. There is a strong public concern on drinking water quality. During the NEFCO/AMAP mission in Syktyvkar, the local newspaper published an article “Chemical attack” on drinking water quality. This article also discussed the Republican Program on “Use, protection and rehabilitation of water resources of the Republic of Komi (2004-2015) within the framework of the Federal Program “Water of Russia – XXI century” with respect of drinking water improvement in the Republic.

It should be noted that EBRD is currently developing the Komi Municipal Service Development Project which involves a loan to the water utilities (Vodokanals) of Syktyvkar and Vorkuta. The main objective of project is to support investments on rehabilitation of drinking water and wastewater infrastructure of the two cities and to ensure sustainable technical and financial management of these services. The investments are expected to include: rehabilitation of water mains and wastewater collectors; rehabilitation and upgrading of water treatment plant; energy saving, demand management and leakage reduction programmes. The total cost of the project is estimated at around 30 million EURO, with EBRD loans of 10 million for Syktyvkar Vodokanal and 5 million forVorkuta Vodokanal. In addition, a grant of 5.9 million EURO has been approved by the Northern Dimension Environmental Partnership. The implementation of the project will start by mid-2003.

3.5.8. Industrial and communal wastes

Environmental pollution by industrial wastes is one of major ecological problems in Republic of Komi. Operation of 385 enterprises, leading to waste products formation, utilization, neutralization and storage was analysed for estimation current situation in the Republic. According to data available, 13090.8 thousand tons of wastes of various classes of hazard were formed in the republic in 2002 (Table 5.9).

Table 5.9.
Formation of solid wastes in the Republic of Komi in 2002

Class of hazard	Was formed, thousand tons	% of total
Total, including:	13090.8	100.0
1st class (extremely hazardous)	0.2	0.0
2nd class (highly hazardous)	20.5	0.1
3rd class (moderately hazardous)	965.0	7.4
4th class (poorly hazardous)	8915.0	68.1
5th class (practically non-hazardous)	3190.1	24.4

The largest amount of wastes is formed in such industrial centres as Usinsk, Inta, Syktyvkar, Ukhta, Pechora and Vorkuta cities, also at Sysolsky and Izhemsky districts.

The basic source of waste formation is the fuel industry - 9586.0 thousand tons in 2002. Building materials industry has formed 1087.1 thousand tons of waste; timber and pulp and paper industry - 1071.7 thousand tons; electric power industry - 590.7 thousand tons; agriculture - 351.6 thousand tons, municipal services - 264.9 thousand tons, other industry branches - 138.8 thousand tons.

In 2002, 5972.2 thousand tons of waste (45.6%) were utilized by the enterprises of the Republic. Animal waste are utilized as fertilizers, strip-mining solid wastes formed at a coal mining and building materials production, as well as slag of heat and power stations, are used as materials for technical re-cultivation of territories, the wood wastes are utilized as fuel. However, most of wastes are accumulated at surface dumps of soils and ash, dumping grounds, at enterprise sites, etc.

In 2002, the enterprises of the Republic of Komi have directed to own objects of waste disposal 9811.8 thousand tons of waste, including for storage - 7378.5 thousand tons and for land application 2433.3 thousand tons. Only 668.0 thousand tons (5.1%) of wastes have been decontaminated at the enterprises. 676.8 thousand tons of waste have been transported to other enterprises of the Republic for utilization.

The problem of the centralized collection and utilization of mercury containing waste, in particular of luminescent lamps, is one of the current problems for all cities and districts of Republic of Komi. In 2001, 7.4 tons of mercury containing wastes were formed; only 3.76

tons of which have been utilised. The issue of used automobile tyres handling is also in suspense.

The solid domestic wastes (SDW) is another significant problem, since environmental pollution connected with them claim an immediate construction of the specialized waste treatment facilities according to the environmental requirements for their placement. It is needed not only due to epidemiological hazard of SDW but also due to possible presence of toxic components in them.

Waste storage monitoring has documented that there are only 169 objects of the authorized placement of wastes (dumping grounds) in the Republic. There are no authorized dumping grounds at Vyktyl city area. The municipal dumping ground is located in water protection zone of Pechora River and does not correspond to conservation and sanitary standards.

In connection with insufficient number of the authorized dumping grounds in the Republic, the practice of illegal waste dumping is widespread. The non-authorized dumping grounds of industrial and domestic wastes place in pits, lengthways of roads, in forests and suburban green zones. Total amount of illegal dumping grounds in the Republic of Komi is not known, and the inventory of waste dumping sites has not been conducted in 2002.

In the Republic of Komi, as well as a whole in Russia, waste management continues to remain economically inexpedient. First, because of high expenses, secondly, because of absence of the economic gear of inducing industry to waste handling, and indispensable legislation, in particular of law, which would bind a waste producer to recycle them. As a result, enormous amount of illegal dumping grounds cause not only environmental, but also economic problem.

For co-ordination of efforts for solution of waste problem in the Republic of Komi the development of the regional program "Wastes" is extremely needed.

3.5.9. Oil spills

Nowadays, the Republic of Komi is well known for the oil spill that occurred in 1994 near Usinsk. Indeed, the scale of event and the volumes of the oil spilled are unprecedented for the Russian Federation. The estimates of the amount of oil released into the environment during this spill have been up to more than 100 000 tons. However, the experts of the Russian Federal Service for Hydro-meteorology and Environmental Monitoring concluded that accidental spill in the autumn of 1994 amounted 37-44 thousand tons out of 103-126 thousand tons totally released to the environment in this area. The rest amount is explained by systematic operational released to the landscape made in a number of years. According to official data, the identified area of direct contamination exceeded 70 ha – and this figure does not include the territories contaminated as a result of oil flow through water ways. The spill led to vast contamination of swamps, forest, meadows, pastures, spawning sites and affected the local wildlife and fish species as well as residents who strongly depend on fishing, hunting and reindeer- herding. At the same time, it should be stated that this large-scale spill did not lead to contamination of lower Pechora and the adjacent part of the Pechora Sea.

In 1995, the IBRD and EBRD provided emergency loans to the Russian Federation and KomiNeft that was unable to finance clean up of oil spill and compensation for the damage.

The selection of oil burning in the open environment as the main method of area clean up appeared to be doubtful from the environmental viewpoint, since burning of 7,000 tons of oil caused substantial emissions of greenhouse gases along with various toxic substances including polycyclic aromatic hydrocarbons and dioxins.

At present, numerous Russian and foreign companies which are engaged in the Komi oil and gas development have responsibility for the infrastructure maintenance. They are developing annually the program on environmental safety, which is agreed with local administration, republican government and the Head Administration on Nature Resources and Environmental Protection. These programs cover all issues of environmental safety of economic activities. For example, the 2003 "Lukoil" program on environmental safety consists of several sub-programs: "Clean air", "Clean waters", "Wastes", "Rehabilitation" etc. In accordance with the Agreement between the Republic of Komi, OAO LUKOIL and OAO KomiTEK, a corporate Program of OAO Komineft Environmental Rehabilitation of Contaminated Areas and Prevention of Oil Spills in 2000-2005 has been developed in 2000. It is planned under this program to rehabilitate about 700 ha of contaminated and disturbed lands, process over 200,000 tons of oil sludge. RUB700m will be expended for this program within 5 years. In 2000 131 ha have been rehabilitated and 24,000 tons of oil sludge processed in the Republic of Komi. In 2000 the Company designed and introduced a Regulation on Environmental Management System in LUKOIL, Regulation and Procedures of Internal Audit of Health, Safety and Environmental Systems in LUKOIL and its Affiliates, Instructions on the Number of Personnel Occupied in Environmental Management Service.

In 2000 an international consulting company, Bureau Veritas performed an independent audit of health, safety and environmental management system of LUKOIL to determine its conformity to international requirements. The Company was the first among Russian oil companies to obtain ISO 14001 (Environmental Management) and OHASAS 18001 (Occupational Health and Safety Management) conformity certificates.

Since 1994 the information on all accidents (oil spills, emissions, leakage of pipelines etc.) are weekly public available in local press and Internet (see f.e. http://www.businesskomi.ru).

In 2002 in territory of three districts of Komi Republic (Usinsky, Sosnogorsky and Vyktyl'sky), 152 depressurisations of oil pipelines were registered. Volume of spilled oily fluid was 301 m^3. The area of contaminated soil has exceeded 8.7 thousand m^2.

3.5.10. Persistent organic pollutants.

3.5.10.1.Stocks of obsolete pesticides.

The outcome of the inventory of stock of obsolete pesticides made by the environmental protection authorities in collaboration with the agricultural and other relevant authorities in presented in Table 5.10. It should be noted that, according to information available, stock of obsolete pesticides are stored in satisfactory state, and the amount of chlorinated pesticides is around 500 kg, however, they are not included into the "dirty dozen" of the Stockholm convention and to the list under the Aarhus POPs Protocol under LRTAP.

Table 5.10.

Stocks of obsolete pesticides in the Republic of Komi, kg*

Rayon (District)	Total, kg	Chlorinated	Phosphorus	Mercury	Other	Mixture	Unknown	Poor state	Comments
Kortkerossky	715	-	268	-	447	-	-	-	
Priluzsky	540	-	-	-	540	-	-	-	
Sysolsky	3691	441	100	-	3150	-	-	-	
Ust'-Vymsky	4760	-	-	-	4760	-	-	-	
Ust'-Kulomsky	2119	60	-	-	2059	-	-	-	
Systyvdinsky	105	-	-	-	105	-	-	-	
Ukhtinsky	470	-	-	-	470	-	-	-	
Total	12,399	501	368	-	10,531	-	-	-	

* - liquid pesticides are registered in liters, in the table they are conditionally accounted in kg, taking I L as 1 kg.

3.5.10.2.Dioxins/furans.

In 1997-2001 Republican Program " Protection of Environment and Population from dioxins and like-dioxins contaminants" has been carried out in the Republic of Komi (according to the order N 253 from 26.09.96, signed by the President of Republic). Analyses were performed by accredited analytical laboratory of the Scientific Research Centre (Ufa, Republic of Bashkortostan). Summary of results is given in the State Report "Environmental Status in the Republic of Komi in 2002".

Environmental (fish, soil) and human tissue (breast milk, blood) samples as well as discharges from enterprises were collected for PCB (17 congeners) and PCDD/PCDF analyses in Syktyvkar and Ukhta. Results of analysis of 14 environmental and human tissue samples shown presence of PCDD/PCDF in practically all samples collected in these cities, the highest levels were found in Ezhvinsky Distric of Syktyvkar, where the combined pulp and paper mill "Neusiedler Syktyvkar" is located. No details are given in the State Report on PCB, PCDD/PCDF levels and analytical method.

Based on the results from this study, the Republican State sanitary and epidemiological control authority requested enterprises, which considered by them as the main POP sources, to carry out own surveys on POP levels 4 times per year. According to Director of environment of "Neusiedler Syktyvkar" Company, they are planning this year to take samples for PCB analyses on different stages of technological process and contracted Institute of the Northern Problems (Arkhangelsk) to carry out these analyses. In this connection, the NEFCO/AMAP expert group would like to emphasise that PCB contamination should have lower priority for pulp and paper industry compared to dioxins. Acknowledging the expertise of the above institute in pulp and paper technology issues, it might be recommended to engage in proposed surveys additionally the research institutions with expertise in sampling strategy in connection with dioxin industrial releases, and dioxin analysis of environmental samples. This position has received full understanding and support from environmental protection authorities in the Republic.

5. List of ”hot spots” and priority projects.

No	Environmental “hot spot”	Environmental and human health problems	Project proposed	Project No	Covering by 1st NEFCO/AMAP Report	Comments
Murmansk Oblast						
1.	“Pechenganickel” combined smelter, Nickel, Zapolyarny	The largest emitter of air pollutants, particularly SO_2 in Murmansk Oblast; large volumes of waste water discharges, particularly salts.	Reduction of sulphates discharges with waste waters.	M1	M31. The Pechenganickel smelters in Nickel and Zapolyarny; reduction of SO_2 emissions and waste water discharges.	Since the 1st Report, SO_2 emissions decreased almost 40%. Waste water discharges decreased insignificantly, however discharge of sulphates increased almost 3 times.
2.	“Severonickel” combined smelter, Monchegorsk	The second largest emitter of air pollutants, particularly SO_2.			M32. The Severonickel smelter in Monchegorsk; reduction of SO_2 emissions and waste water discharges	Since the 1st report, SO_2 emissions decreased almost half. Waste water discharges are reduced 40%.
3.	JSC “Apatit”, Kirovsk	Since the 1st Report, industrial emissions increased almost twice, with corresponding increase of all major pollutants. Some increase of waste water discharge is also documented.	Reduction of acidifying compounds and dust emissions	M3-1	M46. Improvement of waste water treatment at the “Apatit” industrial association in Kirovsk.	The project M46 has not been included into the priority list of the 1st Report.
			Reduction of discharges of organic matter and salts.	M3-2		
4.	Heat and power plant, Apatity	HPP in Apatity is the largest air polluter among HPPs in the Murmansk Oblast, which emits 18,500 tonnes of contaminants, including almost 12,000 of SO_2. It is responsible for 84% of total air emissions in Apatity.	Reduction of air emissions of acidifying compounds in the Apatity heat and power plant	M4		

No	Environmental "hot spot"	Environmental and human health problems	Project proposed	Project No	Covering by 1st NEFCO/AMAP Report	Comments
5.	Kovdor mining and concentration combined enterprise (Kovdor GOC).	It is the second largest, after JSC "Apatit" discharger of industrial waste waters. Since the 1st Report, its discharges increased 40%, including more than doubling of sulphates discharge.	Reduction of waste water discharges by Kovdor GOC.	M5	M34. The iron ore plant in Kovdor, reduction of gas emissions and waste water discharges.	
6.	Water quality in Kola river and Bolshoye Lake used for drinking water supply of Murmansk city.	More than 6% of drinking water samples in Murmansk do not meet microbiological standards, and 75% - chemical standards. Almost 50% of water used for Murmansk water supply system is extracted from Kola river. Its water quality is strongly affected by pig and poultry farms effluents located in the river watershed. Bolshoye Lake is located not far from the Murmansk waste incineration plant and affected by its environmental releases.	Protection of Kola river water quality from negative effects of the "Murmanskaya" poultry farm effluents.	M6-1	M52. Treatment of faeces and effluents from the Murmanskaya (or Snezhnaya) poultry farm (Kola river water shed). M53. treatment of faeces and effluents fromn Prigorodny pig farm. M42. Improve the plants for treatment of household water in Murmansk City.	
			Elimination of the manure collector at the "Prigorodny" pig farm.	M6-2		
			Construction of ozonation facility at the water intake station of "Murmanskvodocanal"	M6-3		
			Elimination of water quality impact in Bolshoye lake on drinking water safety in Murmansk city	M6-4		
7.	Drinking water supply in Zelenoborsky-1 settlement.	The settlement is supplied with water from lake Bezymyannoe with poor organoleptic quality and periodic deficiency of water resources.	Improvement of drinking water supply system in Zelenoborsky-1 settlement.	M7		

No	Environmental "hot spot"	Environmental and human health problems	Project proposed	Project No	Covering by 1st NEFCO/AMAP Report	Comments
8.	Mercury-containing wastes.	"Ecord Ltd" (Kirovsk), one of two enterprises involved in treatment of used luminescent lamps in Murmansk Oblast, has outdated facilities that contribute to mercury contamination of the environment.	Modernization of the facility for treatment of used luminescent lamps at "Ecord Ltd".	M8		
9.	Scrapped ships in the Kola Fjord	122 scrapped ships are located in Kola Fjord contributing to its pollution, increasing navigation risk and causing economic losses.	Clearing Kola Fjord from scrapped ships with recycling of metal and rehabilitation of the fjord bed.	M9	M54. removing scrapped ships from the Kola Fjord and recycling of the metal.	
10.	Handling of oil containing wastes	Oil-containing wastes, particularly solid ones, is an alarming environmental issues in the Murmansk Oblast.	Construction of the site for biological neutralization of oil-containing slams for Murmansk and Kolsky District.	M10		
Republic of Karelia						
11 (1).	Gas emissions from Kondopoga pulp and paper combined mill	Kondopoga PPCM is responsible for 18% of total industrial air emissions in Karelia. It is the only large polluter in the Republic, which amissions increased since 1995			K42. Kondopoga pulp and paper4 mill, waste water treatment and gas and dust emissions	The project has not been included in the priority list. After finalization of gas pipeline "Petrozavodsk-Kondopoga" and transferring for use of natural gas, significant reduction od emission is expected.

No	Environmental "hot spot"	Environmental and human health problems	Project proposed	Project No	Covering by 1st NEFCO/AMAP Report	Comments
12 (2).	Gas emissions from Nadvoitsy Aluminium smelter	The smelter is responsible for 97% of total air emissions in Nadvoitsy. Emissions from the smelter, particularly of fluorine compounds, create significant human health problems.	Reduction of fluorine compounds emissions from the Nadvoitsy aluminium smelter.	K2	K32. Nadvoitsy aluminium plant, reduction of gas and dust emissions and waste water discharges.	Emissions of fluorine compounds from the smelter increased 11%
13 (3).	Drinking water supply in towns and settlements of the Republic of Karelia	In many towns and settlements drinking water quality does not correspond to chemical and microbiological sanitary and epidemiological guidelines. Poor water quality presents serious threat to human health.	Improvement of drinking water supply in Loukhi settlement	K3-1	Water management in a number of smaller towns in Karelia K44. Medvezhyegorsk town K45. Pudozh town K46. Suoyarvi town K47. Sortavala K48 Kalevala	The projects have not been included in the priority list
			Improvement of drinking water supply in Olonets town.	K3-2		
			Improvement of drinking water supply in Sortavala town	K3-3		
14 (4).	Poor water quality in water supply network of Petrozavodsk	The city is supplied with water from Onega lake, with water quality that does not meet the existing guidelines. The existing treatment facilities do not allow to get the required water quality, particularly on chemical parameters.	Reconstruction of water treatment facilities of Petrozavodsk city.	K4	K43. Improvement of drinking water supply and communal sewage system in Petrozavodsk	The project has not been included into the priority list.
15 (5)	Pollution of Onega lake with communal waste waters of Petrozavodsk	Poorly treated effluents are discharged into the Petrozavodsk bay that is the source of potable water supply. High nutrient load promote strong eutrophication in the bay.	Modernization of municipal sewage treatment facilities in Petrozavodsk city	K5	-"-	-"-

No	Environmental "hot spot"	Environmental and human health problems	Project proposed	Project No	Covering by 1st NEFCO/AMAP Report	Comments
16 (6)	Absence of municipal sewage treatment facilities a number of smaller towns	Untreated wastewaters are discharged to water bodies close to drinking water intakes. In a number of cases, it creates high epidemiological risk	Construction of sewage treatment facilities in Medvezhyegorsk town.	K6-1	Water management in a number of smaller towns in Karelia. K44. Megvezhyegorsk town. K45. Pudozh town	-"-
			Construction of sewage treatment facilities in Pudozh town	K6-2		
17 (7)	Oil and coal burning at boilers	For production of heat during heating season, one boiler (type PTVM-30) needs 14.8 thousand tons of boiler oil. It forms 0.82 thousand tons SO_2.	Conversion of boiler PTVM-30 in boiler-house AS "Petrozavodskmash" from oil to natural gas.	K7-1		
			Conversion of heat and power plants in Olonets and Muezersky from traditional fuel to timber wastes.	K7-2		
			Construction of the boiler house in Suoyarvi (Kaypa) using timber wastes as fuel	K7-3		
18 (8)	Hazardous industrial solid wastes and communal wastes. Almost 1/3 of 206 landfills in Karelia are illegal.	Landfills are often located in green zones, along forest roads, contaminate soil, surface water bodies and aquifers.	Organization of waste management system in Karelia	K8-1	K51. Construction of non-radioactive hazardous waste treatment plant in the Republic of Karelia. K53. Municipal waste management in Petrozavodsk city	The projects have not been included into the priority list.
			Construction of hazardous waste treatment plant	K8-2		

No	Environmental "hot spot"	Environmental and human health problems	Project proposed	Project No	Covering by 1st NEFCO/AMAP Report	Comments
19(9)	Negative impact of former municipal dumping ground of sewage on ecosystems of Logmozero and Onega lakes, Petrozavodsk city.	Surfact dump of production wastes of JSC "Petrozavodskmash" is located on a place of a former municipal dumping ground of sewage. Urregulated dumping has converted it into a dumping ground of industrial and municipal wastes of the northern part of the city.	Localization of negative effects of former municipal dumping ground on ecosystems of Logmozero and Onega lakes.	K9		
20(10)	Stocks of obsolete pesticides.	2.5 tons of obsolete DDT is stores in "Sortavala Agroservice" in poor conditions	Elimination of a stock of obsolete DDT in "Sortavala Agroservice"	K10		
Arkhangelsk Oblast						
21(1)	Solombala pulp and paper mill (SPPM), Arkhangelsk	Air emission is almost 20% of total in Arkhangelsk, all air pollution with specific contaminates and dust originates from SPPM.	Reduction of air emissions of specific contaminants from Solombala PPM.	A1-1	A47:Solombala pulp and paper mill in Archangel city. Reduction of waste water discharges and gas emissions	There are two alternatives for solving waste water problem in Arkhangelsk: construction of municipal waste water treatment plant, and re-construction of SPPM waste water treatment plant.
		SPPM waste water treatment plant treats both, its own waste waters and communal effluents. In total, it is 85% of total waste water discharge from the city	Reduction of Northern Dvina contamination with waste waters of Arkhangelsk	A1-2		
22(2)	Arkhangelsk heat and power plant (AHPP)	AHPP emits almost 45% of total contaminants in the city, mostly acidifying compounds.	Reduction of dust emissions from HPP-1	A2	A31: Reduction of gas emissions from Archangel heat and power plant.	

No	Environmental "hot spot"	Environmental and human health problems	Project proposed	Project No	Covering by 1st NEFCO/AMAP Report	Comments
23(3)	Severodvinsk heat and power plants: SHPP-1 and 2	HPPs are responsible for 95% of gas emissions in the city. HPP-1 is the matter of particular concern due to emission of 95% of dust.	Reduction of dust emissions from HPP-1	A3	A32: reduction of gas emissions from Severodvinsk heat and power plant.	Distribution of SO_2 emissions from HPP-1 and 2 is 2:1, according to their energy production. However, HPP-1 emits most of dust in the city due to using coal fuel compared to mazut in HPP-2.
24(4)	Arkhangelsk pulp and paper mill (APPM), Novodvinsk	It is the only PPM in Oblast that has increased its gas emissions since the 1st NEFCO/AMAP Report. Its annual emission is comparable with total emission of Arkhangelsk. Emissions of specific contaminants and dust is of particular concern.	Reduction of air emissions of specific contaminants and dust in APPM.	A4-1	A46: Archangel pulp and paper mill in Novodvinsk: reduction of waste water discharges and dust emissions	In spite of significant reduction of waste water discharges, APPM remains the main pollution source for lower part of Northern Dvina river, including Arkhangelsk area
		APPM is the large discharger of waste waters in Oblast (32%). Being located upstream Arkhangelsk in its vicinity, creates permanent environmental and health hazard for this city.	Reduction of discharges of insufficiently treated waste waters from APPM	A4-2		

No	Environmental "hot spot"	Environmental and human health problems	Project proposed	Project No	Covering by 1st NEFCO/AMAP Report	Comments
25(5)	Kotlas pulp and paper mill (KPPM), Koryazhma	KPPM is one of major air polluters in Oblast, particularly with specific contaminants. It emits 4.2 times more methyl meracptane than APPM.	Reduction of methylmercaptane emissions from KPPM.	A5-1	A48: Kotlas pulp and paper mill in Koryazhma; reduction of waste water discharges and gas and dust emissions	The project has not been included into the priority list
		KPPM is the largest waste water discharger in Oblast (almost 50%) Discharge of large amounts of organic and suspended matter strongly impacts aquatic ecosystem. Significant increase of lignosulphonates is of particular concern.	Reduction of organic and suspended matter discharges with KPPM waste waters.	A5-2		
26(6)	Toxic solid wastes in Arkhangelsk Oblast	Amount of solid wastes in Arkhangelsk Oblast increased more than three times since the 1st NEFCO/AMAP Report	Development of toxic solid waste management system in Arkhangelsk Oblast	A6	A51: Construction of non-radioactive hazardous waste treatment plant in Archangel province. A52: Sewage sludge treatment plant in Archangel province A53: Municipal waste management in the cities of Archangel and Severomorsk.	The project has not been included into the priority list
27(7)	Sites of former and current military activities as sources of oil contamination	Large areas in Arkhangelsk Oblast are strongly contaminated with petroleum fuel and spent motor oils, particularly due to former and current military activities.	Rehabilitation of the area of the Letneozersk garrison from oil pollution	A7-1		The projects should be coordinated with the corresponding Oblast targeted program.
			Survey and development of proposals for rehabilitation of Franz Jozef Land	A7-2		

No	Environmental "hot spot"	Environmental and human health problems	Project proposed	Project No	Covering by 1st NEFCO/AMAP Report	Comments
28(8)	Spent motor oil	Since 1995, spent motor oil is not collected and treated in Oblast, and became a serious source of environmental pollution	Development of the spent motor oil management system	A8		The project should be coordinated with the corresponding Oblast targeted program.
29(9)	Enterprises of pulp and paper an timber industry as sources of dioxin pollution	A large number of enterprises are considered as significant sources of dioxin pollution	Survey of dioxin pollution and rehabilitation of the territory of Onega timber processing combined plant.	A9		
30(10)	Stocks of obsolete pesticides	More than 40 tons of obsolete pesticides, many of them in poor storage conditions, are stored in Arkhangelsk Oblast	Elimination of stocks of obsolete pesticides in Ustyansky rayon	A10		It is proposed to coordinate NEFCO actions with the ACAP project on obsolete pesticides in Russia, within the framework of which Arkhangelsk Oblast is selected as a pilot one, at the stage of destruction of obsolete pesticides. In the context of development and construction of PCB destruction facilities in North-western Russia, they can be evaluated for destruction of obsolete pesticides.

No	Environmental "hot spot"	Environmental and human health problems	Project proposed	Project No	Covering by 1st NEFCO/AMAP Report	Comments
Nenets Autonomous Okrug						
31(1)	Accident at well No 9 in Kumzhinskaya field.	The torch formed at this well due to explosion in the early 1980s lasted until 1987, and led, together with measures to extinguish it, to significant contamination of the area, which is at present belongs to the Nenets Nature Reserve.	Rehabilitation of the area affected by the accident at the well No 9 in Kumzhinskaya field.	N1		
32(2)	Poor drinking water quality in the NAO settlements and towns	Due to poor quality, drinking water supply is one of the most important tasks for NAO. Water quality problems mostly arise due to natural rather than anthropogenic reasons. The quality of potable water meets to sanitary norms only at one settlement (2% of the population), does not meet to sanitary norms at 19 settlements (86% of the population).	Impovement of drinking water supply in Velikosochnoya settlement (pilot project)	N2		
33(3)	Waster waters of Naryan Mar city and its port discharged into Pechora river	Technology used in biological treatment of waste waters in Naryan Mar, and capacity of treatment facilities, do not ensure surface water protection. The port has no storage tanks and used waters are directly discharged into Pechora river.	Reconstruction of waste water treatment facilities in Naryan Mar	N3-1		
			Construction of facilities for treatment of ballast and other oil-contaminated waters	N3-2		

No	Environmental "hot spot"	Environmental and human health problems	Project proposed	Project No	Covering by 1st NEFCO/AMAP Report	Comments
34(4)	Handling of mercury-containing wastes.	Mercury-containing used luminescent lamps (1.334 tons) is the most hazardous waste products in NAO	Construction of facilities for treatment of used luminescent lamps.	N4		
The Republic of Komi						
35(1)	Greenhouse gas emissions to the atmosphere in the Vorkuta coal field	Coal industry is one of the most significant contributors to greenhouse gas emissions to the atmosphere. Coal-mining industry has emitted into the atmosphere 74.2% of total methane, emitted in the Republic of Komi in 2002.	Utilisation of coal methane in coal mines of the Vorkuta field	Ko1		
36(2)	High air contamination in Vorkuta city	A number of enterprises in Vorkuta city emit large amounts of contaminants to the atmosphere. Vorkuta cement plant is responsible for 25% of dust emissions. HPP-1 is the main emitter of SO_2 in the city	Reduction of dust emissions by Vorkuta cement plant	Ko2-1		
			Reduction of acidifying compounds emissions by Vorkuta Heat and Power Plant-1	Ko2-2		
37(3)	"Neusiedler Syktyskar" pulp and paper mill.	NSPPM emits almost 75% of total industrial emissions in Syktyvkar. Emission of specific toxic and organoleptic contaminants is of special concern. It also responsible to the largest volumes of polluted waste waters discharged in the city.	Reduction of CO and specific contaminants emissions by NSPPM	Ko3-1		
			Reduction of waste water discharges by NSPPM.	Ko3-2		

No	Environmental "hot spot"	Environmental and human health problems	Project proposed	Project No	Covering by 1st NEFCO/AMAP Report	Comments
38(4)	Communal sewage discharge in small settlements	Communal sewage treatment facilities in many small settlements are practically absent. Untreated sewage enter water bodies and pose threat to the ecosystems and humans	Development of municipal sewage treatment facilities in Izhma settlement (pilot project)	Ko4		
39(5)	Poor drinking water quality in many towns and districts of the Republic of Komi.	High chemical and microbal pollution of drinking water is observed in Ukhta and Usinsk towns, Knyazhpogostsky, Kortkerossky, Koygorodsky, Ust'-Vymsky districts. Virus contamination has been found in drinking water of Usinsky, Knyazhpogostsky and Kortkerossky districts.	Development of the master plan for drinking water supply in the Republic of Komi	Ko5		
40(6)	Formation of industrial and domestic wastes.	11.0 million tons of industrial and domestic wastes including 3.5 million tons of toxic waste are formed Komi annually. Only 1.2% of wastes are utilized. The dumping grounds of industrial and domestic wastes are pollution sources for ground waters and surface water bodies, from which water intake of potable water is carried out.	Development of waste management system in the Republic of Komi	Ko6		

No	Environmental "hot spot"	Environmental and human health problems	Project proposed	Project No	Covering by 1st NEFCO/AMAP Report	Comments
41(7)	Wastes of timber and pulp and paper industry	In 2002, timber and pulp and paper industry of the republic produced 1071.7 thousand tons wastes, largest part of them is timber wastes, stored at enterprises and at various landfills.	Recycling of timber wastes for production of fuel pellets	Ko7		
42(8)	Coal-mining wastes	Numerous coal-mining wastes disposed near mines are the sources of land and atmospheric contamination and pose threat for human health.	Recycling of coal mining wastes for production of coal briquettes	Ko8		

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Appendix 1: The status of projects identified by the NEFCO AMAP study in 1995.

Projects in northwest Russia				
Project code	**Project title**		**Project Status**	**Comments**
Murmanskya Oblast				
M41	Construction of communal waste water treatment system in town of Kildinstroy			Integrated with M61, M81 and M44 into one water and sewage treatment pre-feasibility study. Project interrelated with M61.
M61	Improve the treatment of municipal waste waters discharged into the Kola fjord from Murmansk City, the Northern sewage treatment plant		Ongoing	See M41.
M44	Improvement of Monchegorsk City water supply system		Ongoing	P.f.s. handed over to the PPC in search of donor support.
M51	Establishment of a system for treatment of non-radioactive hazardous waste in the Murmansk Oblast	Upgrading of the oil treatment plant at the fishing port of Murmansk	Some measured implemented	
		Improving the municipal waste incinerator	Ongoing	
M52	Treatment of faeces and effluents from the Murmanskaya poultry farm (Kola river water shed)		On hold	

M101	Energy saving and reduction of the airborne emissions from the Southern heating and power plant in Murmansk City		ongoing	
Republic of Karelia				
K31	Segezha pulp and paper mill, reduction of gas and dust emission and wastewater discharges		Some measured implemented	The Swedish investor withdrew from the project. The new owners of the mill have secured external loans for plant modernaziation.
K32	Nadvoitsy aluminium plant, reduction of gas and dust emission and wastewater discharges		Some measured implemented	No donor assistance has been mobilized for a supplementing feasibility study.
K41	Kostamuksha iron pellet plant, Karelsky Okatysh, reduction of wastewater discharges and industrial gas emissions		Some measured implemented	Investments aiming at securing the supply of raw-material are currently in preparation at Karelsky Okatysh.
K61	Artificial rearing of Atlantic Salmon in the Karelian part of the White Sea, in order to increase the stock of salmon in the Karelian rivers		No action	
Archangelsk Oblast, including Nenets AO				
A42/43	Drinking water supply in the cities of Archangelsk and Novodvinsk	Water treatment and distribution and wastewater collection	Ongoing	

		Upgrading of the wastewater treatment plant at the Solombala Pulp and Paper Mill	On hold	
A46	Archangelsk pulp and paper mill in Novodvinsk, reduction of wastewater discharges and gas and dust emission		Ongoing	
A71	Preservation of virgin north taiga forest in Mezen County			The project is linked to the planned national park in the Belomoro-Kuloiskoje Plato.
Projects concerning indigenous and traditional people				
M81	Water supply in Lovozero village		Completed	Implemented in cooperation with Karasjok municipality (Norway). See also M41.
A81	Improvement of environmental aspects of human health in the settlement Nelmin Nos		No action	
A82	Drinking water and sewage treatment in small villages of Konozero national park		Preparations ongoing	
Projects concerning the entire Barents Region				
G91	Integrated environmental and human health monitoring systems		No action	Several proposals have been made to TACIS by the local and regional environmental authorities, but with unclear compliance with the general plan.

Appendix 2.

Priorities of the NEFCO/AMAP Project "Updating of the NEFCO/AMAP Report "Proposals for Environmentally Sound Investment Projects in the Russian Part of the Barents Region"

Project background.

The Declaration of the Summit dedicated to the 10th Anniversary of the Barents Euro-Arctic Council (Kirkenes, 10-11 January 2003) signed by the Prime Ministers of the Barents region countries supported the instrumental role of NEFCO in implementing of environmentally sound small and medium sized projects in the Russian part of the Barents region. The documents adopted by the Summit encouraged NEFCO to revise the environment "hot spot" list in this region compiled in 1995. In this connection NEFCO, in collaboration with the AMAP Secretariat, has initiated the preparatory work for updating the list of environmentally sound projects, implementation of which is important for improvement of environmental situation in this region, keeping in mind presentation of the new report to the Meeting of the Environmental Ministers of the Barents Euro-Arctic Council in Sweden, August 2003.

Geographical limits of the project.

The project covers the following administrative territories of the Russian Federation entering the Barents region: Republic of Karelia, Republic of Komi, Murmansk Oblast, Arkhangelsk Oblast, Nenets Autonomous Okrug.

Organizational framework of the project.

It is envisaged that the operation project coordination will be under the responsibilities of the AMAP Secretariat and the corresponding departments of the Ministry of Natural Resources of the Russian Federation (mostly the Department of International Cooperation in the Field of Environmental Protection and the Department of Environmental safety). The work will be implemented with active participation of environmental protection authorities of the administrative territories listed above subordinated to both, the Ministry of Natural Resources and regional administrations. It is important for the project success that it is practically supported by the Administration of the North-Western Administrative Okrug (super-region).

The central expert group (CEG) will be established for the work in the regions, which will compile of (one from each):

- The AMAP Secretariat;
- Department of Environmental Safety of the RF Ministry of Natural Resources;
- Norwegian-Russian Cleaner Production Centre;
- Russian National Pollution Abatement Facilities;
- International expert (Akvaplan-niva, Tromsø, Norway).

During the visits to the regions, CEG will work jointly with the expert group of the given administrative territory, based of the materials prepared in advance by this expert group.

For consideration of the project results, the project Steering Group, consisting of the authorised representatives of NEFCO, AMAP Secretariat, Ministry of Natural Resources and environmental protection authorities of the administrative territories involved in the project, will be established.

Tentative timetable for the project implementation.

1. Preparation of guidelines and gathering of the relevant to the project information documents (1 March – 15 April)
2. Organisational meeting in the Ministry of Natural Resources with participation of the lead persons of the environmental protection authorities from the administrative territories of the region (1st week of April)
3. Work in the regions (20 April – 31 May).
4. Compilation of the materials and preparation of the draft report (1 – 30 June).
5. Consideration of the draft report and international audit (1 – 15 July)
6. Preparation of the final draft report (15 – 25 July)
7. The report approval by the Steering Group (beginning of August).

Project priorities.

The NEFCO/AMAP Report of 1995 covered the following 10 environmental issues of concern:

11. Environmentally safe operation of nuclear installations.
12. Handling and storage of radioactive wastes.
13. Reduction of industrial gas emissions.
14. Preservation of freshwater resources, including improvement of drinking water supply.
15. Solid wastes.
16. Prevention of marine pollution of the White Sea and the Kola Fjord.
17. Preservation of forest resources.
18. State of the environment and lifestyle of the indigenous and traditional population in the Region.
19. Development of integrated environmental and human health monitoring system.
20. Environmental issues concerning energy consumption and energy saving.

Since the issue of 1st NEFCO/AMAP Report the issues related to radiation safety and radioactive wastes have been singled out into a separate field, into which significant financial resources have been invested. In this connection, **it was agreed not to include issues 1 and 2 into the scope of this project.** However, other issues related to environmental aspects of use and handling radioactive materials in the region that have not been covered by the previous report, can be included into this report.

Issues related to environmental impact and lifestyle on health of the indigenous population is currently studied within the framework of the project "Persistent Toxic Substances, food Security and Indigenous peoples of the Russian North". In this connection, **it was agreed not to include the issue 8 into the project scope.**

In this context, main attention in the project shall be dedicated to the issues 3, 4, 5, 6, 10.

In the investment projects selection process, as in the previous exercise, main attention should be paid to official data available at the environmental protection authorities and other institutions. However, taking into account that the currently used state statistics forms do not fully correspond to the requirements to data and information on emissions and other forms of environmental impacts following from the recent international treaties, including the Stockholm POPs Convention, Kyoto Protocol to the Global Climate Framework Convention, etc., attention should be paid to possibilities of environmental releases from the enterprises of pollutants that are not covered by the forms of state statistics but fall under the above treaties. First of all, it concerns by-products (dioxins/furans, PAH), mercury, etc.

It is highly desirable to get an information on pollution sources from the abandoned/not currently used military facilities. In this respect, it would be desirable to attract the experts from the Ministry of Defence and other agencies of the military sector from the corresponding administrative territories.

Besides environmental aspects, selection of enterprises and other actual or potential pollution sources into the priority list should be made with consideration of the economic state of these enterprises, their organizational and management capacity, and capability to take part in implementation of the selected projects.

Appendix 3.

Records
From the organizational meeting of the NEFCO/AMAP project
(Moscow, Ministry of Natural Resources, 3 April 2003)

The meeting was opened by the Deputy Minister of Natural Resources of the Russian Federation Kirill Yankov, who welcomed the meeting participants (List of participants is presented in Annex 1) and emphasised the importance of the environmental cooperation within the Barents Euro-Arctic Council. He paid special attention to the role of implementation of environmentally sound investment projects for improvement of environmental situation in the Russian part of the region. He expressed strong support by the Ministry of Natural Resources of the NEFCO/AMAP project, and requested Andrei Pechkurov, Deputy Director of the Department for Environmental Safety, to chair the meeting.

Andrey Pechkurov made general overview of environmental situation in the region and pointed out priority issues to be addressed during the project.

Yuri Alexandrovsky, Deputy Director of the Department for International Cooperation in the field of Environmental Protection and the Head of the Russian Delegation at the BEAC Working group on Environment Meeting (Stockholm, 27 January 2003) informed the meeting participants on the decisions of the meeting relevant to the NEFCO/AMAP report.

Vitaly Kimstach, AMAP Secretariat, reminded the meeting participants on the priorities of the previous NEFCO/AMAP project in 1995 and basic methodological approaches used. He presented the paper on the priorities of the NEFCO/AMAP Project to be implemented, which has been distributed prior to the meeting (Appendix 2).

The representatives of environmental protection authorities from each administrative territory of the Russian part of the Barents presented their views on the project implementation. In general, they supported implementation of the project. However, the representatives of the Republic of Karelia and Arkhangelsk Oblast expressed their disappointment in the effectiveness of the follow-up of the NEFCO/AMAP Project-1995. The were supported by the representative of the Republic of Komi, which was not the BEAC member at that time, but monitored carefully its environmental protection activities. He stressed that a lot of efforts have been put by both, Russian and international experts in the development of the NEFCO/AMAP Project-1995, but the outcome from this work was minor. He said that “it would not be wise to clone another report with the same outcome”.

Commenting on this criticism, Vitaly Kimstach recommended the Russian environmental protection authorities to establish more close operational relationship with NEFCO at the stage of the selected project implementation. He also stressed that this project is to be implemented at the request of the BEAC Summit, and that such a strong support might create better background for the follow-up of the report to be prepared.

Larissa Yanchik, the representative of the Russian-Norwegian Cleaner Production Centre, agreed with the important role of the cleaner production methodology in implementation of the small- and medium-sized project to be selected, and expressed the readiness of the

Centre representatives to take part in the project. She also presented some tentative proposals to Vitaly Kimstach.

Maxim Petrov, the NPAF representative, commented that it would be practically impossible to present more or less comprehensive assessment of the economic state of enterprises to be proposed by the project for further implementation of the investment projects. The pointed out that this work is the part of feasibility study. However, he expressed his readiness to take part in the project, and to give a brief tentative overview of these issues.

Sergey Tikhonov, Director of the Centre for International Projects, reminded the CIP took part in recent years in implementation of a number of relevant activities, and expressed the with of CIP to take part in the project. This proposal was supported by Andrey Pechkurov. Commenting on this proposal, Vitaly Kimstach pointed out that it is envisaged to form the project expert group on individual basis, and the AMAP Secretariat would not mind if the Ministry of Natural Resources nominate CIP experts as its representatives in the expert group.

Before the meeting, the Vitaly Kimstach discussed with the representatives of the Ministry of Defence, Vladimir Antonov and Yuri Kozhanov, possible involvement of the military experts in the project. They explained that all abandoned/not used military sites were transferred under the responsibility of local authorities, and they are currently not in a possession of the Ministry of Defence and its bodies. It was tentatively agreed that the Ministry of Defence looks at the possibilities to present the list of such sites in the region concerned to the AMAP Secretariat. However, during the meeting discussion Yuri Kozhanov, based on presentation of the regional representatives, expressed his scepticism on the effectiveness the follow-up of this project, and that the Ministry of Defence can benefit from it. After the meeting, he recommended that the AMAP Secretariat should send an official application on this matter to the First Deputy Chief of Staff of the Russian Army.

Lyudmila Khorosheva, coordinator of the Russian IUCN Arctic Programmes, emphasised that biodiversity issues should be also included into the NEFCO/AMAP project. Commenting on this proposal, the meeting participants suggested that too wide project objectives would negatively influence on its outcome, and suggested to limit them with environmental pollution issues. Being in general agreed with this, the Delegation of the republic of Komi emphasised the importance of issues related to protection of forest resources for this republic. It was agreed that these issues should be also considered in a limited context of specific medium- and small-sized projects.

Based on the discussion the meeting adopted the following decisions:

1. To agree with the Priorities drafted by the AMAP Secretariat, with the additions specified above.
2. To agree on the following timetable of the work in the regions:
   21 – 30 April: Arkhangelsk and Maryan Mar;
   12-16 May: Murmansk;
   19-23 May: Petrozavodsk;
   26-30 May: Syktyvkar.
3. The list of the Russian members of the Steering Group to be established for consideration and adoption of the project report will be determined by the Ministry of Natural Resources.

Appendix 4.

List of the Central Expert Group.

1. Vitaly Kimstach, AMAP Secretariat – Chairman
2. Tatyana Savinova, Akvaplan-niva, Tromsø
3. Vladimir Savinov, Akvalan-niva, Tromsø
4. Alexei Pechkurov, Ministry of Natural Resources-coordinator, mission to Murmansk
5. Marina Malakhova, Cleaner Production Center, Moscow
6. Yuri Shuitsev, Center for International Projects, Moscow
7. Sergey Antipov, Ministry of Natural Resources-mission to Arkangelsk
8. Olga Morozova, Ministry of Natural Resources-mission to Petrozavodsk
9. Natalia Bukina, Ministry of Natural Resources-mission to Syktyvkar

Appendix 5.

View of the Cleaner Production Centre on the environmental "hot spot" list in the Russian part of the Barents Region.

1. Definition of Cleaner Production.

Cleaner Production means the continuous application of an integrated preventive environmental strategy to processes and products to reduce risks to humans and the environment.

- For production processes, Cleaner Production includes conserving raw materials and energy, eliminating toxic raw materials, and reducing the quantity and toxicity of all emissions and wastes before they leave the process.
- For products the strategy focuses on relating impacts along the entire life cycle of the product, from raw material extraction to the ultimate disposal of the product.
- Cleaner Production is achieved by applying know-how, by improving technology, and/or by changing attitudes.

2. The objective of Cleaner Production

The general objective of the CP program is to restructure industry in an economically profitable manner and at the same time to improve industry's environmental performance. Simply put, CP program's aim is to increase the profitability of industry by continually reducing water and energy consumption, pollution emissions and waste volumes whilst improving product quality and workplace safety.

In this way, CP measures yield a double dividend of economic and environmental benefits. Furthermore, through being applied continually in all parts of the organization, CP provides a perfect instrument for executing some of the basic requirements of any Environmental Management System (EMS) by continually supplying the EMS with objectives and targets for its operation. Cleaner Production should, therefore, always be practiced where management systems such as ISO, EMAS are being practiced.

3. Principles and levels of the Cleaner Production Program.

The Cleaner Production Program has four major principles:

- Polluter pays principle
- Tube's start
- From engineer to engineer
- Continuous and gradual

The Program has three levels:
First level – Resource saving
Second level – Financial Engineering
Third level – Ecological management

4. "Hot spots" from the Cleaner Production Center's view.

The Russian-Norwegian Cleaner Production Program has been geographically constricted to the Northwestern regions of the Russian Federation. To ensure a continuous and more widespread dissemination of the program in Russia, an independent **Centre for Cleaner Production was established in Moscow in 1994**, followed by the subsequent organization of regional CP Centres in those parts of Russia where the Program has been introduced. On the regional level, one has also observed that larger networks or societies of trained CP engineers and co-advisers have been formed in the wake of the program. At present more then 1,6 thousands engineers have graduated from CP Programs.

Arkhangelsk Oblast

The basic environmental problems in the Arkhangelsk Oblast are related to:

- activity of the timber and pulp and paper industry;
- shipbuilding production, in the first place, of such a giant as the State Center of Atomic-Powered Shipbuilding in Severodvinsk;
- provide of these and other kinds of production with electric power at the expense of the operation of heat and power plants depending on fuel (heavy oil and coal) deliveries from other regions;
- processing of food raw materials into products for meeting populations' needs;
- municipal services, which features the absence of sewage treatment and waste processing system in large cities.

Taking that into consideration the Cleaner Production Program was aimed at these basic targets. In future it would be expedient to go on with the Training Programs at such an enterprise as JSC "Kotlassky PPM" where the Program was not implemented till now in order to prepare 60 to 90 specialists there during two-three years taking into consideration the scale and scopes of the production at this large enterprise. The implementation of specialized Programs for reducing the toxic substance impact is urgently required since these substances get into the water bodies, for instance, into the Northern Dvina river, and then get into the Arctic Ocean without in practice any transformation to more neutral compounds.

It is proposed to initiate Programs for reducing the level of dioxine and furan emissions from the complex of timber, pulp and paper and hydrolytic enterprises in Arkhangelsk and Kotlas. A Program aimed at neutralizing and processing of toxic substances formed in the State Center of Atomic-Powered Shipbuilding has already been initiated at FSUE "Zvezdochka" in Severodvinsk. In parallel, the work on introducing EMS is being carried out at this enterprise and SUE "Sevmash". Financial Engineering Programs are intended to be implemented in future on the basis of already implemented Training Programs in order to have in the year of 2004 already prepared business plans to be submitted to the investing financial institutions. This work must be extended in order to have in 2005 real results from reduced discharges of all kinds of toxic substances into the Arctic waters.
As for heat and power engineering, it should be pointed out that the first specialized Program for the "Arkhenergo" system was implemented in 2001 that gave very high results. Unfortunately, in the following years breaking up of power systems was started in Russia, i.e. their division into 4-5 companies that did not allow continuing this work. In 2003 the reformation must be completed and then a real possibility to resume this activity will appear.

There are great reserves for reducing the water consumption and, consequently, untreated sewage discharges in the municipal economy. The obstacle here consists of a poor financial base of the municipal economy and active conservatism and resistance to everything new on the part of the managers of all levels of authority who do not believe that any serious practical results can be achieved in their sphere and prefer to be satisfied with the existing situation.
Taking into consideration the interest of the Arkhangelsk city administration in introducing a cleaner production, it is planned to initiate the first specialized Program for the utilities of Arkhangelsk in 2004 that requires a strict control and pressure onto the utilities' managers and the part of the city administration.

The Republic of Karelia

The natural and geographic location of the Republic of Karelia features the fact that emissions into environment affect the biosystems both of the Arctic basin (the White Sea) and the Baltic Sea. The Baltic Sea systems are affected through waters of two largest lakes of Europe: Ladoga and Onega.

The basic environmental problems are related, in the first place, to:

- timber and pulp and paper industry;
- mining and concentrating production near the Finland border in the town of Kostomuksha and also relatively small metallurgical enterprises, for instance, aluminum plant in the town of Nadvoitsy, metallurgical plant in the town of Vyartsilya, etc.;
- transport complex and cargo transshipping in lake ports and ports of the White Sea and also the activity of the river and marine transport;
- housing and municipal services due to the lack of waste treatment facilities and obsolete systems of heat supply in many towns of Karelia.

Cleaner Production Programs were implemented in all pulp and paper enterprises of Karelia and a conference of specialists who completed this Program was held already in 2000.

It should be particularly pointed out that the work on creating an EMS system was carried out at JSC "Petrozavodskmash" simultaneously with the Cleaner Production Program in 2000-2002 and this enterprise is in practice ready to get a certificate of ISO 14000. However, for the time being the Republic has prepared no investment proposals that is a significant disadvantage. Therefore, it would be expedient, not to suspend the Training Program, to implement Financial Engineering Programs in 2003-2004 in order to select and prepare 10 to 15 business plans for investments.

Taking into consideration the Republic's geographic location bordering upon EU, it is necessary to implement Programs for reducing contaminants getting into the Baltic Sea (Gulf of Finland) through the Ladoga and Onega lakes from all the enterprises located in their basins. In order to achieve completely the results specialists from the enterprises located in the basin of the Ilmen lake must be drawn to cleaner production training since contaminants get through the Volkhov river into the Ladoga lake and through the Neva river into the Gulf of Finland of the Baltic Sea.

A special sub-program can be arranged in this Program for transport enterprises in order to prevent and minimize the negative impact of various kinds of toxic substances and petroleum products getting into water bodies from navigation projects.
Like for the Arkhangelsk Oblast, a specialized Program is required for timber and pulp and paper enterprises for preventing environmental releases of dioxins.

The Republic has already a certain experience in preparing utilities' managers in small towns in cleaner production, therefore, this work must be continued so that the entire municipal economy's management should not only get necessary training, but start elaborating and creating appropriate business plans.

Murmansk Oblast

Historically, the region developed, on the one hand, as one of most powerful ore bases for metallurgy and chemical industry (fertilizers) in Russia, on the other hand, as a system of army and navy bases to ensure the country's security from the northern direction, on the third hand, as a producer of fishery products for entire Russia from the Arctic seas and Northern Atlantic ocean, on the forth hand, as one of the basic ports for cargo carriage by the North sea route that is necessary for the vital functions of the entire Arctic coast of Russia.

As a result of such multi-dimensional intensive development, a great amount of metal compounds: nickel, zinc, copper, aluminum, iron, vanadium, etc. and also reagents used for their production get into the water systems. The marine transport, ports, navy ships and their bases are sources of releases of petroleum products, mineral fertilizers upon transshipment, including radioactive substances, taking into consideration a great number of atomic-powered ice-breakers, atomic-powered submarines and facilities ensuring their operation. At last, many settlements have no water treatment systems that results in discharging untreated sewage which under conditions of cold northern rivers and reservoirs does not dissolve, since the self-purification capability is negligible. Taking into consideration that, in the long run, these contaminants get into the Arctic ocean common for many Arctic countries which, in addition, gets a great amount of contaminants through air, the problem becomes very urgent for the Earth's Arctic region.

The described situation with the water resource shows that urgent actions must be taken both to reduce the water consumption and also to reduce untreated sewage discharge into the water bodies of the Oblast.

The implementation of training Cleaner Production Programs is supposed to be continued in conjunction with the Financial Engineering Programs that are necessary for preparing business plans and their transfer to investing organizations.

The following Cleaner Production training Programs are assumed to be implemented in 2004:

- For utility enterprises of the Oblast in Murmansk.
- For specialists of JSC "Apatit" in the town of Apatity.
- For NPP "Polyarniye zori" in the town of Polyarniye Zori.
- For specialists from marine transport enterprises inviting specialists from the Navy.

- Familiarization Cleaner Production Program for the management staff of the District administration and Administrations of such cities as Murmansk, Kandalaksha, Severomorsk, Monchegorsk, etc.

Each group consists of 25 persons, therefore, we'll have 100 trained specialists at the end of the year not considering 25-30 trained administrators.

The selection of specialists just like preparation of the Program can be made taking into consideration the main line of reducing the resource consumption that results in reducing the amount of formed waters to be treated. At the same time projects for improving sewage purification from such contaminants as metal ions, petroleum products, persistent organic compounds must be designed.

As the practice demonstrated, it will be possible to carry out a great number of actions without any extra resources during the training year. Approximately 30-35 projects for investments on the NEFCO conditions that in the course of their future implementation will give the best environmental results must be prepared. Thus, 50 to 70 specialists must be trained under the Financial Engineering Program in Murmansk or Apatity (Monchegorsk).
The anticipated effect that must be striven for consists of reducing untreated sewage discharge by 20 to 25% for operating enterprises and reducing toxic substances discharge by 30 to 40%. The aforesaid Programs can be implemented both by the RNC advisers in the Murmansk Oblast, and also of neighboring regions, i.e. Arkhangelsk Oblast, St. Petersburg, the Republic of Karelia.

A Cleaner Production Program for marine transport systems was initiated in May 2003 in Murmansk with the aim of reducing the sewage and toxic substances formation under which 27 specialists are trained. This Program is planned to be completed at the end of 2003.

The Republic of Komi

The basic kinds of natural resource development in the Republic of Komi are:

- forest;
- coal;
- oil and gas.

A diversity of fields was found and explored in the Republic's territory, an oil and gas producing complex was created in the town of Usinsk and oil processing enterprises were set up in the town of Ukhta. There is also a center of coal mining in Vorkuta and Inta in other localities whose coal is widely used as fuel in the entire Barents region of Russia.
Forest resource stocks allow developing a powerful wood processing complex in the town of Syktyvkar.

Three Cleaner Production Programs were completed in the Republic: territorial; for the NPC "Komienergo" system; for oil producing enterprises in the town of Usinsk. Proceeding from the gained experience it is expedient to concentrate attention on the Program continuation for oil producing complexes paying particular attention to setting up such productions that would not negatively affect the northern ecosystems. At the same time it is necessary to reduce as much as possible petroleum products getting into water bodies since the abundance of the branched network of small rivers flowing into the Pechora river makes any oil spills very dangerous since they are brought into the Arctic sooner or later.

The inevitable formation of wastes must be also reduced to an optimal minimum followed with processing or neutralizing in order to reduce toxic substances getting into reservoirs. Taking into consideration that in many cases local oil differs from common oil - it is very heavy and viscous and it should be heated for transportation - therefore, a Program must be highly specialized since there is no practice of handling such oil anywhere.

At the same time the cleaner production principles must be applied in construction and operation of petroleum product transportation systems, in particular, of oil pipelines since there are considerable potential possibilities in this sphere.
The "Lukoil" company invested great amounts of monetary resources to the development and reconstruction of the Ukhta oil processing factory the only enterprise of such type in the North. This company carries on a certain work on reducing the environmental impact and it would be reasonable to hold negotiations with it as per the possibility to implement the Russian-Norwegian Cleaner Production Program as applied to this enterprise. Negotiations have given no positive results as yet.

There is a diversity of large industrial centers in the Republic of Komi such as Vorkuta, Inta and others for which it is useful to implement a Cleaner Production Program with the participation of specialists from the coal industry, fuel power plants, transport and municipal economy. About 4-5 Programs for such centers will assist to considerably improve the use of resources and reduce sewage discharge and gas emissions. Very likely, the use of surplus methane from local mines with its possible use as fuel will become one of the problems.

The introduction of the cleaner production principles at the Syktyvkar wood processing complex has high prospects. Negotiations thereof were held, but were suspended in connection with the enterprises' owner change. In this case it would be also possible to single out the dioxin/furan problem in order to reduce these super-toxicants getting into the Arctic Ocean through the rivers. In addition, the problem of wood wastes that form in great amounts in the course of wood processing needs to be solved.

Nenets Autonomous Okrug

No Cleaner Production Program has been as yet implemented in this territory, although the Russian-Norwegian Cleaner Production Centre arranged information seminars with the assistance of the district's Administration.

Taking into consideration that many companies in the region are engaged chiefly in intensive exploration and development of oil and gas fields it is proposed to start implementing Cleaner Production Programs in NAO also inviting specialists from transport systems and nousing and communal services.

Appendix 6

List of contact persons on the NEFCO-AMAP project Murmansk mission (12.05-16.05.2003)

Name	Position
Evgenyi Petrovich Olesik	Deputy Head, Department of Nature Resources and Environmental Protection for the Murmansk Oblast, MNR
Vladimir Mikhailovich Khrutskyi	Deputy Head, Department of Nature Resources and Environmental Protection for the Murmansk Oblast, MNR
Sergey L'vovich Pevzner	Expert on ground water, Department of Nature Resources and Environmental Protection for the Murmansk Oblast, MNR
Nikolai Nikolaevich Dobrokhotov	Head of water Division, Department of Nature Resources and Environmental Protection for the Murmansk Oblast, MNR
Nikolai Nikolaevich Parshin	Expert on air emissions, Department of Nature Resources and Environmental Protection for the Murmansk Region, MNR
Vladimir Viktorovich Markelov	Expert on solid wastes, Department of Nature Resources and Environmental Protection for the Murmansk Oblast, MNR
Alexey Filippovich Zimin, Pavel Viktorovich Pestov	Experts on forest, Department of Nature Resources and Environmental Protection for the Murmansk Oblast, MNR
Irina Yur'evna Vereschagina	Head of Department on Ecology and Environmental Protection, "Murmanskvodokanal"
Lidiya Vasil'evna Arktyukh	Director of "Murmanskstroivodokanal"
Galina Mikhailovna Dmitrieva	Director of Murmansk incineration plant
Alexey Leonidovich Kudrenko	Director, Environmental Harmony Evolution Found
Vladimir Il'ich Bakharev	Executive director, Environmental Harmony Evolution Found
Margarita Evgen'evna Ryabtseva	Head of Department on special analytical control, Murmansk regional fund on geological information
Olga Ivanovna Mokrotovarova	Chief of Monitoring Centre Murmansk Hydromet
Nikolai Stepanovich Kulpeka	Director, "Progorodnyi" farm
Alexander Konstantinovich Korekhov	General Derector, "Arktikeko-A"

List of contact persons on the NEFCO-AMAP project

Petrozavodsk mission (19.05-23.05.2003)

Name	Position
Alexander Ivanovich Shirlin	Deputy Head, Department of Nature Resources and Environmental Protection for the Republic of Karelia, MNR
Boris Georgievich Chikhachev	Deputy Head of Water Service
Vyacheslav Grigor'evich Gaikov	Chief specialist, Environmental Protection Department
Irina Vasil'evna Filatova	Chief specialist, State Expertise Department
Vasily Mikhailovich Yukhno	Chief specialist, Department of Economics, finances and licences
Stanislav Viktorovich Titarenko	Deputy Director of Regional Energy Commission
Avraam Mikhailovich Sklyarskyi	First Deputy, Regional Energy Commission
Viktor Dmitrievich Panyshev	Head of Department, Regional Energy Commission
Dmitry Vladimirovich Astrakhantsev	Deputy Director, Petrozavodsk "Vodokanal"
Vladimir Dmitrievich Musyichuk	Deputy Chief Engineer "Petrozavodskmash"

List of contact persons on the NEFCO-AMAP project

Arkhangelsk mission (21.04-25.04.2003)

Name	Position
Viktor Sergeevich Kuznetsov	Deputy Head, Department of Nature Resources and Environmental Protection for the Arkhangelsk Oblast, MNR
Ivan Nikolaevich Popov	Deputy Head of the State Control Division, Department of Nature Resources and Environmental Protection for the Arkhangelsk Oblast, MNR
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Gennady Egorovich Danilov	Director of Franz Josef Land Nature Protected area (“zakaznik”)
Valery Pavlovich Afanasev	Researcher, Franz Josef Land Nature Protected area (“zakaznik”)
Vladimir Alexeevich Markov	Head of Department on Protection of Biological resources, Arkhangelsk Special Marine Inspection
Tatiana Yurevna Dolgoschelova	Deputy- Head of Committee on Ecology, Administration of Arkhangelsk Region
Tatyana Abramovna Drobeshkina	Environment and labour safety manager, Joint Stock Company ”Solombala Pulp & Paper Mill”
Nikolai Kostogorov	Chief engineer, Arkhangelsk Pulp and Paper Mill
Tatiana Vladimirovna Soboleva	Arkhangelsk Pulp and Paper Mill
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Mikhail Ivanovich Mas’kov	General Director, Joint Stock Company ”Technoekologia”
Ivan Alexandrovich Leont’ev	Executive Director, Joint Stock Company ”Technoekologia”
Sergey Vital’evich Lodochnikov	Zvezdochka Head of Bureau on environmental protection
Sergey Fedorovich Tsykov	Sevmash Head ecologist
Leonid Valer’evich Medvedev	General Director, Joint Stock Company ”Kraton”
Sergei Ivanovich Pukanov	Deputy-head, Northern Department of Russian Hydrometeorological Service
Nikolai Anatol’evich Kolosov	Chief engineer ”Vodokanal”

List of contact persons on the NEFCO-AMAP project

Nenets Autonomous Okrug (27-30.04.03)

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Rafail Vyacheslavovich Rumyantsev	Deputy Head, Department of Nature Resources and Environmental Protection for NAO, MNR
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Sergey Vladimirovich Chibisov	Head of Division of state control, Department of Nature Resources and Environmental Protection for NAO, MNR
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Alexandr Vasil'evich Konchits	Deputy Chairman, Committee for Nature Resources and Ecology, Administration of the NAO
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Alexey Vasil'evich Kolobov	Ecological fund
Igor Anatol'evich Lavrinenko	Geo-Information Center, Administration NAO
Yana Kisliakova	Department on Foreign Affairs, Administration NAO

List of contact persons on the NEFCO-AMAP project

Komi mission (26.05-30.05.2003)

Name	Position
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Vasily Dmitrievich Obukhov	Deputy Head , Forest Division, Department of Nature Resources and Environmental Protection for the Komi Republic, MNR
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Lyudmila Ivanovna Nepomnyaschaya	Leading specialist, Department of Nature Resources and Environmental Protection for the Komi Republic, MNR
Leonid Dmitrievich Antonov	Department of water use Ministry of Nature Resources and Environmental Protection of the Komi Republic
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Anatoly Pavlovich Shevchenko	Director of Center on Energy Efficiency of the Komi Republic
Alexander Ignat'evich Uryupinskov	Deputy Director of Center on Energy Efficiency of the Komi Republic
Sen'kin Nikolai Alexandrovich	"Komienergo"
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Lyudmila Ivanovna Glushkova	Chief doctor, Sanitary-Epidemiological Service
Naum Grigor'evich Oberman	Head of Komi Republic Centre for monitoring of mineral resources
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Zoya Petrovna Troshina	Director for environment, Neusiedler Syktyvkar
Yuryi Mikhailovich Vechtomov	"Partner-S"
Leonid Leonidovich Ugryumov	Chief Engineer, "Vodokanal"
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