Ministry of the Environment

The Environmental Challenges for Northwest Russia

THEMATIC REPORT

DANCEE
Danish Cooperation for Environment in Eastern Europe
Ministry of the Environment

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1. Introduction

Geographic focus

The geographic focus of this report is Northwest Russia and more specifically the Baltic Sea catchment area comprising the city of St. Petersburg, and the Oblasts of Leningrad, Pskov, Novgorod, and Kaliningrad.

Main geographic focus of this report

Sector Focus

The main emphasis is on analysing the local, regional and transboundary environmental problems and challenges that have direct impact on the population in Northwest Russia and on the Baltic Sea environment, i.e. water quality and waste management. Also energy is being included as air pollution is transboundary in nature and often ends up in water bodies. Furthermore, disposal of side products from energy production represents an environmental problem, which has significant impact on the water quality.

The report has been prepared by COWI AS, an independent Danish consulting company, having more than ten years of experience from working with environmental problems in Northwest Russia. The report is a desk study and data have been collected from the extensive literature, which exists on this subject. Data were extracted from reports and material published by convention secretariats, international research institutes, Danish Environmental Protection Agency, international donors, NGOs, official Russian statistics etc. Furthermore, material published on the homepages of various Russian ministries is included in the analysis.

The report provides the reader with an overview of some of the key environmental challenges Northwest Russia faces today and needs to address to avoid significant negative consequences on:

- the human health situation in Northwest Russia
- the water quality and biodiversity of the Baltic Sea
- the world's air pollution.

The contents of this report have been requested by the Russian environmental authorities in the co-operation with the Danish Ministry of the Environment as a rounding-off of the Danish-Russian efforts. The purpose of the report is to illustrate the status of the environment and indicate possible solutions to the problems.

2. Background

History

Some of the major environmental challenges faced by Russia today can be traced back to the start of the century when the centrally planned economic modernisation and industrialisation of the USSR were launched. The main focus was on optimising output levels and often neglecting ecological impacts. Based on the country's abundant natural resources, extremely ambitious investment projects were launched in previously pristine environments (e.g. dams, mines, large-scale farms and industrial cities). Millions of people were moved to the cities with little consideration for the environmental effects of urbanisation. Massive clustering of industrial and agricultural activities has lead to high concentrations of pollutants with a highly negative impact on the environment.

Russia's abundant natural resources were utilised by the state to boost production and public service levels with limited concern given to optimising the efficiency of these inputs, which has resulted in inefficient use of e.g. energy and water. Furthermore, due to cross subsidies from low energy prices, which are today still below world marked prices, energy intensive industries have been favoured.

Although the Soviet Union passed some of the earliest laws on toxic substance levels the second half the 20th century was marred by a long list of ecological disasters culminating in 1986 with the Chernobyl nuclear power plant meltdown.

2.1 The Reform Process

Since then the Russian governments have introduced a number of reforms to improve the environmental situation of the country. See summary in the text box below.

1987	USSR resolution "International Environmental Security" introduced
1988	USSR State Committee for the Protection of Nature created
1989	USSR submits its first annual environmental report
1991	USSR Ministry of Environmental Protection is created taking over all responsibilities from the State Committee and the first environmental law formulated
1992	Ministry of Environmental Protection and Natural Resources is created by the Russian Federation
1993	The Environmental Law is up-dated by the Russian Federation
1994	State strategy of the Russian Federation on Environmental Protection and Sustainable Development
1995	New regulations on the EIA procedure, including public participation
1996	Downgrading of Ministry of Environment to State Committee for Environmental Protection. Ministry of natural resources responsible for natural resource management
1997	National Strategy on Sustainable Development approved by the Parliament
1998-1999	National Environmental Action Programme 1999-2001
2000	Responsibilities of State Committee for Environmental Protection and Federal Forestry Service given to Ministry of Natural Resources. The two committees dissolved.
1991-2002	More than 30 new environment related laws adopted 25 multilateral environmental agreements entered into 30 bilateral environmental agreements entered into
2002	New Law on Environmental Protection signed and Environmental Doctrine adopted

Environmental strategy

The National Environmental Action Plan (NEAP 1999-2001) is one of the Russian Federation's most significant and comprehensive strategic documents for environmental protection. The National Environmental Action Plan outlined the objectives for: improvement of the environmental situation in Russia; conservation of nature resources; the effective participation of Russia in international environmental initiatives; and implementation of priority environmental protection activities. However, it was not developed as an operational document and consequently did not

specify targets, offer a ranking of activities nor provide a clear indication of financial sources. A new National Environmental Action Plan for the period 2003-2005 is presently being prepared. Its main purpose is to concretise environmental goals outlined in the Environmental Doctrine of 2002.

In spite of the reforms initiated since the dissolution of the Soviet Union, the Russian society is still far more polluting and resource consuming than other OECD countries.

2.2 International Environmental Co-operation

Russia's International Commitments and Targets for Environmental Performance

Up through the 1990s, Russia has entered into 25 multilateral agreements and 30 bilateral agreements, which are directly targeted at or include commitment towards improved environmental protection. Russia's status regarding the most relevant environmental conventions and protocols are presented in the text box below.

Environmental conventions and protocols ratified by the Russian Federation include:

- The UN-ECE Water Convention on Protection and Use of Transboundary Water Courses and International Lakes
- The Helsinki Convention on Protection of the Marine Environment of the Baltic Sea area with amendment
- The London Protocol on Water and Health
- The Marpol Convention on Prevention of Pollution from Ships
- The Basel Convention on Control of Transboundary Movements of Hazardous Wastes and Their Disposal
- The Framework Convention on Climate Change
- The Vienna Convention on Protection of the Ozone Layer, specifically the Montreal Protocol and the London amendments
- The Geneva Convention on Long-Range Transboundary Air Pollution
- The Convention on Biological Diversity (including the PAN-European Biodiversity and Landscape Strategy and the PAN-European Forest process)
- The Ramsar Convention on Wetlands of International Importance especially as waterfowl habitat
- The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (including harmonising of EU – Russian standards).

Non-ratified conventions and protocols relevant for Northwest Russia's environmental challenges Include:

- The Kyoto Protocol – *its ratification is expected soon*
- The Stockholm Convention on Persistent Organic Pollutants (POP Convention) – *signed, but not ratified; this convention is reportedly number two on the "waiting list of ratification"*
- The Espoo Convention on Environmental Impact Assessment in a Transboundary Context – *signed but not ratified*
- The Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) – *not signed*
- The Cartagena Protocol on Bio-safety to the Convention on Biological Diversity – *not signed*
- The Aarhus Convention on Access to Information, Public Participation in Decision Making and Access to Justice in Environmental Matters – *not signed*
- The Copenhagen Amendments to the Montreal Protocol on Substances that Deplete the Ozone Layer
- The Oslo-Paris (OSPAR) Convention for the Protection of the Marine Environment of the Northeast Atlantic – *not signed*

Furthermore, environmental co-operation with EU and international organisations, such as e.g. the WB, OECD, WTO, has intensified significantly during the 90s.

EU

The cornerstone in EU's relation to Russia is the "Partnership and Co-operation Agreement" (PCA). This agreement was signed in 1997 and has expanded the scope of previous relations remarkably as the parties hold summits twice a year. Russia states in its strategy towards the European Union an overall commitment to secure a close and co-operative relation between the two parties including amongst other an approximation to EU environmental legislation, framework directives and technical standards.

The TACIS Regional Co-operation Indicative Programme for 2004-2006 has sustainable management of natural resources as one of its priority areas, including in particular water issues, biodiversity and sustainable use of forest resources as well as climate change. The Northern Dimension

Of particular relevance is the Northern Dimension, which operates through EU's existing financing instruments. The main instruments are the Tacis, Phare and Interreg programmes. Furthermore, a number of regional organisations and international financing institutes are active in supporting the Northern Dimension, including the European Bank for Reconstruction and Development (EBRD), the Nordic Investment Bank (NIB), the Nordic Facility for Environmental Finance Corporation (NEFCO), and the Nordic Project Fund (NOPEF).

An environmental partnership under the Northern Dimension Environmental Partnership (NDEP) was initiated during the course of 2001 in response to calls from Russia and the international community for a concerted effort to address environmental problems in Northwest Russia. Of particular concern was the legacy of environmental damage in the region concerning water, drainage, energy efficiency and nuclear waste. With the creation of the Northern Dimension Environmental Partnership together with its Support Fund, the Russian Federation, the European Union, the international financing institutes (EBRD, EIB, NIB and the World Bank Group), and bilateral donors have a cohesive institutional framework, backed by dedicated resources, to support the solution of these problems.

The Role of International Financing Institutions and Donors

International financing institutes and donor organisations are an important source of finance for environmental investments in Northwest Russia. However, given the sheer size of the financing need, international financing alone cannot solve the environmental problems.

From an environmental perspective, increased international co-operation and signing of various conventions and charters indicate a willingness to address environmental issues. Furthermore, it has the advantage that Russia, in order to live up to the agreed standards, is required to put the environment on the agenda. Through dialogue, and concrete international support, the various multilateral and bilateral agreements increase awareness of the environmental challenges and influence the Russian decision-making process towards making more environmentally sustainable priorities.

However, as will be further substantiated in the next chapters, Russia still has a long way to go before it overcomes the environmental challenges it faces today.

2.2.2 Baltic Sea Environment

One of the key areas today for Russia's environmental efforts and international co-operation is the Baltic Sea.

The Baltic Sea is an important commercial fishing area and attracts millions of people to its attractive recreational water environment. The Baltic Sea and its tributaries is also one of the main transboundary areas of environmental pollution in Northern Europe. The Baltic Sea is the largest brackish water area in the world, because of the many rivers that reduce the salinity, and because of the very low level of water exchange. These factors make the sea especially vulnerable to pollution.

An important international agreement guiding the co-operation relating to the Baltic Sea is the Convention on the Protection of the Marine Environment of the Baltic Sea Area, 1992.

The governing body of the Convention is the Helsinki Commission – Baltic Marine Environment Protection Commission – also known as HELCOM. The HELCOM works to protect the marine environment of the Baltic Sea from all sources of pollution through intergovernmental co-operation between Denmark, Estonia, the European Community, Finland, Germany, Latvia, Lithuania, Poland, Russia and Sweden.

Through its "Joint Comprehensive Environmental Action Programme" (JCP), HELCOM involves all neighbouring countries in the efforts to secure an environmentally sustainable Baltic Sea. The JCP is a 20-year programme of action approved by the Helsinki Convention in 1992. The programme was reviewed and updated in 1998.

The main objective of the JCP is to support both "preventive" and "curative" measures in the Baltic drainage basin to restore the ecological balance of the Baltic Sea by reducing pollution loads. This involves identifying key pollution sources – also called hot spots – and carrying out measures to reduce the inputs of nutrients and other harmful substances.

Key Facts on the State of the Environment in the Baltic Sea – 2001

HELCOM concluded in its 2001 overview report that the loads of many substances have been reduced by at least 50% since the late 1980s – mainly due to the effective implementation of environmental legislation, the substitution in production of hazardous substances with harmless or less hazardous substances, introduction of cleaner technology and improved treatment of industrial and municipal wastewater. In Estonia, Latvia, Lithuania, Poland and Russia, however, reductions have been mainly due to fundamental socio-economic changes and to a lesser extent due to cleaner production, and improved treatment. And yet the environmental status is as follows:

- Concentration of Nitrogen and phosphorus is too high
- Eutrophication remains the most pressing problem in the Baltic Sea
- Concentrations of most of the monitored hazardous substances, including mercury, lead and DDT, have decreased in marine organisms in the past 20-25 years, thanks to international environmental protection measures
- Marine mammals suffer from reproductive disorders linked to the continued presence of polychlorinated biphenyl (PCB) and dioxins in the environment
- Other, as yet unknown hazardous substances are a new worry.
- Cadium concentrations in fish in the Baltic Sea have increased for unknown reasons

Source: Helsinki Commission – Activities 2001 Overview

In 1992, HELCOM identified 132 environmental hot spots of which 18 were in Northwest Russia. The hot spots were identified by an international group of scientists, engineers, environmental managers, financial experts and national representatives on the basis of practical economic considerations and the seriousness of their impact on the environment and human health.

Today 51 of the original 132 hot spots[1] – or 39 per cent – have been improved to meet HELCOM requirements and thus deleted from the list. However, so far only one – or six per cent – of Northwest Russian hot spots have been removed from the list due to closedown of the polluting industry[2]. Consequently, Russia still has 17 hot spots to address.

1. *HELCOM press release 21/11-2002*
2. *The Pulp & Paper plant No.1, in Kaliningrad was removed as a Hot Spot in 1998 due to close down of the plant.*

Hot Spot No. 49 Sovetsk Pulp and Paper Mill – a case example
In 1991, the Sovetsk pulp and Paper mill discharged 35,000 tons of BOD5, which was about 35% of the total BOD5 load in the region, 3,300 tons of Ntot (59% of the total nitrogen load in the region) and 52 tons of Ptot (21% of the total phosphorus load in the region). To fulfil the requirements of HELCOM recommendations for pulp industry, a reduction to 330 tons of BOD5 (99%), 210 tons of Ntot discharges (92%) and 33 tons of Ptot discharges (32%) would be required.

Development – Sovetsk has reduced its wastewater discharges considerably between 1991-1998. BOD discharges were reduced by 95%, Ntot wastewater discharges by 98% and Ptot discharges by 99%. This is partly due to reduced production, since the wastewater flow was reduced by 65% in the same time period. The reduction of wastewater discharges per production unit has been achieved by the construction of a wastewater treatment plant, of which 60% was completed in 1994. The funds available in 1994 were only enough to support the operation of those parts already completed. The cost estimate for the modernisations is Euro 64 Million of which 26 have been allocated. However, the construction was stopped in 1998 when centralised funding ceased.

Contrary to the predictions of 1992, the Sovetsk Pulp and Paper Mill survived the pressure from the new economy. The treatment facilities are still not satisfactory and if production is increased in the future, the problem will return.

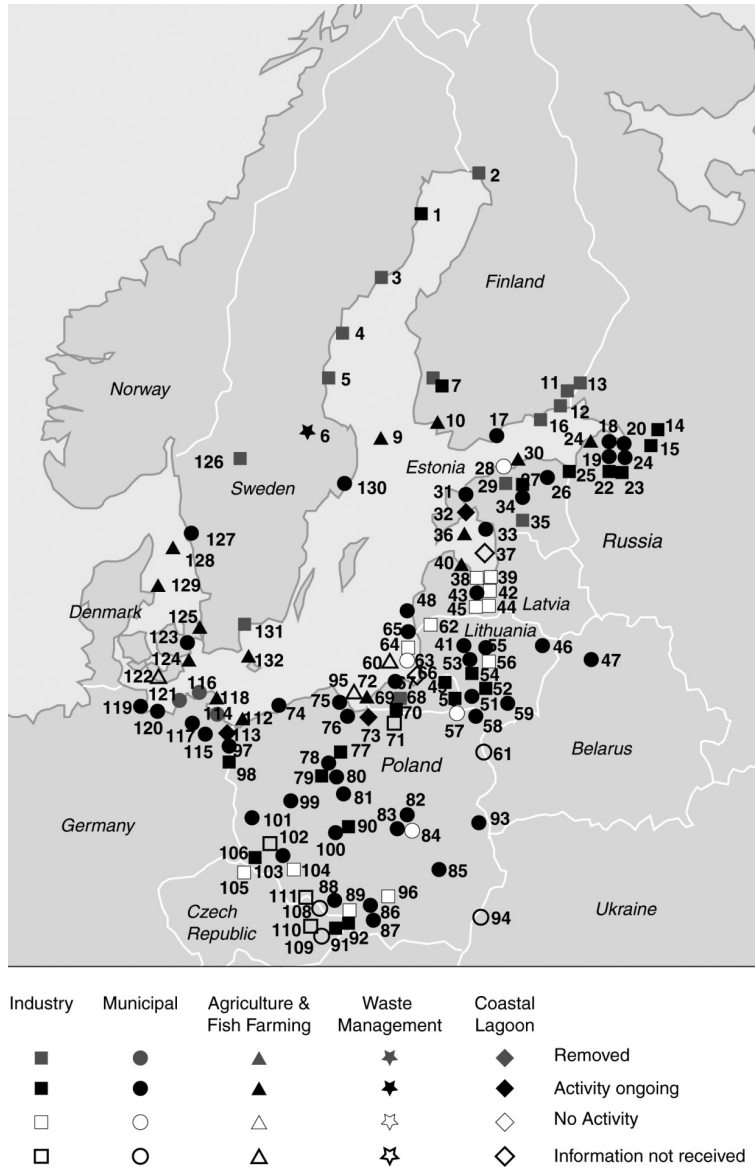
Source: Review of Progress at Industrial Hot Spots, Finnish Environment Institute, Helsinki 2002

According to HELCOM the Russian efforts have been encouraging but not sufficient to remove the hot spots from the list. There is a serious lack of funding and during 1991-98 only Euro 30.4 million were allocated for improving the environmental performance of the industrial hot spots in Northwest Russia[3]. As reference, a total financing need of Euro 313 millions was identified in the HELCOM Joint Comprehensive Environmental Action Programme for Northwest Russia's industrial hot spots.

3. *Review of Progress at Industrial Hot Spots, Finnish Environment Institute, Helsinki 2002*

In comparison, 17 – or 50 per cent – out of Poland's 33 hot spot identified in 1992 have been removed from the newly updated list1. A map of the hot spots is presented below and a full list of all hot spots identified in 1992 and their present status can be found in Appendix 2.

Hot Spots in the Baltic Sea[4]



Source: www.helcom.fi

4. *The list of hot spots has been revised in November 2002, and HELCOM is currently preparing an updated map.*

The 18 hot spots in Northwest Russia are divided into:

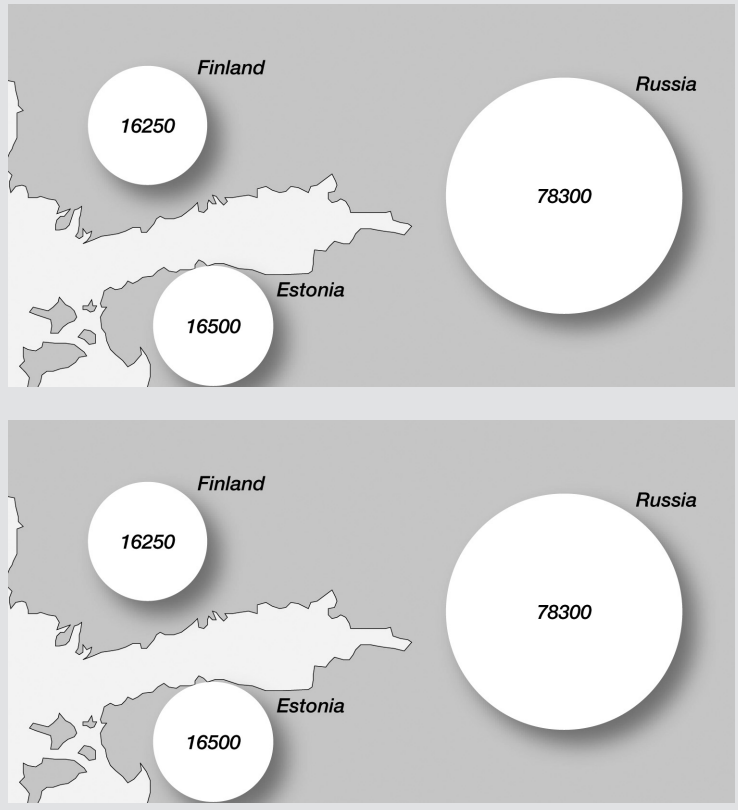
- Municipal and industrial wastewater treatment — 5 hot spots
- Industry — 7 hot spots
- Hazardous waste — 2 hot spots
- Agriculture[5] — 2 hot spots
- Coastal lagoons and wetlands — 2 hot spots

The problems in Northwest Russia are by far limited to the designated hot spot locations. In addition to being some of the most critical sources of the Baltic Sea pollution, the various hot spots indicate the type of problems to be found throughout Northwest Russia causing serious threats for the local environment and the health situation of the population.

5. *Agricultural hot spots concern large scale pig farms. These have a size of more than 50,000 pigs and handling and discharging animal waste is a serious threat to regional ground and surface waters*

Insufficient treatment of municipal and industrial wastewater in Northwest Russia is leading to discharge of nutrients, microbiological elements and chemical toxins. In addition to local and regional consequences, the nutrients have significant transboundary impacts on the eutrophication especially for the Gulf of Finland and the Vistula and Coronean Lagoons. As can be seen from the below figures Northwest Russia is responsible for a significant share of the discharges into the Gulf of Finland.

Nitrogen and Phosphorous loading in tonnes 1997-98 from the catchment of the Gulf of Finland



Source: Finnish Environmental Institute

3. Cross-Sector Challenges

This chapter highlights some of the cross-sector challenges related to public environmental management.

3.1 Legal and Institutional Challenges

3.1.1 Institutional framework

Vertical structure

The three existing administrative levels in Russia – the federal, regional and local/municipal – all have legislative, executive and judicial bodies. The individual regions have extensive autonomy from the federal level, and the institutional set-up of the authorities at subfederal levels varies from region to region. In May 2000, seven Federal Districts were established to ensure that federal legislation is implemented throughout the country[6], each headed by a socalled "empowered representative" of the president.

Each region is divided into a number of municipalities. The municipal level is responsible for a number of public services to the citizens, such as water supply, wastewater collection and treatment, district heating and waste collection.

Horizontal structure

The Ministry of Natural Resources is the main institution in the Russian Federation responsible for setting the overall priorities and administrative framework for the management of natural resources and environmental protection. It implements the state environmental policy of the Russian Federation[7] and co-ordinates activities related to environmental protection. However, the Ministry of Natural Resources is far from the only ministry responsible for environmental protection. Although MNR has a responsibility to supervise the implementation of the environmental policy, it has no real power to control and co-ordinate environmental activities of other ministries and committees.

6. *Before this major administrative reform there was an "empowered representative" of the president in each Federal Subject (Regions).*
7. *After the reorganisation started in May 2000 it was joined by the State Committee for Environmental Protection of the Russian Federation, which had these responsibilities before.*

The list below illustrates the various Ministries and state Committees which have been empowered with influence on environmental protection[8]:

- Ministry of Natural Resources
- State Service for Hydrometeorology and Environmental Monitoring
- Ministry of Health Protection
- State Committee for Construction and Housing
- Ministry of Transport
- Ministry of Agriculture
- Ministry of Economic Development and Trade
- Ministry of Finance
- Ministry of Emergency Situations
- Ministry of Atomic Energy
- Ministry of Energy
- State Committee on Fisheries

An important challenge in Russia's effort to improve the environmental management is the complex structure of the Russian public administration. There are numerous examples of unclear division of labour and overlap of competencies between the various ministries, which hampers the possibilities of creating a well-functioning environmentally oriented public administration.

An important factor preventing the Russian public administration from functioning in an efficient manner is lack of co-ordination and knowledge exchange between the various institutions.

The picture gets even more complicated when taking into consideration that most governmental institutions have a "vertical" hierarchy of offices from the federal down to the lower administrative levels[9]. The newly established level of federal districts does not yet cover the full spectrum of establishments corresponding to the federal ministries and other executive power bodies, even though most of them are present within the lower administrative levels.

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8. *These institutions represent only the most important Federal bodies responsible for activities which have an impact on the environment.*
9. *At the local level, there are only few separate offices under ministries as the more diverse functions are normally performed by joint departments of executive bodies.*

Each Federal District has an interregional department for natural resources located in the central city of the District. The Northwest Federal District is placed in St. Petersburg. Departments for Natural Resources likewise represent the Ministry of Natural Resources at oblast level and at local level by a corresponding department or just a staff member in charge.

The "Dual" Role of the Ministry of Natural Resources

As the Ministry and its regional and local network is overall responsible for both the exploitation of natural resources and environmental protection, these often conflicting interests demand strong co-ordination within the ministry. At the same time, this setup should facilitate a proper integration of environmental concerns when planning and executing the exploitation of the country's abundant natural resources, though this opportunity does not yet seem to be fully utilised.

3.1.2 Legal framework

In 1991, the Law on Environmental Protection was signed. This was the first comprehensive environmental law of the Russian Federation. It was based on some of the principles of international environmental law contained in the Rio Declaration, i.e. "polluter pay" principle, public participation and access to environmental information.

Since 1991, a systematic revision of environmental legislation has taken place and new laws have progressively replaced those of the USSR. During 1991 and 2000 more than 30 new environment-related laws were adopted in Russia.

Despite the significant progress in developing environmental legislation, the environmental regulatory framework is still complex and sometimes inconsistent. The Regions may adopt their own legislation in areas of shared competence and in areas unregulated by federal legislation, e.g. regional norms and standards. Local administration may also lay down regulations in addition to or elaborating on federal and regional requirements.

Thus, the environmental regulatory framework leaves considerable room for regional and local environmental administrations to make discretionary decisions. As a result the present multilevel administrative sy-

stem is complicated and incoherent, and it has numerous and not always compatible norms and standards and diverging permitted practices[10].

Lacking "Rule of Law" Legislative Tradition

Traditionally Russia has not been a society based on "rule of law" principles. Rather, the governing of the country has been based on the administrative apparatus. During the past decade, a number of steps towards rule of law have been taken and a number of key pieces of legislation have been drafted and passed. However, there are still gaps and overlaps in regulation. Some areas are not regulated properly and other areas are subject to several provisions thus creating confusion concerning the actual legislation in force – i.e. confusion between old (Soviet) regulation and new regulation.

Changing the system towards "rule of law" is difficult due to resistance in the administrations. Individuals in the administrations have built up power bases, which secure influence and eventually economic gains. The World Bank report "Transition – the first ten years" points to the fact that these gains can be extraordinarily high in the context of a partly liberalised economy, and especially in economies rich in natural resources which is the case for Russia.

> "… experience shows that these shortterm winners of partial reform can convert a small share of their gains into political influence that can be used to restrict entry, undermine competition and preserve the very distortions that generate these rents. Such constituencies seek to freeze reform into an equilibrium of liberalization without discipline…".

Source: World Bank, Transition – the first ten years, 2002

Administrative reforms would jeopardise these positions and consequently the reformers have to overcome shortterm losses for individuals in order to create longterm benefits for the society.

10. *Danish Environment Protection Agency Project Document 2002 "Reform of Water sector legislation"*

Standards

The present environmental effluent standards in Russia have been established during the Soviet period and are based on the "zero risk concept" i.e. maximum allowable concentrations of pollutants in effluents (e.g. air emission, wastewater discharge, waste disposal). On paper, the standards and norms established are very strict. However, since most industries and public utilities are unable to operate at those high environmental standards, so-called "temporary agreed standards" are usually negotiated. As such, the implementation of environmental laws and standards are based more on exemptions than enforcement.

3.1.3 Monitoring and enforcement

Even if normative standards were upheld, enforcement capabilities seem to be quite weak, both with regard to technical[11] as well as institutional capacity. Lack of capacity has lead to infrequent inspections and on-site controls. Inadequate and infrequent monitoring and inspection practices do not create incentives for compliance and for improving technological and environmental performance.

There are a large number of water standards applicable in Russia, which illustrate the unclear institutional structure. Within the water sector a multitude of water quality standards, with unrealistically high levels of protection and partly overlapping fields of application, flourish. The list below illustrates the variety of bodies from Kaliningrad which all play a role in environmental water monitoring, often with overlapping responsibilities.

Regional bodies of federal agencies, which are responsible for water monitoring in Kaliningrad Oblast:

- Kaliningrad Centre for Hydrometeorology and Environmental Monitoring (regional body of the State Service for Hydrometeorology and Environmental Monitoring)
- Federal institution "Kaliningrad territorial fund of geological information" (affiliated to MNR)
- Specialised Marine inspection
- Centre of State Sanitary and Epidemiological Inspection in the

11. An example is drinking water standards, which include a long list of components which many laboratories cannot analyse for at present.

Kaliningrad Region (regional body of the Ministry of Health)
- Kaliningrad Hydrogeological and Meliorative Research Center (affiliated to the Ministry of Agriculture)

In addition to organizations mentioned above the following institutions are also involved in water monitoring activities:

- Atlantic Research Institute of Sea Fishery and Oceanography
- Atlantic Branch of Shirshov Oceanological Institute
- Institute "Zapvodproekt"
- Vodokanal

Source: Department of Natural Recourses and Environmental Protection of Kaliningrad Oblast

When it comes to standards for efficient use of natural resource, the Russian system is less restrictive. Whereas Soviet standards and norms on energy efficiency in the heat and power generation reflected state-of-the-art in 1960s and 1970s, they fall short when compared to today's requirements in the European Union.

Resources in the Ministry of Natural Resources have been channelled away from the environmental protection system. Environmental inspectors were reduced by 31% from (4,805 in 1999 to 3,309 in 2000); the number of enterprises controlled fell from 332,000 in 1999 to 282,000 in 2000.

Source: Article by WWF Russia

3.2 Financing of Environmental Services and Investments

3.2.1 Challenges and problems related to financing

A major barrier to compliance with international conventions and targets for environmental improvements is to secure financing. Environmental targets in Russia have often been defined without regard to the related costs.

This issue of financing is in particular relevant to the provision of public services, i.e. supply of energy and water, treatment of wastewater and

collection and handling of waste. These sectors suffer from out-dated and worn-out infrastructure, which has been left in disrepair for decades.

3.2.2 Financing need

No overall assessment has been made of the total financing need for bringing environmental services in Northwest Russia up to an acceptable standard.

The Russian National Environmental Action Plan (1999) does not contain costing estimates and contains no specific action plan covering Northwest Russia. Following the NEAP, some regions developed sector-oriented plans partly based on the National Environmental Action Plan, but they rarely encompassed the costing of planned interventions.

The total costs of bringing all 132 HELCOM hot spots up to environmentally acceptable standards were estimated by HELCOM in 1999 at about Euro 18 billion for all countries involved. According to the costing exercise, the financial requirements related to the hot spots in Russia within water supply and wastewater treatment was estimated to be Euro 1,400 Million and Euro 14 Million for hazardous waste management[12].

Today, the 1999 estimate of financial requirements for hazardous waste management seem too low as the reprocessing plant planned for the Krasny Bor hazardous waste landfill site alone represents an investment cost of app. Euro 45 million[13].

In addition to the identified hot spots, there are a number of similar challenges throughout Northwest Russia, which likewise require huge investments.

3.2.3 The Financing Gap Related to Environmental Services

For many HELCOM hot spots, financing packages with participation from Russian sources, international financing institutes and bilateral donors have been identified.

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12. JCP Annual Report, 1999

13. THE RUSSIA JOURNAL, JUNE 1 - 7, 2001

However, the general picture is that significant underfunding marks the municipal services sector and the problems are worsening year-by-year. At present, many utilities have problems covering even their operational expenses within the present levels of revenue they can generate.

During the last two-three years, a number of environmental financing analysis – and subsequent strategy formulations – in selected regions in Northwest Russia have been carried out in the water and waste sectors with support from OECD and the Danish Environmental Protection Agency. The results from these initiatives serve to illustrate the significant amount of funding needed throughout Northwest Russia for environmental services. The strategies for Pskov, Novgorod, and Kaliningrad all concluded that there was a major gap between expenditure need for public utilities and available finance – even when aiming for a continuation of the existing moderate service level. Hence, the financing requirements related to a more ambitious service level – e.g. improved wastewater treatment – would lead to an even larger financing gap because of the required investments and subsequent needs for maintenance and operation.

3.2.4 Main Causes of the Financing Gap

There are four main explanatory factors for the serious lack of financing in the municipal environmental services. These are discussed below.

Low revenue from user charges
Traditionally municipal services have been provided to users at a very low cost intended to cover the operation of utilities, whereas financing for main repairs and investment in new equipment for utilities were to be provided by the public budget.

Today, user charges are still at a low level compared to other countries and do not reflect the costs of supplying the service. Apart from the insufficient revenue base, the low prices do not disfavour conservative habits of overconsumption of water and energy by endconsumers. Even though there are differences between the situations in various regions and cities, the general problems are:

- The procedures for calculation of tariffs are very restrictive. A tariff is calculated on the basis of the documented costs of the utility, but

cost elements related to investment and "writing off" of overdue receivables from households are not allowed. Also, the tariff setting procedure is ill equipped for taking into account the effects of inflation on the costs.

- Tariff levels are ultimately decided by the local Duma (Parliament). Due to the poor economic situation in many households, there is an incentive to lower the tariffs for social policy reasons.
- Collection of tariffs is often inefficient due to poor financial management and complicated systems (e.g. exemptions rules for disadvantaged house-holds based on somewhat outdated Soviet definitions).

The utilities are generally in a very unfavourable position when it comes to possibilities for attracting loan financing due to their low creditworthiness. This situation is not likely to change before the framework for setting user charges is reformed and the utilities have a better revenue base.

Lack of public funding

The Ecological Fund was established in the early 1990s and comprised the collection of revenues from pollution charges to be channelled into environmental activities.

With respect to the public budget, ambitious federal target programmes were drawn up during the 1990s. However, these programmes have received only a fraction of the planned funds from the annual public budget due to the general economic decline in the country.

Earlier, the Ecological Fund of the Russian Federation was a source of financing for environmental projects. However, this Federal fund was abolished in 2000 and consequently the regional and local environmental funds were consolidated with corresponding budgets. The revenue from pollution charges now goes directly to the public budget.

The loss of the centrally administrated Ecological Fund may have a negative impact on investment related to environmental problems of cross regional and/or cross boundary nature as these now have to be funded by regional and local budgets, which traditionally have a geographically more narrow focus.

Inefficient use of investment resources and lack of investment planning

There is a general lack of strategic sector-level planning. Programmes and action plans are often overambitious in terms of targets to be achieved and do not consider the financing constraints. This means that the

few resources available for investments may not be used in the most effective way. Furthermore, new investments in public utilities and the subsequent need for finances for maintenance and operation drains the funds available for maintenance and operation of existing utilities.

Also, complicated ownership structures lack of clear divisions between utilities and municipal administrations and diversified responsibilities for investment actions form an important barrier to sound investment practises.

Resource-intensive services and low maintenance levels
Resource intensity brings up the operating costs associated with the provision of services, and therefore has a negative impact on the financial situation of the utilities. Resource intensity stems both from the inefficiency of the utilities and overconsumption by the endusers.

Compared to levels in western countries, the utilities in Russia are not efficient in terms of energy and staff, which brings up the supply costs of each unit of e.g. water or energy. One main reason for this is that the infrastructure is so worn out that overly high operational costs are required to keep the utilities running. In both the water and the energy sector, there are high losses in the distribution system as a result of badly maintained supply systems.

With respect to overconsumption of water and energy by the endconsumers, this is rooted in a number of factors.

- Tariffs are charged on the basis of norms and not on the basis of actual consumption, which implies that there is little incentive for the user to reduce consumption.
- There is very little use of individual metering, which means that it is impossible to measure the consumption of the individual enduser.
- The awareness among endusers of the environmental effects of e.g. excessive water and energy use is generally not high.

Public Awareness
In general, public utilities in Russia do not organise awareness raising campaigns focused on water or energy savings. Moreover, they may not be interested in such savings for economic reasons. Water consumption dropped significantly in the 1990s due to the economic decline. Many

water utilities use only part of their capacity and have no incentive to decrease their production further.

However, the environmental consciousness among the population is slowly improving due to the efforts of state institutions, international organisations and NGOs (local and international) e.g. in the form of campaigns and distribution of information on rational use of natural resources.

Some elements of environmental education have also been introduced in all primary and secondary school programs as well as in all curricula of higher educational institutions.

3.2.5 The Reform Programme for Upgrading the Housing and Utility Sector in the Russian Federation during 2002-2010

The Government of Russia has over the past decade pursued a reform of the housing and municipal services sector. Lately, the reform process has taken an important step forward with the most comprehensive document spelling out the aims of the reform.

In response to the present financing gaps, the Programme for Restructuring and Modernisation of the Housing Sector was approved as part of the Federal Targeted Programme on housing by Government Resolution #797 in November 2001. It includes a wideranging, comprehensive package of development measures to improve the services provided and financial health of the municipal utility sector.

The key objectives of the programme are to:

- Improve the efficiency and reliability of housing and utility services
- Attract investment into the housing and utility sector
- Provide targeted social assistance to socially vulnerable groups

The programme focuses on enabling the utilities to function as self-sustaining entities. Some key features of the reform programme include:

- The delivery of municipal services to the consumers to be “contract based” and revitalisation of the utility services through demonopoli-

sation and efficient contractual relationships between owners, management companies and contractors.

- Ensure a transition to tariffs reflecting the cost of the service provided (full cost recovery) by 2003. Efficient and transparent tariff regulation procedures should be introduced, and tariff setting should be delinked from social policy issues by introducing separate programmes for public subsidies to disadvantaged households.
- The tariff regulatory mechanisms to be adopted in the utility services sector should be based on the need to promote and encourage investment, in particular private investment, in utility enterprises (this is one of the principal goals of tariff reform), ensure that enterprises have adequate financial resources, and have "inbuilt" mechanisms which lower the "politicisation" of the tariff setting process.
- The installation of meters for measuring water consumption at household or condominium level and the termination of cross subsidising between consumer groups.

The total cost of implementing the reform programme throughout the Russian Federation is divided into:

- Investments to upgrade the housing and utility sector estimated at around EUR 18 billions and
- Costs of supporting a subsidy programme to maintain household affordability estimated at around EUR 12 billions.

The cost estimate for the investment programme is subdivided into EUR 10.6 billion earmarked for district heating and some EUR 7.4 billion for water supply and sewerage utilities.

The specific budgets of each region are to be developed during the first stage of the programme i.e. 2002-2003. However, the investment programme is mainly to be based on regional and local funding, which are expected to cover 98 per cent of the financial needs (to be secured though increased user payments, improved cost efficiency and private investments). Federal funds are only expected to cover around one per cent of the estimated investment costs. International loans are likewise expected to cover one per cent whereas foreign grants are expected to cover some 0.16 per cent of the estimated costs.

With regard to the subsidy scheme, around 86 per cent of the budget are expected to be covered from regional and local funds whereas the remaining is expected covered by federal funds.

The oblast administration of Kaliningrad Oblast presented a draft Oblast Target Programme in February, 2002, defining a long list of investments to be undertaken in the municipal and housing sector in the period 2002-2010.

The total size of the draft investment programme for the period 2002-2010 is around USD 330 million. Of this budget, USD 110 million is foreseen to be financed from the Oblast budget (including transfer from the federal budget), USD 140 million from the local/municipal budgets (predominantly Kaliningrad City, which accounts for USD 135 million) and other sources should provide the around USD 75 million.

3.3 Increased momentum of the reform process

3.3.1 Institutional and legal reforms

To meet its environmental targets – as also demonstrated through Russia's participation in a number of international environmental agreements – the process of reforming Russia's legal and administrative framework must be further strengthened based on environmental and financial sustainable principles.

In order for Russia to pursue the overall environmental objectives it is important that the new National Environmental Action Plan for the period 2003-2005 is finalised in a manner that truly facilitates the achievement of the environmental goals outlined in the Environmental Doctrine of 2002.

In addition to the Programme for Restructuring and Modernisation of the Housing Sector, a new water law is also under preparation drawing on EU experiences and lessons and moving toward harmonisation with EU standards in particular the EU Water Framework Directive.

In the administrative system of Northwest Russia the co-operation between Housing and Municipal Services Companies, the Regional Committee of Natural Resources and the Regional Sanitary-Epidemiological Service must be further enhanced to secure a uniform and more effective approach toward regulating activities within the water, waste and energy sectors. Consequently, a strengthened co-operation is needed also at the federal level between the State Committee for Construction and Housing, the Ministry of Natural Resources and the Ministry of Health Protection.

This demand for a thorough analysis of shortcomings of the whole environmental administration (national, oblast, local level) to secure a proper distribution of tasks and responsibilities, which should be followedup by a capacity-building programme (targeted at human resources, IT, internal procedures, and co-ordination between ministries). Furthermore, the efficiency and willingness to continue the reform process within the public administration from the federal to lowest local levels must be secured.

3.3.2 Closing the Financing Gaps

Dealing with the underlying causes for the poor financial position of the public utilities is a key to improve financing in the municipal services sector. The main causes for the identified financing gaps in the waste, water and energy sectors can be summarised as:

1 Low revenue from user charges that do not reflect the cost of providing the service
2 Low level of public funding
3 Inefficient use of investment resources; lack of proper investment planning
4 The provision of services is resource-intensive; little focus on efficient utilisation of inputs in particular water and energy

The financing strategies carried out for several regions in Northwest Russia point to several policy options, which may be pursued in order to close the financing gap. Most importantly, closing the gaps requires realistic approaches to what can be achieved within a given financing framework. Therefore, the environmental targets and the cost of achieving these targets must be carefully considered in the light of the scarce supply of finance.

Closing the financing gap, Water services in Pskov

The recommendations made in the financing strategy included measures for increasing the supply of finance:

- increasing the revenues from user charges through increasing tariff levels and collection efficiency.
- increasing funding from the public budget
- increasing financing from international grants

It was concluded that the financial resources, which could be generated from a realistic policy package was unlikely to be able to finance even the sustainment of the present service level. Therefore, measures for reducing the expenditure need were needed. These included:

- reducing water demand (through introduction of water meters and higher tariffs)
- reducing energy consumption (through replacement of less efficient pumps)
- reducing the service level (for selected parts of the infrastructure)

Even though reducing water demand and energy consumption implied investments, these were deemed to pay off in a short period due to reduced costs of operation and maintenance. It was concluded that it would be necessary to reduce the service level for selected parts of the infrastructure. It was suggested to reduce maintenance of the relatively advanced storm water system, which would have a limited environmental impact.

Source: OECD, Danish Environmental Protection Agency: "Short Justification for the Municipal Water and Wastewater Financing Strategy, Pskov", 2001.

Due to the socio-economic situation only gradual increase of tariff levels and collection effectiveness can be materialised. Today, such measures are based on initiatives and political courage of the local Dumas and its materialisation may not be likely (as the Duma's risk hampering their reelection possibilities). Increased tariffs will lead to higher service expectation. Finally, if a significant part of the consumers have installed e.g. gas and water meters, this will allow them to pay

only for their own consumption and not losses of municipal utilities due to e.g. leakage.

It is crucial for the environmental benefits of the Reform Programme for Re-structuring and Modernisation of the Housing Sector that the above issues are properly addressed during its implementation.

Areas of particular relevance for international co-operation
The most important instruments for international support to environmental financing in Northwest Russia include the Joint Comprehensive Environmental Action Programme and the Northern Dimension. However, donor and international financing institutions can not close financial gaps but contribute to more targeted, structured and effective efforts.

Looking for alternative financial solutions experience from EU countries should be considered in particular financing mechanisms from revenues from property tax (charges on land). E.g. costs of solid waste removal and further utilisation are financed through such mechanism in Denmark. However this method of financing requests that a significant part of collected charges on land and properties actually be spent for sector financing of municipal waste management.

3.3.3 Environmental Awareness – resource consciousness

One of the underlying causes for the problems in the water, waste and energy sectors in Northwest Russia is lack of common understanding – both among the civil society and the public administration – on the true economical value of natural resources like energy and water. One explanation is that Russia did not go through the energy crisis in the early 70ties as most of the western countries did, and – as a consequence – had to reform public sector services to reflect their improved costs. In fact, the low energy prices in Russia may have had the opposite effect.

As an integral part of the western countries' reform of the public services, intensive awareness campaigns were initiated and are still being implemented, as mentalities cannot be changed in the short run. Similar efforts must be initiated in Northwest Russia to increase the public awareness to e.g. understand "affordability" rather than base behaviour on "wants".

Furthermore, there is a huge need in Northwest Russia to increase the quality and accessibility of environmental information. The Environmental Committees should strengthen ties with the NGO community.

Areas of particular relevance for international co-operation
Although Russia maintains a position as observer of the Aarhus Convention, the State of the Environment Report compiled by the Ministry of Natural Resources, clearly states the need for Russia to join the Convention.

Signing, ratifying and implementation of the Aarhus Convention is deemed needed in order to secure Russian citizens' access to information, public participation and access to justice in environmental matters and strengthened international co-operation would facilitate this process.

4. Sector Specific Environmental Challenges

This chapter provides an overview of key environmental problems in three sectors, based on their significance for the people in Northwest Russia and the Baltic Sea environment.

1. The water sector (Section 5.1)
2. The energy sector (Section 5.2)
3. The waste sector (Section 5.3)

4.1 Environmental Challenges in the Water Sector

During the Soviet period Russia maintained – as compared to e.g. West Europe – a high service level in urban areas concerning water supply and wastewater collection and treatment. The problem today is therefore not always lack of access to these services because of their non-existence but the poor or non-functioning of systems mainly due to lack of maintenance. Much of the equipment is broken down or heavily energy consuming, whereas structures are of sufficient quality or can be rehabilitated. Therefore, rehabilitation and retrofitting existing plants could be more cost-efficient and in general be more adequate than investing in new plants. Public utility systems in the water sector are generally designed for capacities much above required levels and are thus inefficient.

The following section focuses on problems related to protection of drinking water resources, water supply and wastewater disposal including collection, treatment and sludge handling. As signatory of the London Protocol, Russia is committed to address environmental and health problems related to water simultaneously. However, the implication of the present problems for public health is outlined first to illustrate the necessity to intervene now and in a cost-efficient manner.

Wastewater treatment and drinking water quality are inadequate for about 500,000 residents of the city of Kaliningrad. While around 160,000 cubic metres of wastewater are generated by the city every day, the existing more than 50 years old waste water treatment plant can only cope with 68,000 cubic metres, and the new treatment

plant is not expected to be ready until 2005, says the Commission. In total, 150 million cubic metres of untreated industrial and municipal sewage, containing more than 30,000 tonnes of pollutants, are emitted into the region's rivers every year. In turn, this flows into the Vistula and Curonian lagoons which, together with adjoining wetlands, are also listed as pollution hotspots.

www.helcom.fi, Press Release 27.04.01

4.1.1 Impact on public health

Outbreaks of infectious diseases related to water supply or recreational waters are frequent in the Russia. According to WHO Regional Office for Europe, Russia had in year 2000 an infant mortality rate of 18 per 1000 live births, more than double of Western Europe and an under-five mortality rate from diarrhoeal diseases of 9.3, more than 10 times higher than Western Europe.

In 1999, the Harvard School of Public Health conducted a detailed survey of the relationship between gastrointestinal diseases and microbiological pollution of drinking water in the City of Cherepovets, Vologda region. The study demonstrated that approximately 90% of adults had antibodies to cryptosporidium in their blood indicating a high frequency of exposure to this pathogen[14].

In August 2001, the Russian Security Council Commission on ecological security stated that drinking water quality in Russia is endangering human lives because of its contamination with industrial waste[15] (from old dump sites).

4.1.2 Drinking water resources

Drinking water resources are contaminated from the following sources:

- discharge of domestic or industrial wastewater to rivers or lakes
- seepage to groundwater from individual sanitation systems

14. *Level of antibodies to cryptosporidium is an often used indicator of the general drinking water quality.*
15. *Health impact from chemical toxics is seldom acute (like for infectious diseases), but chronic diseases can develop over time.*

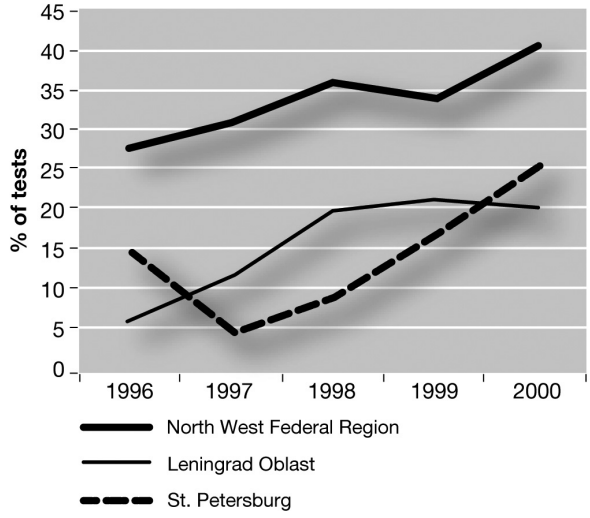
- seepage into both surface and groundwater from dump sites of all kinds
- seepage or overspill from storage of sludge from wastewater treatment (domestic and industrial) or from storage of farm manure.
- seepage of sewage pipes to water supply systems

Urban areas generally draw their raw water from surface water sources, whereas rural areas typically rely on shallow wells. About 60% of the population[16] are supplied with water from surface water sources.

According to the national classification of surface water, most Russian rivers and lakes are classified as "moderately polluted" or "polluted" and less than 1% can be abstracted without treatment. Within this classification the Neva River, the main drinking water supply source of St. Petersburg, is characterised as "polluted"[17]. In Northwest Russia 40% of the drinking water does not meet chemical standards and about 25% does not meet microbial standards[18]. Poor raw water quality due to bacteriological and chemical contamination of water sources, inadequate water treatment facilities and leakages in the distribution systems are seen as main reasons for not maintaining a safe drinking water supply.

16. *GOSKOMSTAT, Annual report on the state of the environment, Russian Federation, 2001*
17. *Department of Natural Resources of Northwest Region, Report on the State of Environment in Northwest Region in 2000*
18. *OECD Environmental Performance Review*

Figure 4.1 - Water test from primary sources not meeting hygienic and sanitary standards*



* *Including ponds, reservoirs, wells etc. Source: GOSKOMSTAT, 2001*

4.1.3 Water supply

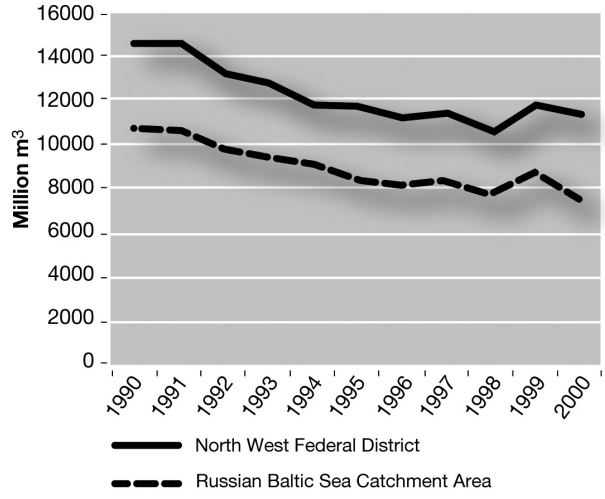
The supply of water is facing the following problems:

- excessive water consumption
- excessive water loss
- poor water quality
- interrupted supply
- excessive energy consumption
- inefficient water treatment

As compared to the Soviet period, domestic water consumption in Northwest Russia has been reduced significantly reaching an average 245 litres /capita/day[19]. However, this level is still twice the consumption of western European countries. The major reason for this excessive consumption is an in-efficient distribution system with a high level of losses, leaking in-house fittings and wasting of stored water (preventive measure against interrupted supply) as well as an insufficient tariff structure not providing appropriate incentives for reducing consumption.

19. *OECD Environmental Performance Review*

Figure 4.2 – Total water consumption 1990-2000*



Source: GOSKOMSTAT, 2001

According to the National Environmental Action Plan for Russia, more than half of the country's water supply systems, including the centralised water supply systems in virtually all cities and towns, need to be renovated or rebuilt. The present water losses are reported to be 40 - 50% of the abstracted amounts of water, which is very high, compared to the levels of typical Western countries of 5 - 15%.

The poor condition of the supply system is also reducing the water quality when contaminants are entering the pipe system at low (or negative) pressure. This situation occurs when the water supply is interrupted either during repair or when pumps are stopped to save energy.

Intermittent water supply requires people to store water for periods of non-supply. This leads to risk of contamination during storage and poor hand hygiene as washing hands become unpractical (when you are used to having a tap). It also leads to wasting of excessive stored water when fresh supply becomes available.

Pskov City is supplied with drinking water from the Velikaja River. After treatment the water is distributed through two major pumping stations into the city network. Due to leakages and frequent bursts in the network about 50% of the produced and treated water is lost or wasted.

The yearly power consumption in the pumping stations totals about 20 million kWh. Pumps with optimal efficiency and adequate controls would provide savings of 25-30% of the present energy consumption. Reduction of network leakages to a realistically obtainable level of 20% will result in additional energy savings leading to a total reduction in power consumption for water distribution of about 50%.

Source: Danish Environmental Protection Agency project document, 2002

Water treatment plants do not sufficiently address the water quality problems of microbiological components like cryptosporidium (parasite). These parasites are a widespread problem in Russian water supply. Another problem encountered in many of Northwest Russia's waterworks, using surface water, is pre-cautionary chlorination in the process of water purification, which leads to the formation of carcinogenic chlororganic compounds in drinking water.

4.1.4 Wastewater disposal

Wastewater collection and treatment represent another major environmental challenge for Northwest Russia. About 55% of the Russian population is serviced by centralised wastewater collection and treatment systems. The wastewater treatment facilities need maintenance: Of the 76% of wastewater treated, only about 10% is treated according to required standards[20].

The main problems facing disposal of wastewater are:
- leaking and collapsing sewers
- hydraulic overloading of system from stormwater and infiltrating ground-water
- discharge of untreated wastewater

20. OECD Environmental Performance Review, p. 83

- insufficient treatment of wastewater
- unsafe disposal and low utilisation of sludge
- excessive energy consumption for transport and treatment

A major source of pollution in the Baltic Sea is the old (>50 years) and malfunctioning sewage and wastewater treatment system in St. Petersburg. Since 1992, the amount of untreated wastewater coming from the sewers has been halved and the amount of phosphate discharged curbed substantially. Nevertheless, half a million cubic metres of untreated municipal and industrial wastewater is still washed into the river Neva and its tributaries every day. In addition, 200,000 cubic metres of untreated industrial wastewater are flushed directly into the river from industrial outlets

Source: HELCOM Task force hot spots review

Wastewater collection system

The wastewater collection system (sewer network) in Northwest Russia is generally of a poor quality and has seriously deteriorated due to lack of repair and maintenance over a considerable span of years. Leaking sewers pose a considerable threat to aquifers and surface water bodies, endangering the drinking water supply. Sewer pumping stations face frequent breakdowns, which in combination with sewer blockages result in severe overflows.

Wastewater treatment

Urban wastewater

Most of Northwest Russia's wastewater treatment plants is designed for mechanical and biological treatment for removal of organic matter. Generally, there is limited removal of nutrients like nitrogen and phosphorus. Most of the plants do not comply with required standards, which result in excessive pollution loads being discharged into receiving waters with subsequent risk of health hazards, eutrofication and oxygen depletion.

The most widespread pollutants present in discharges into water bodies or catchment areas are oil products, suspended solids, nitrogen, phosphorus, synthetic surfactants, zinc and copper compounds, and phenols[21].

21. *Department of Natural Resources of Northwest Region, Report on the State of Environment in Northwest Region in 2000*

The treatment technology in Northwest Russian wastewater plants is, generally speaking, in line with internationally accepted principles as regards the process configuration. However, the plants suffer from severe lack of maintenance, obsolete and inefficient equipment and lack of appropriate control systems.

Rural wastewater

Wastewater treatment in the rural areas is characterised by low coverage by public utilities. A significant number of people living in rural areas are thus responsible on their own for handling and disposal of their wastewater. As the financial situation in rural villages is not favourable, the scope for improving or just maintaining local facilities is limited.

Disposal of Sludge

Sludge from wastewater treatment constitutes a severe threat to the soil quality and ground and surface water resources. The sludge is often poorly stabilised and previously contained large amounts of heavy metals and other toxic or recalcitrent substances. However, the decrease in industrial production has generally resulted in a substantial improvement of the sludge quality, thereby reducing the risk of contamination from sludge presently produced and disposed of.

Where sludge is still stored in lagoons it imposes a risk of contamination of streams and rivers due to frequent overflows of aquifers and due to pollutants seeping into the ground.

4.1.5 Energy consumption in the water sector

Energy consumption in wastewater pumping stations is generally excessive due to inefficient control measures, inadequate pumping equipment and lack of maintenance. The energy consumption is estimated to be two to three times larger compared to corresponding western installations of similar capacity and nature. The efficiency of wastewater pumping stations reaches only 15-20%, and electricity over-consumption for all Russia amounts to 2.5 billions kWh annually[22].

Energy consumption for groundwater pumping, water treatment and supply exceeds by a factor 2 to 3 the kWh/m3 needed when using modern pumping equipment combined with efficient operations con-

22. *OECD Environmental Performance Review*

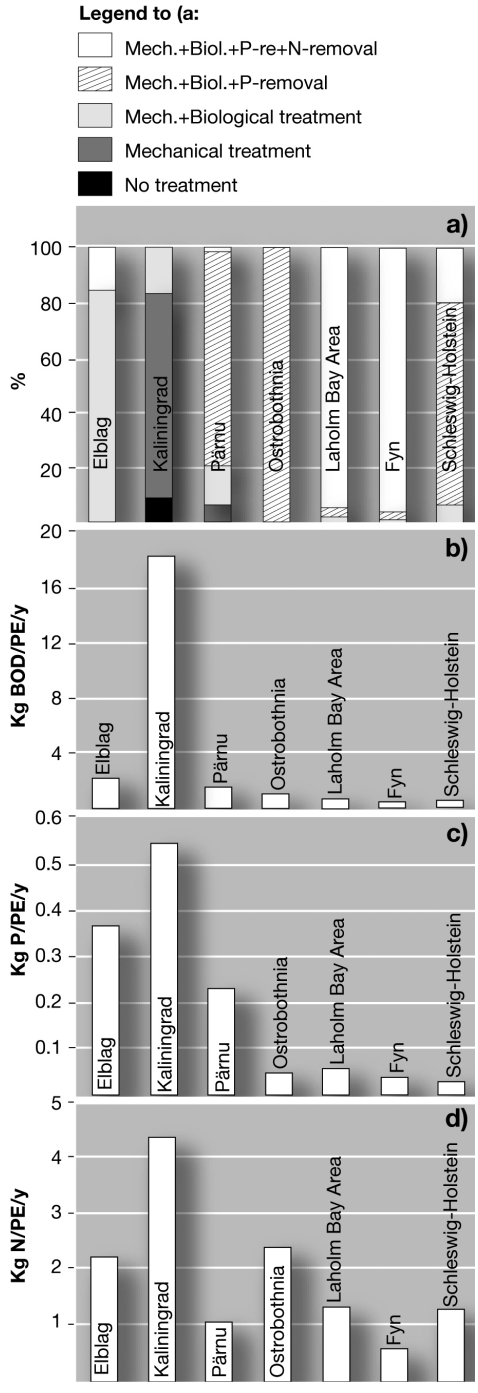


Figure 4.3
Wastewater treatment efficiency (expressed as discharge/person equivalent (PE)/year in treatment plants larger than 30 PE of b) BOD5 (biological Oxygen Demand in 5 days), c) Phosphorous and d) nitrogen. Assessment from 1998 Kaliningrad (Russia), Elblag (Poland), Pârnu, Ostrobotnia (Finland), Fyn (Denmark) and 1999 Laholm Bay area (Sweden) and Schleswig-Holstein (Germany)

Source: Strategies for improved Eutrophication Management in the Baltic Sea Region, Bernet., p.

trol. Investments in pump replacements often have a payback period of less than 5 years. One reason is that pumping stations in Northwest Russia are not usually equipped with special devices regulating their output upon demand, and the regulation of output is carried out by manual operation of valves. As a result, the efficiency of the pumping station does not exceed 35-40%. For all Russia, the annual electricity losses amount to 5-5.5 billions kWh due to this reason only.

The mechanical/biological treatment plant in Novgorod receives wastewater loads corresponding to about 190,000 inhabitants (calculated as Population Equivalents (PE)). The annual power consumption at the plant is 25 million kWh or 135 kWh/PE*year. Typical figures for Danish treatment plants of a similar size lie between 30-45 kWh/PE*year.
The excessive energy consumption is mostly attributable to inefficient aeration systems and poor or non-existing process control.

4.1.6 Water Sector Financing

The low level of revenue generated from the user charge payments is the core of the financing problems experienced by the water utilities.

- Many utilities have not been allowed to raise tariffs to levels that would allow them to collect enough revenue to cover O&M costs; cross-subsidies between industrial and domestic consumers remain very high (in average industrial tariffs are about six times larger than domestic tariffs); the industrial recession and the large industrial tariffs have forced industries in some Vodokanals to find alternative sources of water; and the domestic tariffs have not been noticeably increased between 1997 and 1999.
- The reduced industrial consumption of water during the 1990s and resulting decline in payments from industrial consumers have further aggravated the financial status as the industrial consumers are the main source of revenue.

The environmental financing strategy carried out for Pskov's water sector compared estimated expenditure associated with operating the municipal water services (water supply and wastewater treatment) and the estimated flow of financing during the period 2000-2020. The situation in Pskov in the base year 2000 was:

- a concern regarding drinking water quality due to secondary pollution in the deteriorated water distribution network
- wastewater treatment appears to be close to or in line with EU standards, but the operating efficiencies of the plants are low
- the infrastructure for sewage collection is well developed and the service level better than in many countries with similar income levels, but the sector suffers from years of underinvestments, lack of systematic maintenance, and the networks have deteriorated

The financing strategy concluded that the requirement for sustainable operation and maintenance would be RUR 491 million per year. This is the expenditure required to continue with the present level of service. However, the study of supply of finance revealed that the level of financing was in the area of RUR 160 million per year. The strategy therefore highlighted a major financing gap and concluded that supply of finance needed a major shift upwards in order to sustain the present level of service.

Source: OECD, Danish Environmental Protection Agency: "Short Justification for the Municipal Water and Wastewater Financing Strategy, Pskov", 2001

4.1.7 Natural Resource Management

When analyzing the challenges faced in the water sector, there is an urgent need to understand the interrelationship between these challenges and issues related to biodiversity and Natural Resource Management.

Problems concerning biodiversity and nature protection include amongst other resource extraction and pollution, poorly planned and executed commercial forestry, construction and transport activities, insufficiently regulated hunting. Furthermore, these problems are aggravated by uncertainty about future ownership of land and resources and

low environmental awareness among administrative staff, decision-makers, and the general public. Also, regional policies are lacking realistic implementation plans, and common principles and standards for resources management including overall strategy for development of protected areas, Ramsar sites etc. The planning is impeded by a lack of cost effective environmental monitoring systems which are able to provide reliable data and information for use in planning, management and conservation of natural resources.

There is a need to improve spatial planning/landscape planning tools to adequately preserve natural resources as eg. water bodies, streams and lakes, incl. ground water protection. The point of departure should be a holistic approach, with comprehensive co-ordination and co-operation between relevant regional and local authorities which would also be a mean to allocate resources more effectively.

Capacity building in North West Russia's environmental administrations with particular focus on implementation of international conventions and agreements relevant to nature protection is essential. Networking with other international protected areas should be encouraged as a mechanism for capacity building of protected areas staff.

4.1.8 Facing the challenges in the water sector

Because of the close interrelationship between wastewater disposal and water supply the concept of total water management must be emphasised in Northwest Russia.

Part of this concept is to prioritise investment to ensure the best use of the limited resources. Proper planning and investigations of perceived problems like groundwater pollution or a health impact can confirm a problem or on the other side lower the priority for an intervention.

Furthermore, the total water demand concept demands for efficient water demand management to ensure lower water consumption and economically and environmentally suitable management of utilities.

Financing strategies carried out for the regions of Pskov and Novgorod also pointed to the need for strategic investments in energy saving

equipment as well as renovation of the water supply networks and other water saving initiatives, including lower consumption levels. Relatively small pilot interventions in this area should be implemented to effectively demonstrate needed win-win solutions, that brings down operational expenses and hence have a short payback period.

Finally, the total water management concept demands for:

- Management strengthening and operational performance improvement initiatives at public utilities;
- Integration of river basin management plans in investment planning; and
- Improved monitoring and regulation.

With regard to rural areas, individual water supply and wastewater disposal systems should be centralised only when found both financially and environmentally feasible, as individual systems are not necessarily a prioritised environmental or health problem.

Concerning health issues, there is a need to identify more precisely which infectious diseases are related to water quality and how they are most efficiently addressed. Similarly the chemical components that locally are having a potential impact on public health should be identified and monitored.

As laboratories in Northwest Russia at present can not analyse all drinking water standards, "problem" components must be identified and subsequent interventions should be initiated at the most efficient place. Some components must be removed at the source where others must be removed at treatment plants or prevented from entering supply systems.

It should be noted that contamination of sludge by heavy metals and other industry related toxic or otherwise dangerous substances must be handled at source i.e. at the industries.

The technical solutions for solving the problems and obstacles within water supply, wastewater collection and treatment are well-known and well-proven technologies exist, for instance:

- rehabilitation of sewer system with priority to replacement of pipes in emergency conditions, either by nodig methods or by replacement of sewer pipes
- replacement of pumps in order to reduce the number of breakdowns and to decrease the present high energy consumption
- rehabilitation of existing water supply and wastewater treatment facilities including implementation of new modern technology for water and wastewater treatment and installation of new less energy consuming equipment and control and monitoring systems
- further investigate groundwater resources as alternative to surface water and where deemed relevant thorough feasibility studies must be conducted to ensure technical, economical and financial feasibility
- possible environmentally and hygienically sound improved sludge handling and disposal includes: anaerob or aerobic stabilisation, sludge dewatering by mechanical dewatering facilities for major plants and sludge drying beds for minor plants, sludge drying and incineration, utilisation in agricultural and horticultural areas, biological recultivation of disturbed lands and landfills, and disposal at controlled landfills

In Jan 2003 the 3rd session of the Coordination Council for National Action Program "Water of Russia – the 21st Century" was held in Moscow.

Development of the National Action Programme was initiated by the Ministry of Natural Resources of the Russian Federation with the objectives to overcome the inter-agency and territorial contradictions in water management and to activate the relevant economic and legal mechanisms, with the river basin management principle as a background.

Among others, the program will comprise the following key components:

- Meeting the demand for water resources
- Prevention of negative impacts of waters
- Safety of river engineering facilities
- Management of national water resources
- Protection of water bodies against pollution
- Introduction of economic mechanisms in water management

The President and the Government of the Russian Federation support the development of the Program. The Working Group and the Expert Council established by them for this matter are to make a presentation of the Program for the President. A meeting of the Working Group is scheduled for Jan 28.

Source: Press-Service of the Ministry of Natural Resources of the Russian Federation, Jan 16, 2003.

Areas of particular relevance for international co-operation
Within the water sector, the following international environmental agreements are of particular relevance to co-operation, as Russia is signatory to all three:

- Convention on Protection of the Marine Environment of the Baltic Sea area
- the UN-ECE Water Convention on Protection and Use of Transboundary Water Courses and International Lakes
- The London Protocol on Water and Health

The international co-operation regarding these three international environmental agreements has received significant attention in the Russian co-operation already, and this effort should be maintained or even further improved.

Furthermore, future co-operation in the water sector shall be seen as a building block in the regional EU Water Initiative (WI) for the EECCA[23] region which was agreed on at the World Summit on Sustainable Development in Johannesburg in September 2002. The new regional TACIS programme has as a specific objective implementation of the EU WI focussing on water supply and sanitation as well as integrated water resources management and transboundary waters.

4.2 Environmental Challenges in the Energy Sector

Serious environmental challenges are related to the energy sector in Russia. These include specific environmental problems caused by air

23. Eastern Europe, Caucasus and Central Asia.

pollution and waste handling (see chapter 4.3), and excessive natural resource consumption due to inefficient use of energy.

Air pollution causes a wide range of health, environmental and socio-economic impacts. While some air pollution problems have local causes and impacts, such as within an urban area, other problems have regional or global implications.

Table 4.1 Principal anthropogenic sources for major air pollutants.

Source	Pollutants	PM_{10} $PM_{2.5}$	SO_2	NO_X	VOC	O_3	HM & Toxics	CO_2, GHG	ODS
Energy production		++	+	+		(+)	+	++	
Industrial processes		++	+	+	+	(+)	+	+	++
Transportation		++	+	++	+	(++)	+	++	
Domestic and commercial		+	+	+	+			+	+
Agriculture									

(+) indicates indirect source

Table 4.2 Overview of impacts of major air pollutants.

Impact	Pollutants	PM_{10} $PM_{2.5}$	SO_2	NO_X	VOC	O_3	HM & Toxics	CO_2, GHG	ODS
Health effects		++	+	+	+	++	++		
Agricultural & forest damage			+	+	(+)	++	+		
Visibility degradation		++	(+)	(+)	(+)	+			
Acidification			++	++					
Eutrophication				++					
Stratospheric ozone depletion									++
Global warming								++	
Material damage		+	+	+	+	++			

(+) indicates indirect impact

Russia has extensive fossil energy resources. Besides supplying its own consumption of fuels – energy exports, particularly oil and gas, account for the main part of export income to Russia. In domestic consumption coal accounts for 16% of the fuel consumption, natural gas for 54% and oil for 19%.

Historically, for various reasons (cheap energy, huge distances, severe climate, large proportion of energy intensive industries in the national economy) energy consumption in Russia has always been very high. The Russian economy is dominated by large energy-intensive industries. Furthermore energy use is in generally inefficient as compared to international norms due to low energy prices, lack of metering and controls and lack of market incentives to reduce costs.

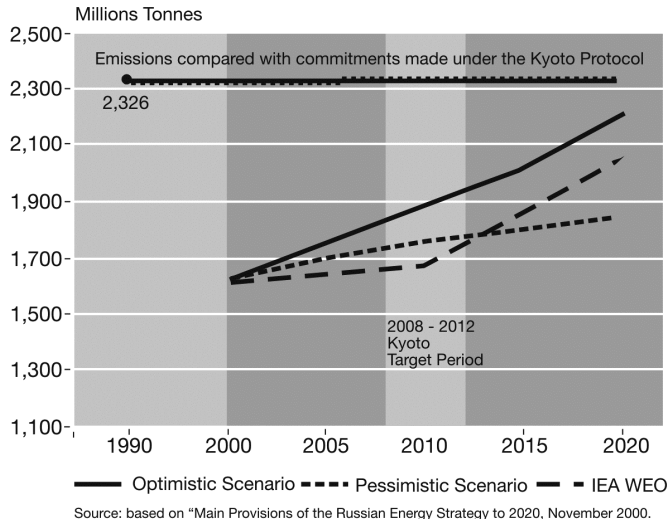
4.2.1 Energy-related global and local environmental problems

Global/regional

Global and regional environmental problems related to energy production and conversion include emissions of CO_2 and other green house gasses and emissions of air pollutants leading to acid rain and eutrophication with transboundary implications, for instance affecting the environment of the Baltic Sea. Russia has met its international commitments to reduce its emissions of SO_2, NO_x, and CO_2. However, the reduction in emissions relates to the decline in the Russian GDP, and the emission reductions have even been slower than the decline in GDP.

The energy sector contributes with 90% of all green house gasses emissions in Russia. If Russia ratifies the Kyoto Protocol it commits itself to maintain its emissions of CO2 and other greenhouse gases in 2008-12 at the same level as in 1990. The decline in the Russian economy following the transition of the economy has already reduced the energy consumption significantly and the country is expected to be in a position to sell carbon credits to other countries that are not able not meet their targets domestically.

Fig. 4.6 – Russian and IEA projection of CO2 emissions



Source: IEA 2002, p. 262

Even though Russia has reduced its emissions they still amounted to 11 tonnes of CO2 per capita in 2000. This is similar to e.g. Denmark, but remarkably high considering that the GDP/capita is 10-15 times lower in Russia. The low energy efficiency in Russia also results in high CO_2 emissions when compared to other countries.

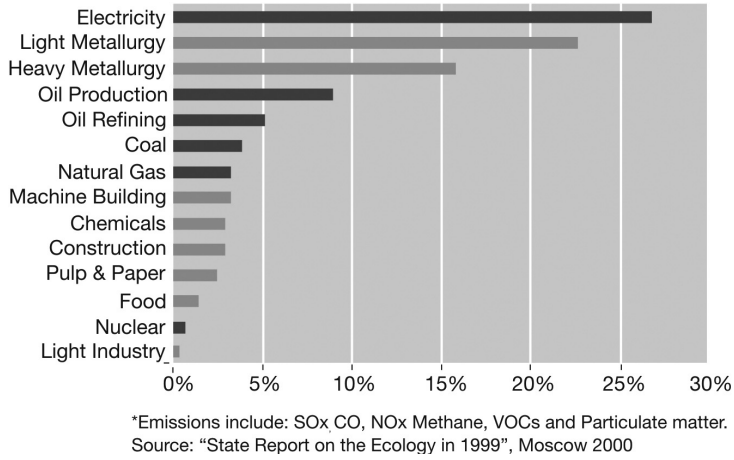
Major emitters of energy related CO2 in 1996

	Total emissions tonnes	Emissions per GDP (tonnes/USD 1000)
United States	5325	0.84
China	3142	0.87
Russia	1517	2.20
Japan	1178	0.45
Germany	905	0.64
India	863	0.70
UK	583	0.57
OECD average	12117	0.66

OECD, Environmental Performance Review, p. 192

The energy sector accounts for 50% of all harmful emissions to the atmosphere. In the figure below emission of different pollutants has been added in order to provide a very rough indicator for the emissions of pollutants to the air to provide an overview of the main sources of these pollutants. The figure discloses the electricity sector (including heat generation) as the main source of emission.

Fig 4.7 – Percentage breakdown of emissions by sector in 1999



Source: IEA 2002, p. 245

Details on the individual emissions from the energy subsectors are provided in the table below.

Table 4.3 – Air pollution emissions from the energy sector 1993-99 (1000 tonnes)

	1993	1994	1995	1996	1997	1998	1999	1993-99
Oil sector emissions	**1,862**	**1,682**	**1,447**	**1,305**	**1,267**	**1,383**	**1,322**	**- 29%**
SOx	16	15	19	20	23	23	23	46%
CO	618	497	438	490	541	657	627	2%
NOx	17	16	17	18	21	22	24	39%
Methane	900	886	689	535	439	432	446	– 50%
VOCs	275	236	208	210	202	189	143	– 48%
Particulates	36	32	30	32	41	60	60	64%
Production (million tonnes)	**352**	**316**	**307**	**301**	**306**	**303**	**305**	**-13%**
Natural gas sector emissions	**717**	**717**	**706**	**541**	**450**	**425**	**453**	**- 37%**
SOx	47	47	47	48	48	51	61	30%
CO	248	241	206	200	216	204	213	– 14%
NOx	62	51	28	24	24	24	25	– 60%
Methane	221	207	404	249	145	132	140	– 37%
VOCs	136	168	18	17	13	5	7	– 95%
Particulates	4	4	5	4	5	8	8	93%
Production (bcm)	**618**	**604**	**595**	**601**	**571**	**591**	**591**	**- 4%**
Coal sector emissions	**376**	**661**	**620**	**542**	**487**	**467**	**555**	**48%**
SOx	56	55	50	42	33	26	20	– 63%
CO	63	67	64	62	50	42	34	– 45%
NOx	15	16	16	16	14	11	10	– 33%
Methane*	–	418	403	345	320	326	436	4%*
VOCs	97	0	0	0	0	0	0	– 100%
Particulates	109	105	86	77	69	61	54	– 50%
Production (million tonnes)	**285**	**273**	**263**	**257**	**245**	**232**	**249**	**- 13%**
Petroleum refining emissions	**1,182**	**997**	**899**	**842**	**810**	**762**	**740**	**- 37%**
SOx	197	181	159	144	148	134	136	– 31%
CO	87	64	59	59	49	50	47	– 46%
NOx	22	21	21	21	22	21	20	– 9%
Methane	276	228	209	171	80	78	102	– 63%
VOCs	589	494	441	438	502	469	427	– 27%
Particulates	13	10	13	9	10	9	7	– 34%
Throughput (million tonnes)	**219**	**181**	**180**	**176**	**178**	**163**	**169**	**- 23%**
Electricity sector emissions	**5,890**	**5,234**	**4,977**	**4,707**	**4,386**	**4,303**	**3,891**	**- 34%**
SOx	2,498	2,255	2,134	2,006	1,833	1,818	1,618	– 35%
CO	191	219	248	259	254	238	242	27%
NOx	1,384	1,200	1,137	1,109	1,055	1,021	961	– 31%
Methane	3	4	4	3	4	6	3	23%
VOCs	1	1	1	1	1	1	1	30%
Particulates	1,813	1,556	1,453	1,330	1,239	1,219	1,065	– 41%
Production (TWh)	**957**	**876**	**860**	**847**	**834**	**827**	**846**	**- 12%**
Total energy sector emissions	**10,027**	**9,291**	**8,649**	**7,937**	**7,400**	**7,339**	**6,962**	**- 31%**
SOx	2,813	2,553	2,408	2,259	2,084	2,051	1,858	– 34%
CO	1,206	1,088	1,015	1,070	1,110	1,191	1,163	– 4%
NOx	1,501	1,304	1,218	1,187	1,135	1,100	1,041	– 31%
Methane	1,437	1,742	1,710	1,302	988	974	1,126	– 22%
VOCs	1,097	899	713	666	718	665	579	– 47%
Particulates	1,973	1,707	1,585	1,453	1,364	1,357	1,195	– 39%

* Comparison of coal sector emissions of methane is for 1994-1999.
Source: "State Report on the Ecology in 1999", Moscow 2000.

Source: IEA 2002, p.246

Local/regional

Apart from the global implications on the environment, energy production has other negative side effects. The establishment of energy plants and the disposal of by-products from energy production represent an environmental problem for the local environment, but can also have regional implications as pollution is washed into the Baltic Sea (see chapter 4.3).

Health Impact

During the first half of the 1990s pollution levels exceeded Russian air quality standards (maximum allowable concentration) in cities covering 62% of the Russian population. One-third of the entire population lives in areas with high pollution peaks. Emission per unit of GDP of SO_x, NO_x, particulates, CO, VOCs, and CO_2 have all increased during the 90s and remain much higher than the OECD average.

Air pollutant emissions, 1997

	SOx Per unit of GDP	NOx per unit of GDP
Russia	6.0	2.9
USA	2.3	2.8
Germany	1.3	1.2
OECD Europe	2.1	1.9

OECD Environmental performance review, p. 56

The severe air pollution leads to high frequencies of respiratory diseases in Russian cities[24].

4.2.2 Energy consumption and conversion

Excessive energy consumption and losses in energy conversion and supply are at the core of the energy related environmental problems in Russia. The Russian energy consumption in 1999 totalled 6.8% of world total[25], making Russia the third largest energy consumer after USA and China. The industrial sector accounted for 65% of the consumption, the remaining was split evenly between transport and residential sectors.

Energy consumption

Households heat and hot water consumption are high – not only due to Russia's severe climate – but to a higher degree due to technical deficiencies and inadequate behaviour. Consumers cannot control their individual heat consumption, as there are often no thermostatic valves on the radiators as central heating systems are normally one-stringed. At the same time they also lack incentive to reduce consumption of heat and hot water, as billing is often independent of the actual consumption of the individual household.

Industries in Russia are very energy intensive, which is reflected in an overall energy intensity of the country of 84 MJ/$ GDP in 2000, compared to for instance 12 MJ/$ GDP in USA. Energy consumption in industry includes district heating, electricity and primary fuels. Historically low energy prices paved the road for heavy energy intensive industry and little awareness to energy efficiency and officially required energy standards. Inefficient design and control measures, inadequate pumping equipment, leakages and insufficient insulation of boilers and pipes often result high electricity and heat consumption in industries. Further more overdimensioning of pipes, valves and pumps often causes electricity consumption for pumping purposes to be very high compared to western systems.

Energy networks

District heating networks are gradually deteriorating due to lack of maintenance (e.g. leakage and poor insulation of pipes) and reinvestments, and some 15% of the pipes in Russia need urgent replacement.

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24. OECD, Environmental Performance Review, p. 58

25. EIA Country Analysis Brief, November 2002

This results in increasing heat and water losses from the networks. The consequence is heat losses that on the average are assessed to some 30%.

Emissions and leakages from the oil and gas industries are of significant environmental importance. Emissions of CO2 and leakages of natural gas from production sites and the pipes of the national gas company Gazprom alone accounted for 11% of the total CO2 emissions in Russia in 1999[26].

Energy Conversion

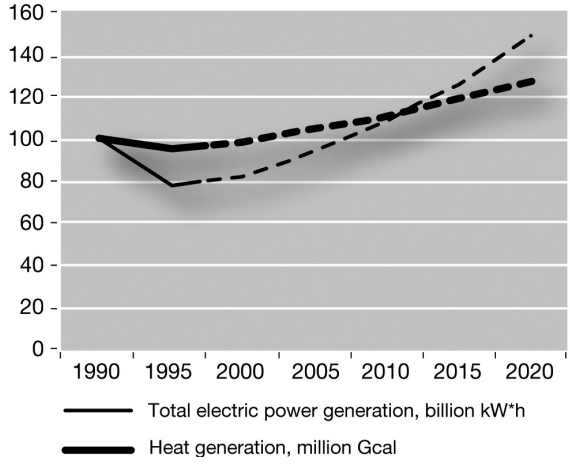
Power generation in Northwestern Russia amounts to 5.6% of total power generation in Russia and is distributed on thermal power production (coal, gas and oil) 33%, hydro 18%, nuclear 41% and others 9%. Coal is playing an increasing role as fuel for power production in Russia, and this is expected to continue at the expense of gas and oil as fuel. The recent economical recovery has resulted in increased electricity consumption in households and industries.

Most power plants in Northwest Russia are obsolete by Western standards and seriously need maintenance and upgrading, resulting in low efficiency power plants. If investments stay at the present low level, 32% of the current generating equipment is forecasted to be out of commission by 2005, which may give rise to crisis in electricity production and lead to regional power shortage[27].

26. Russia – Environmental Issues. EIA August 2001

27. EIA Country Analysis Brief, November 2002, p.9

Fig 4.8 - Electric power and Heat generation



Source: Energy Strategy of Russia (1990 index 100)

District heating consumes about 280 million tons of oil equivalents, corresponding to about 44% of Russia's total fossil fuel demand.

The overall energy efficiency of combined heat and power plants production in Russia is around 75-80%. When comparing with international best-practise it should be possible to reach efficiencies in Northwest Russia of not less than 90% which would imply a reduction in fuel consumption and emissions of at least 25%.

However, rehabilitation of district heating systems and introduction of decentralised solutions will entail huge investments, which are also needed to remove pollutants from flue gases of central heating plants and boiler stations.

4.2.3 Energy sector reforms and strategy

In 2001, the Main Provisions of the Russian Energy Strategy to 2020 was approved by the Russian government. The Strategy provides an overview of problems facing the energy sector and resolutions needed to support general economic growth and reform. However, due to criticism as to the reality of the implementation of the Strategy a revised version is presently under preparation.

Sector reforms within in the oil, gas, coal and electricity industries have been implemented or are on their way/being considered.

The oil industry has only had limited foreign investments due to the unstable investment climate. In order to overcome the uncertainties to investors, Product Sharing Agreement legislation is being debated in the Russian Parliament as foreign capital and expertise are needed for the development of the industry. A new pipeline to the Baltic Sea is under construction to allow for increased oil export.

The gas sector is currently being considered reconstructed in order to split the monopoly of Gazprom into several up stream production companies and to allow equal access for gas producers to the transmission network to foster competition on the Russian market. New pipelines are under construction and the Russian government aims to increase its export to Western Europe in the next decade.

The coal sector holds the world's second largest coal reserves. The industry was restructured in the mid 1990s as the state coal company was phased out and production subsidies were ended. After a period of decline, since 1998 production has increased and in 2000 reached 281 million tons. Domestic use of coal is given priority in the Russian government's energy planning in order to allow for larger exports of oil and gas.

The power sector lacks funds for maintenance and repair. To improve the performance of the sector and to attract foreign investors the Russian government in 2001 approved a plan for restructuring of the power sector monopoly UES. The restructuring will break UES into separate generation and distribution units, and after 2004 the wholesale and retail electricity market will be liberalised.

4.2.4 Difficulties related to institutional and pricing issues

Organisational and financial difficulties are at the heart of the environmental problems in the energy sector and need to be addressed. Difficulties arise in the interface within the energy sector and between energy companies and consumers.

Fuel prices

Low fuel and energy prices have a long history in Russia and this has negatively influenced incentives for heat and power plants, industries and public utilities to increase energy efficiency.

Tariffs

In the Energy Strategy, tariffs were planned to increase to cover long-term costs by 2010. In reality, however, the tariffs recently approved by government on gas and electricity as well as the planned increases announced for 2003-2005 fall significantly behind the tariffs envisaged by the Energy Strategy.

Table 4.4 - Selected tariffs and fuel prices

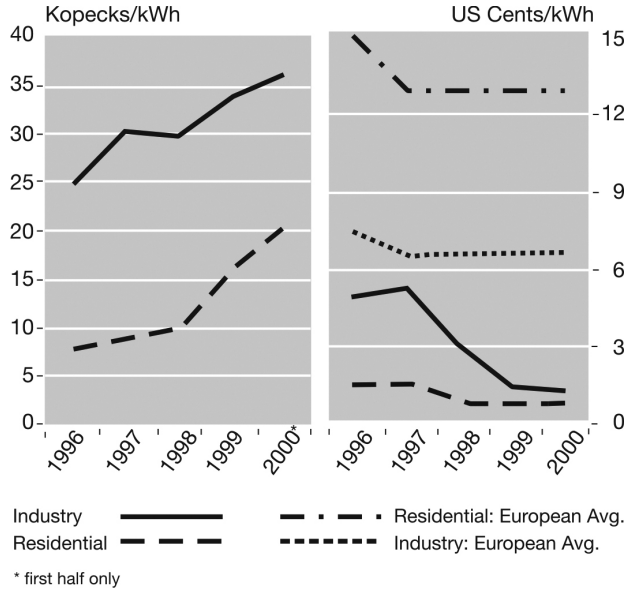
	2002		Forecast 2010
	Russia	European average	Russia
Electricity, US c/kWh	1,31[1]	6-12	3,6
Natural gas, USD/1000 m^3	18	100	30-55
Crude oil USD/toe	47	220	100
Steam coal USD/toe	30		54-60

1. Average for households and industry in Russia

Sources: Energy Strategy of Russia, EIA 2002, p.209, and data collected by COWI Moscow

The tariffs on electricity for Russian industries are higher than for households and traditionally large cross subsidies have been provided from industry to the residential sector.

Fig. 4,9 Residential and industrial electricity tariffs in Russia



Source: IEA 2002, p. 209

Lack of funding

Similar to the public utilities in the water sector, energy companies lack funds to finance maintenance and investments. Tariffs typically only cover operational costs, i.e. fuel, operation and limited maintenance costs.

The District Heating distribution systems in Russia are old and worn out. 25 % of the capital assets have fully exceeded their service life-time, and breakdowns in the heating networks have increased significantly during the last 10 years.

Another problem is that the District heating networks have poor thermal insulation and often significant leakages resulting in major heat loss and groundwater pollution. Loss of heat is far higher than the norm and represents approximately 30% of the produced heat.

Preventive maintenance is downscaled due to lack of funds, though, emergency and rehabilitation works cost 2-2.5 times more than the planned maintenance of the same facilities.

4.2.5 Environmental nuclear challenges

15% of Russia's energy production originates from 9 nuclear power plants with 29 reactors in total. While European countries as Sweden, Germany, Belgium and the Netherlands are aiming at a downscaling their present levels of nuclear power production, Russia is expanding its nuclear power production capacity.

Russia is currently planning to upgrade/renovate a number of reactors and plans to construct five new reactors in the coming 5 to 7 years and additional 10 reactors in the following 10 years[28]. The realisation of these very ambitious plans is threatened by lack of financial resources. Minatom receives limited revenue for the electricity delivered (65% in 2000) and consequently the investments are only 20% of what was originally planned. The major non-paying consumers are mainly state-owned companies.

It is the declared objective of the Minister of Minatom that Russia should be an important player on the international market in relation to nuclear issues. Russia exports nuclear power plants to, amongst others, China, India, Iran, and exports uranium and electricity and has lately started to receive used nuclear fuel for storage.

International support

A long range of countries have on a bilateral basis been involved in tackling the nuclear problems Russia faces and e.g. the US has contributed with 7 Billion USD since 1992[29]. The EU and Russia are currently negotiating on the terms for a "Multilateral Nuclear Environmental Programme in the Russian Federation (MNEPR)" which is supposed to become the framework for donors who seek to contribute to the nuclear stability and safety in Northwest Russia. However, it has not yet been possible to conclude this agreement.

In the summer 2002, the Northern Dimension Environmental Programme pledged Euro 62 Million earmarked for nuclear projects in Northwest Russia including handling of spent nuclear fuel (see chapter 4.3.6). However, the implementation of these projects is dependent on the

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28. International Kernekraftstatus 2001, Forskningscenter Risø, Roskilde, April 2002

29. www.bellona.no – article – EU-Russia Committee discusses Russian Nuclear Safety

successful signing of the Multilateral Nuclear Environmental Programme in the Russian Federation.

Safety

The 1986 Chernobyl disaster is a clear illustration of the risks connected to old and worn-out nuclear power plants. Today, 16 years later nuclear generated power still represents an important part of Russia's energy production and although the safety-conditions in the Russian nuclear power plants have been considerably improved during the 1990s they still give rise to concern[30].

The Leningrad Atomic Energy Station is located 70 kilometres west of St. Petersburg in Sosnovy Bor. The Leningrad Atomic Energy Station has 4 RBMK-1000 Chernobyl-style reactors and produces app. 50% of the energy in the St. Petersburg region. The first generation reactors were constructed in the late 1960s and the second generation reactors in 1979 and 1981. The construction of two new MKER-800 reactors (a modernised version of the old RBMK reactor), which will replace the first generation reactors, has started.

Since 1991, more than Euro 65 Million have been invested by foreign donors in safety equipment in the Leningrad Atomic Energy Station. Nonetheless, the safety is highly criticised and critics claim that the first generation RBMK reactor type is amongst the most unsafe in the world due to outdated technology. The International Atomic Energy Agency (IAEA) is of the opinion that the RBMK reactors should be shut down.

www.bellona.no

4.2.6 Facing the challenges in the energy sector

Reduced energy consumption and increased efficiency in energy production and supply are the most efficient ways – and must be pursued – to reduce the environmental and health problems caused by the sector. This calls for establishing an institutional and financial set-up that provides these means and incentives.

30. EIA, Russia Energy Survey, 2002

Tariff setting must reflect the real longterm cost of producing and supplying energy and natural gas. This requires that:

- not only fuel cost but also operational and maintenance cost and depreciation of capital and equipment are allowed to be included in tariffs
- the regional regulatory boards approving tariffs must operate on an arm length and be independent of local government also in practical terms, and that transparency in tariff setting is ensured
- social concerns for low income families are dealt with not through tariffs but for instance through direct subsidies or other means

In the heat sector, installation of control equipment, meters and billing according to consumption should be introduced both in the domestic, industry and service sectors. This calls for:

- huge investments in thermostatic valves and other control equipment, as well as the required adjustments of existing heating installation, so that the families and consumers are enabled to control their heat consumption
- installation of heat and hot water meters in households and service sector
- billing of heat and hot water according to consumption

Most energy plants in Northwest Russia are in a serious state of disrepair. It is pivotal that sufficient financial resources be allocated to this sector to avoid more or less permanent regional power shortages in the coming years, which would have significant negative impact on the economical activities in Northwest Russia.

Tremendous spills and leakages from pipelines losses further aggravate the situation and preventive measures should be taken. Furthermore, increasing oil export on tankers through the Baltic Sea poses a higher risk of accidents and oil spills if no additional measures are taken. This demands for:

- Increased minimum requirements to contingency plans and safety equipment and quality of oil tankers passing through the Baltic Sea
- Increased monitoring of the Baltic Sea region to spot oil spills and identification of guilty parties and subsequent enforcement of the polluter pays principle.

With regard to nuclear energy, replacement of first generation RBMK reactors is urgently needed as these are classified as being amongst the most unsafe in the world due to outdated technology. Also contingency plans and more efficient monitoring systems should be developed.

Areas of particular relevance for international co-operation
Co-operation could include preparatory work still needed for Russia's signing of the Kyoto Protocol e.g. technical support, awareness raising and demonstration activities Furthermore, the scope for Joint-Implementation activities should be pursued.

Finally, Russia should further strengthen its international alliances and efforts toward fulfilling the obligations of being signatory to the Geneva Convention on Long-Range Transboundary Air Pollution as well as the Vienna Convention on Protection of the Ozone Layer, specifically the Montreal Protocol and its amendments.

4.3 Environmental Challenges in the Waste Sector

There are several critical environmental impacts linked to the practises for handling waste in Northwest Russia. Deficient waste management has a major bearing on the state of the environment in the Baltic Sea and on issues related to water quality, soil pollution, and human health. A number of the HELCOM hot spots in Russian territory are in fact related to waste issues, and are attributable directly to waste management plants or industries' discharge of various hazardous substances.

4.3.1 Municipal solid waste

In Northwest Russia, municipal solid waste[31] is almost exclusively disposed of in landfills that do not meet requirements and are subject to growing capacity constraints. There is very little focus on waste minimisation and recycling.

31. *Waste can be divided into hazardous and municipal solid waste. Hazardous waste is waste, which is characterised as toxic, poisonous, explosive, corrosive, flammable or infectious. This includes, for example clinical waste, chemical waste as well as waste resulting from a number of industrial processes. Most hazardous waste origins from the industrial sector. Municipal solid waste is non-hazardous waste from households, commercial enterprises, industry, etc. See www.basel.int for more information.*

The legal framework for activities related to municipal solid waste was established during the Soviet period. Most Acts and Ordinances adopted before 1991 are still in force. For instance, sanitary norms and rules (SanPin), State Standards (GOST) established requirements to the Municipal Solid Waste landfills and municipal services involved in waste collection. In order to promote a new legal basis, the Federal Law "On waste of production and consumption" was approved in 1998. Based on this Law a number of new governmental Acts must be adopted.

Waste collection

Urban solid waste collection equipment and transfer stations work fairly well in the sense that main streets are generally kept clean. However, there are suburban and rural areas, which are not serviced by regular collection services, which mean that residents must resort to illegal dumping of waste. There are problems related to an outdated system of waste collection and storage within and near houses, which requires a lot of manual labour for waste handling, creates unsanitary conditions within multistorey apartment houses and around collection points because of odour and contamination of surroundings by waste. As a result of improper management, waste is readily accessible to rodents, flies and other insects, which creates a nuisance and risk for human health.

There is a widespread lack of organised collection and treatment of Household Hazardous Waste (e.g. used accumulator batteries, PVC, mercury lamps etc.). Consequently, these categories of waste are either not collected, or disposed at unauthorised dumps or at municipal facilities not equipped to handle this waste segment properly.

Recycling

Modern waste management practices such as separate collection, recycling and recovery are almost non-existent in Northwest Russia. In St. Petersburg approximately 15% of the solid domestic waste is recycled[32].

Landfill capacity

Many Northwest Russian landfills operate close to their maximum capacity and the environmental quality of the facilities is low. Many dumpsites are poorly situated both geologically and geographically. They are not properly designed, constructed and operated:

32. *St. Petersburg research Centre "Single Policy in solid waste management in St. Petersburg and in Leningrad Oblast", St. Petersburg 2000*

- Most disposal facilities are constructed without synthetic liner, many dumpsites have not even a natural clay lining on the bottom.
- leachate is usually not collected and treated at municipal solid waste facilities.
- most of the disposal facilities lack a run-on/run-off control system
- Ground water quality is not monitored
- Fires and open burning on landfill is common.
- Limited capacity / access leading to illegal dumping

The poor condition of Municipal Solid Waste disposal facilities contributes to negative environmental impacts such as soil, surface and groundwater contamination, air pollution (including dioxin production), odour and damage to landscape.

More than 400,000 tonnes of domestic and industrial waste generated every year in the Kaliningrad region and only a small fraction is recycled. As a result, roughly 15 million tonnes of solid waste have accumulated in municipal landfills, which do not meet the requirements for environmental protection. These sites represent a major source of air, ground and particularly water pollution.

The solid waste disposal site in the city of Kaliningrad is a combined open landfill dump for municipal and industrial waste, situated not far from some of the drinking water reservoirs of Kaliningrad. The landfill, constructed in 1978 as a temporary site, was not provided for environment protection measures. It is, however, still in use and occupies an area of 13.5 hectares. The landfill is located on a swamp and there is high water penetration and thus a high risk of ground water pollution. In addition, storm water flows from the landfill and into the river of Pregolya, which drains into the Vistula Lagoon and, ultimately, the Baltic Sea.

Source: Proceedings, EcoTech, Sweden, September, 1999

Northwest Russia's treatment facilities do not comply with international or Russian Standards. St. Petersburg has two treatment plants, which treat approximately 30% of the domestic waste. An example of the waste problems is insufficient quality of the compost produced, which contains too high levels of plastic and glass material. At one of the St.

Petersburg treatment plants 7 years of production is accumulated on the site[33].

Unauthorised dumping

Insufficient waste collection systems lead to a high level of unauthorised dumping. In St. Petersburg City and Leningrad Oblast there are approximately 75 registered landfills but also approximately 1,000 unauthorised dumps of various size[34].

Lack of control of waste streams

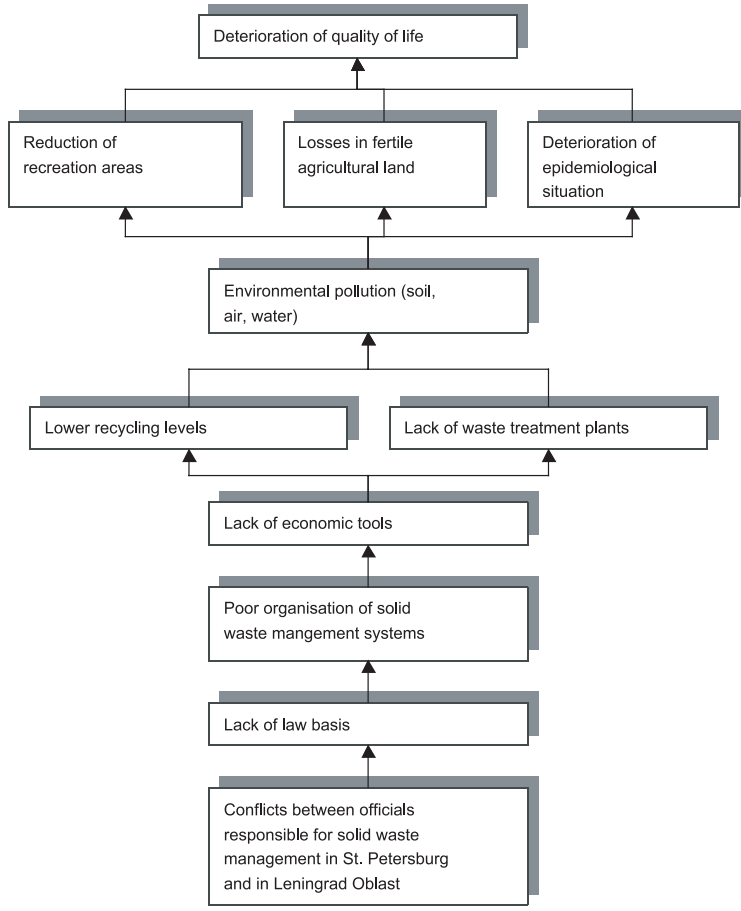
There is a lack of continuous (from top to bottom) control of the waste streams from their places of origin to final operations on their disinfecting and recycling. The main causes of these shortcomings are a weak institutional and legal framework combined with a widespread lack of co-operation both between the subjects of Northwest Russia and between the various municipalities.

Privatisation

Even though a privatisation process has been pursued, a de facto monopoly situation is still the case in many places in the waste sector, even if private enterprises have taken over provision of most of the service. These companies are either owned by the public authorities or privately owned (or a combination) and it appears that open tender procedures based on real competition is not common.

33. *DEPA project document 2002, Waste Management Plan for St. Petersburg City*
34. *Department of Natural Resources of Northwest Region, Report on the State of Environment in Northwest Region in 2000*

Figure 4.4 - Main problems of the St. Petersburg region in the solid waste management sphere.



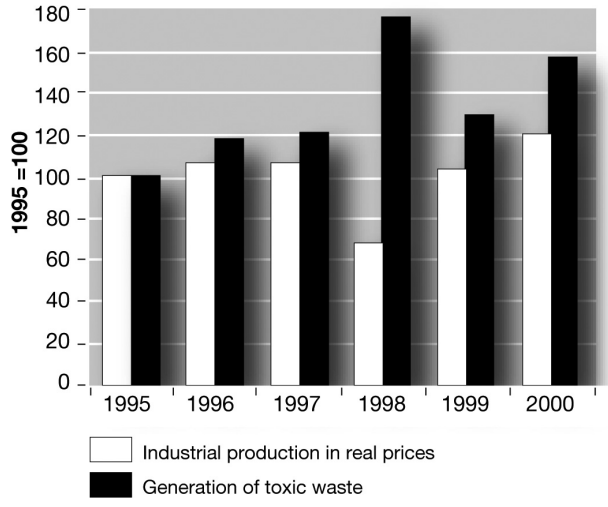
Source: St. Petersburg Research Centre "Single Policy in Solid waste Management in St. Petersburg and in St. Petersburg City.

4.3.2 Industrial hazardous waste

Waste Generation

The most urgent environmental concerns in Northwest Russia are related to **industrial hazardous waste.** In spite of the general decline in industrial production during the 1990s and specifically the economic crisis in 1998, annual industrial hazardous waste quantities are not reported to have fallen during the period. The Russian industry generates more hazardous substances in the industrial processes than European industries.

Figure 4.5 - Industrial production and generation of toxic waste. Northwest Russia*



* Industrial production in real prices, using the consumer price index for the area as deflator
Source: GOSKOMSTAT, 2001

Waste disposal

In the former USSR the problem of hazardous waste was usually solved in a very simple way, i.e. by disposing such wastes in special landfills. Many of these hazardous waste landfills still exist and in many cases they are the only place where it is officially allowed to bring hazardous wastes.

Between 1970 and 1990 a number of hazardous waste incineration plants were built all over the Soviet territory. Such incineration plants were usually constructed near e.g. major industries and big chemical plants and were only capable of treating liquefied wastes. Moreover, none of them were designed for PCB destruction. After 1991, most incineration plants were closed down for economic reasons, though some are still in operation. However, nearly all of them require fundamental modernisation and upgrading to meet international environmental standards.

In Northwest Russia, there are also cases of hazardous waste being dumped at disposal sites for municipal solid waste although they are

not equipped for this purpose – because no proper site for hazardous waste is available. Also, industries often do not separate and treat their hazardous waste according to the environmental requirements. In such cases the hazardous substances are discharged with industrial waste-water into surface waters.

St. Petersburg is located at the nexus of an immense ecological system. Lake Ladoga, the largest freshwater lake in Europe and the primary source of drinking and industrial water for St. Petersburg and the autonomous republic of Karelia, which lies just outside St. Petersburg. Thirty-two rivers flow directly into Lake Ladoga (whose reservoir basin spans a total area of 280,000 square kilometres), and only one river, the Neva, flows out.

The city of St. Petersburg is located at the Neva delta which drains into the Gulf of Finland. Lake Ladoga is rapidly losing its ability to absorb and disperse the harmful effects of pollutants, presumably because of the sheer volume of pollutants dumped into the lake and its ecosystem.

It is estimated that the greatest pollution to Lake Ladoga comes from effluent waste from pulp and paper plants (like the Priozersk and Syas plants), which contains more than 300 toxic substances, from agricultural enterprises (which cause epidemiological risks through their concentration of microbes and parasites), and from the concentration of phenols from timber which is floated and allowed to sink in the lake. The key means to save Lake Ladoga from environmental degradation at the hands of municipal and industrial pollutants is to adopt more stringent waste treatment measures for existing enterprises.

Source: TEC Case Study, Courtney M. Nero (May 1999)

Large accumulations

Capacities of recovery and disposal facilities for hazardous waste in Northwest Russia are by far sufficient to cover the present needs. Therefore, large accumulations of industrial and hazardous waste are growing at industrial sites, particularly in the metallurgical and power generation industries. By the year 2000, it is estimated that more than 120 million tonnes of hazardous waste have accumulated in Northwest Russia[35].

35. GOSKOMSTAT. 2001

As a comparison, the facility serving the entire territory of Denmark, i.e. more than 5 million people, treated about 110,000 tonnes of hazardous waste in 2000. The accumulated amount of hazardous waste in Northwest Russia, hence, constitutes more than 1,000 times the annual treatment capacity of this facility[36].

Improper storage

The industrial hazardous waste accumulated at industrial sites or deposited at old hazardous waste landfills in Northwest Russia represent a major environmental problem as the waste is seldom stored in an environmentally safe manner. Hence, there is a risk of dangerous substances seeping into, or being washed out from storage sites and polluting the soil and ground and surface waters, thereby endangering drinking water resources and human health.

In the Leningrad region, the official hazardous waste disposal site does not meet environmental requirements (see Box 3.1). Around 800,000 tonnes of unprocessed industrial hazardous waste, such as chlorinated substances and heavy metals are improperly stored in open pits[37]. This implies a serious risk of soil and ground water contamination, and stormwater may cause substances to wash into the Neva River and thereby the Gulf of Finland.

Krasny Bor Hazardous Waste Disposal Site

The hazardous waste disposal site Krasny Bor near St. Petersburg is among the HELCOM hot spots. Since the opening thirty years ago, it has received more than 1.5 million tons of industrial toxic wastes. It is the main dumping point for industrial and toxic waste for factories located in the city and the surrounding Leningrad region. It has also received waste from other regions in Northwest Russia, but is now running out of capacity, and hazardous waste from other Oblasts or regions may only be accepted on the basis of a special resolution (permission).

The existing scheme of hazardous wastes disposal at the landfill provides inadequate environmental protection, which means that the landfill is a potential source of pollution affecting the St. Petersburg water supply system as well as the Baltic Sea basin.

36. The Russian classification of hazardous waste is stricter than western standards.
37. HELCOM, 2001

In 1995 the Russian Federation Government supported the initiative of Leningrad Oblast Administration and St. Petersburg Administration to build an incineration plant for hazardous waste at the Krasny Bor but then decision was made to construct an experimental toxic waste treatment plant instead. It is planned to finalize the construction of the first line of the plant with the capacity of 18,000 tones and put it into operation in 2003. Furthermore, recently Toxic Waste Emergency Clean-up Programme aiming at upgrading and cleaning up the site has been launched with the support of the EU, bilateral donors and International Financing Institutions.

Source: Committee of natural resources, environmental protection and environmental safety of St. Petersburg administration, DEPA project documents 2000- 2002

Kaliningrad has similar problems related to storage and processing of hazardous waste, however, on a smaller scale. Today 6,000 tons of hazardous industrial waste is deposited in temporary storage houses that were not designed for this purpose. The risk of hazardous substances leaking into the ground is considered very high[38].

4.3.3 Persistent Organic Pollutants (POPs)

Effects of POPs

Of all the pollutants released into the environment every year by human activity, POPs are among the most dangerous. They are highly toxic, causing an array of adverse effects, notably chronic diseases, and birth defects among humans and animals. This report will briefly describe the 3 categories of POPs: POP pesticides, PCBs (industrial POP) and Dioxin.

Characteristics of the POPs

These highly stable compounds can last for years or decades before breaking down. They circulate globally through a process known as the “grasshopper effect”. POPs released in one part of the world can, through a repeated (and often seasonal) process of evaporation, deposit, evaporation, deposit, be transported through the atmosphere to regions far away from the original source.

38. *www.helcom.fi, press release 24.04.2001*

In addition, POPs concentrate in living organisms through another process called bioaccumulation. Though not soluble in water, POPs are readily absorbed in fatty tissue, where concentrations can become magnified by up to 70,000 times the background levels. Fish, predatory birds, mammals and humans are high up the food chain and so absorb the greatest concentrations. When they travel, the POPs travel with them. As a result of these two processes, POPs can be found in people and animals living in regions such as the Arctic, thousands of kilometres from any major POPs source.

Fortunately, there are alternatives to most POPs, though, in Northwest Russia a lack of public awareness and the absence of appropriate infrastructure and technology often prevent their adoption.

POP pesticides

Northwest Russia has large stocks of POP pesticides to be dealt with in the future (estimated 21,000 tonnes), though exact figures are not available.

PCBs

Another important POP is the PCBs, which were produced by two factories in the former Soviet Union. From 1939 to 1993, the factories produced a total of about 180,000 tonnes of PCB[39].

It is estimated that some 17,000 tonnes can be found in transformers and 7,000 tonnes in capacitors.

Amap estimates in its report "PCB in the Russian Federation" that between 1000 and 2000 tonnes of PCB is stored in PCB containing equipment in the Northwest Russian territory[40].

From the point of view of collection or substitution, the transformers are probably the application areas offering the highest "cost-benefit" ratio with the present plans for incineration[41].

39. *As is also the case for POP pesticides, estimation of PCBs and dioxin emissions in Northwest Russia are very approximate and need more detailed research*
40. *Amap, "PCB in the Russian Federation, Inventory and proposals for Priority Remedial Actions - executive summary"*
41. *Dancee, Status report on POPs in the Russian Federation*

Dioxins and Furans

Dioxin and Furans are by-products of e.g. incineration of POP pesticides, PCB and waste in general. A large scale US-Russian project provides estimations of dioxin emissions by different sources. According to the inventory, total annual dioxin emission to the air from Russian sources was estimated to be within the interval of 6900 to 10900 g I-TEQ (International Toxic-equivalent)[42].

The most urgent problems regarding dioxins in the Russian federation have until now been pollution within and around chemical plants producing chlorinated and brominated compounds. When considering 3 of the most polluting chemical plants, each of them have an emission about 10 times higher than the entire Danish emission (all sources included).

In Russia domestic waste is primarily deposited at landfills, often together with industrial wastes. Smoking landfills can be seen in many Russian regions all year round. Often landfills are set on fire in order to reduce the volumes of waste. No quantitative estimates of Dioxins and Furans formation from burning landfills are available but there are reasons to believe that such formation is not less hazardous than emissions from the waste incineration plants and the burning of landfills represents thus an environmental challenge that should be dealt with.

4.3.4 Financial challenges in the waste sector

Tariffs

The waste sector in Northwest Russia is in dire need of heavy investment in order to overcome the challenges indicated in the above sections and establish an environmentally sustainable waste management system.

Tariffs are collected by the Municipalities/City administrations, but there are a series of problems related to the collection of tariffs which is similar to those identified in the water sector (see section 4.1).

42. *It should be noted that the emission from the main source - incineration of waste - is calculated on the basis of emission factors from the UNEP toolkit for dioxin inventories.*

The Danish Environmental Protection Agency has financed the development of an environmental Financing Strategy within the waste sector in Novgorod Oblast. The Environmental Financing Strategy is a tool for establishing realistic plans for future investments encompassing amongst other expected revenue generated from user charges, Operation & Maintenance costs, future investments needs, required service levels etc. The financing strategy, developed with the aid of FEASIBLE, a newly developed computer modelling tool, concluded that:

- There are both motives and possibilities for increase of the waste collection coverage in the oblast;
- There are both motives and possibilities for development of recycling systems, starting in the larger cities;
- There is an urgent need to replace current inappropriately located, designed and operated dumpsites with proper landfills;
- The construction of waste incineration plant in the oblast is not expedient considering the high costs and the long transport distances;
- There are both motives and possibilities for an increased inter-municipal co-operation on development and operation of regional landfills;

With regard to financing issues the report concluded that:

- The revenues of municipal waste management enterprises cover, in general, costs related to their activities in all considered cases in the larger cities. With the exception of Novgorod, this is explained by that the minimal expenditures on sub-standard dumpsites;
- The revenues for waste collection and treatment are in many cases cross-subsidizing sanitary cleansing activities;
- In the larger cities, the envisaged developments in collection coverage and developments of the regional landfills can be financed with parallel increases tariffs. However, in the smaller towns, oblast subsidies will be required for the envisaged developments.
- New modes of financing, such as through property taxes, could prove beneficial;
- During years of implementation of large facilities, such as new landfills, there is a need to identify sources of capital investments financing.

4.3.5 Waste problems related to the energy sector

Oil spills and leakage

The Russian oil and gas industries are responsible for spills and leakages that contaminate soil and waters in many areas. Environmental standards are not enforced and international petroleum standards are not yet in place. Spills arise from pipeline leakages, accidents and tanker spills.

Additional refinery capacity has been established in St. Petersburg and the export of Russian oil products through the Baltic Sea is planned to triple within the coming years. Consequently, the risks of accidents and of oil spill will increase if measures to reduce these risks are not taken.

In total, more than 39 thousand ha of Russian land are contaminated with oil products of which military sites accounts for more than 70 per cent[43]. It is estimated that over 3 billion roubles (2001 prices) or more than USD 100 million are required only for the priority clean-up activities.

A significant part of these military sites are located in Northwest Russia, though, more detailed studies are needed to assess the full volume of this problems and the impact on the environment in particular on the ground water, local and regional water bodies.

Similar to other industries in Russia the military sites are supposed to be operated according to environmental permits. By 2002, less then 50% of the sites within the federal subordination have got the permits.

Extensive environmental studies at military sites are now being carried out with international assistance within the general demilitarisation process in Russia assuming their conversion to civil land use. The studies have already revealed a number of crucial environmental management issues:

- Of total reported 39.2 thousand ha of areas contaminated with oil products in Russia, more than 27 thousand ha are within military

43. Source: National Report on Status of the Environment, Russian Federation, 2001.

sites. It is estimated that over 3 billion roubles (2001) are required only for the priority clean-up activities.
- About 25% of wastewater from military sites is discharged without treatment. Only 15% of wastewater discharged from military vessels and harbour facilities are treated to the level meeting existing environmental norms.
- There are no solid waste treatment facilities at the majority of military sites. About 14.5 thousand tonnes of mixed waste from the sites per year are just dumped. The total area of the dumps is 171 thousand ha (2000).
- Over 350 old navy vessels (with total deadweight of 220 thousand tonnes) are accumulated in navy harbours with practically no pretreatment.

Source: National Report on Status of the Environment, Russian Federation, 2001

Waste from energy production

Concrete examples of waste problems related to establishment of energy plants and the disposal of by-products from energy production in Northwest Russia are:

- High dust and fly ash emission (from coal fired power plants and boiler stations in Kaliningrad oblast, Pskov oblast, from oil shale recovery in Leningrad oblast);
- Wastewater discharge (from the Kirishi oil refinery, cooling water from power plants from open-type district heating systems with supply water partly used as hot tap water);
- Pollution of groundwater and soil by petroleum products (from the Kirishi oil refinery and oil storage tanks).

Construction of several new refineries, pipelines and oil terminals in the region in order to be able to ship out more crude oil and oil products in the Baltic Sea and the Barents Sea constituting increased risks of oil spills and adverse impacts on sensitive habitats.

4.3.6 Spent Nuclear Fuel (SNF)

Storage and reprocessing of used fuel

Apart from the safety issues relating to the nuclear power plants there

are a series of problems relating to storage and reprocessing of Spent Nuclear Fuel and other contaminated wastes.

The only facility for reprocessing used fuel is the Mayak plant which is situated in the southern part of the Urals. Thus, the used fuel is transported from all over Russia to this plant which has severe security related implications.

However, Mayak is not capable of treating all types of used fuel elements produced in various nuclear powered generators and nuclear power plants. Furthermore, long-term storage facilities are not available and approximately 14,000 tonnes of spent nuclear fuel is stored at Mayak and at various plants[44]. OECD estimates that approximately 1 billion tons of high and low level radioactive waste is stored in Russia. However, the larger part is related to low-level radioactive waste from uranium and thorium mining and processing.

At Leningrad Atomic Energy Station the spent nuclear fuel elements are stored in a storage facility on the site right next to the Gulf of Finland. The storage facility is in a bad condition. Reportedly, there are cracks in the wall and in the roof. Rainwater enters and contaminated water runs out. All storage facilities are utilised to the maximum capacity, and RMBK fuel elements will not be reprocessed.

www.bellona.no

The naval nuclear decommissioning

Northwest Russia is awash with laid-up nuclear powered submarines and ice-breakers waiting to be decommissioned. Out of the 248 nuclear submarines built by the Soviet Union and Russia for the Northern and Pacific fleets, 191 are laid-up. 115 of these are located in Northwest Russia, of which only 32 have been dismantled. Only 10 submarines have been defuelled and 71 are laid-up with spent nuclear fuel onboard[45].

44. *EIA, Russia Energy Survey, 2002*
45. *www.bellona.no - Article 28th November 2002 - EU Russia Committee discusses Russian nuclear safety*

The tempo at which spent nuclear Fuel is transported an process at Mayak Plant has slowed drastically during the last decade. As of 1991, Mayak Chemical Combine has required full coverage of its expenses.

The Russian Navy lacks funds to pay for the service of the Mayak Plant for reprocessing, which still constitutes the most important reason for the drop in the rate at which spent nuclear fuel is reprocessed.

Thus there is a sharp increase in the amount of spent nuclear fuel that is stored at naval bases in Northwest Russia, including fuel that remains in reactors of laid up submarines.

Specialists and Commanders of the Russian Northern Fleet are both greatly concerned about this situation, for in theory it will be impossible to transport all this fuel to Mayak over the course of the next 30 to 40 years.

Finally, experts believe that 10 per cent of the fuel assemblies accumulated at the Northern Fleet bases and shipyards cannot be reprocessed at Mayak.

Source: The Russian Northern Fleet: Handling of Spent Fuel Assemblies, Bellona, 2002

Another source of nuclear waste is spent strontium-90 fuel used to power lighthouses in the northern region. This method of powering lighthouses was also tested in the west but abandoned since it was difficult to ensure the safety of such large sources at remote and isolated locations. The source from lighthouses no longer in use is now taken care of with international assistance[46].

4.3.7 Facing the challenges in the Waste sector

Russia should continue the work towards creating an efficient legal and institutional framework for the waste sector. Russia's waste handling

46. *Overview of the sources of spent nuclear fuel and radioactive waste in Northwest Russia, EBRD, 22/4-2002.*

strategies should relate to internationally recognised principles for waste management i.e. the "waste hierarchy" (highest priority given to prevention, followed by recovery and lowest priority to safe disposal).

Within these principles, special efforts in Northwest Russia should be given to:

- Waste minimisation through public awareness campaigns and increased recycling and reuse. Introduction of waste selection practice and construction of sorting stations initially in large cities where one can expect sufficient volume of sorted waste to make the business commercially attractive;
- Mapping and controlling the waste streams. This would improve the understanding the needs and force the various municipalities and Oblast into development and operation of regional landfills.
- Tariffs should reflect the cost of the service provided and full cost recovery has not yet been achieved.
- Capacity building and institutional strengthening especially with regard to waste management planning, financial and operational management and best practices.

The technical challenges related to the waste sector are extensive but not insurmountable in the sense that well known and more or less technology intensive solutions are available.

- There is a need for increasing both urban and rural waste collection coverage (e.g. sorting stations and types of vehicle) for both municipal and industrial waste. This would reduce illegal dumping of both Municipal and Industrial waste on unauthorised dumpsites.
- Waste collection equipment need to be upgraded to allow more focus on recycling and include household hazardous waste needs in the overall waste collection system.
- There is an urgent need for replacing current inappropriately located and designed landfills.
- Waste treatment procedures at landfills need to be environmentally optimised.
- The Soviet "heritage" in terms of accumulated waste needs to be dealt with. E.g. priority should be given to collecting the POPs that still pose a serious threat to the environment.
- The nuclear waste in Northwest Russia must urgently be handled in a safe manner.

Areas of particular relevance for international co-operation
As signatory to the Basel Convention Russia should continue pursuing that a) transboundary movement of hazardous waste should be reduced to a minimum, b) hazardous waste should be treated and disposed of as close to their source of generation as possible. c) hazardous waste generation should be reduced and minimised at the source.

Furthermore, Russia participated in the preparation of the 1998 protocol to the Convention on Long-range Transboundary Air Pollution on Persistent Organic Polluters, but has not signed it. One reason is the requirement to phase out PCB use by 2005, which is causing difficulties. The 1999-2001 "National Environmental Action Plan" does not consider Persistent Organic Polluters elimination (among air pollution problems, phase-out of leaded petrol is given the highest priority). Russia should continue working towards ratification of the Stockholm Convention on Persistent Organic Pollutants (POPs). Examples of specific activities envisaged within the preparatory process are:

- Contribution to the Arctic Monitoring and Assessment Programme project concerning PCB products (feasibility studies, preparation of pilot projects for elimination/phasing out of PCBs);
- Development and demonstration of strategies for reduction of dioxin releases in Northwest Russia;
- Inventories and development of action plan regarding stockpiled obsolete pesticides (in co-operation with UNEP and the United States Environmental Protection Agency).

According to Russian targets set in the Partnership and Co-operation agreement with the EU Russia should approach various EU regulations as e.g. The EU Waste Management Strategy (COM (96) 399) and the EU Landfill Directive (1999/31/EC).

Finally, safe handling of nuclear waste demands for close international co-operation, as Northwest Russia apparently is not able to handle the situation. Dependent on the successful signing of the Multilateral Nuclear Environmental Programme in the Russian Federation, Euro 62 Million have been earmarked for nuclear projects in Northwest Russia under the Northern Dimension Environmental Programme.

5. Summary and perspectives

The overall environmental situation in Northwest Russia can be summarised as follows:

- Huge loads on the environment in Northwest Russia from the Soviet period urgently need to be addressed
- There is an imminent need for investment in renovation and upgrading of the public utility infrastructure.
- The discharge and emission of polluting substances in Northwest Russia has been reduced during the 90ies. However, the main reason for the reduction was the serious decline in the economical activities
- The environmental problems in Northwest Russia are not solved
- If growth picks up and production increases – without new environmental investments – the strains on the environment will return to previous alarming high levels.

The sector related challenges within the water, waste and energy sectors are:

- In the short run – to carry out the urgently needed damage control of stored hazardous and nuclear waste
- In the short and medium run
  - to increase industrial production levels and public services in North-west Russia without increasing the related load on the environment
  - to secure clean drinking water for the population in Northwest Russia
  - to reduce water and energy consumption as well as waste loads
  - to replace first generation reactors at nuclear power plants
- In the longer run – to reduce the pollution levels in Northwest Russia and solve the immense environmental problems accumulated during the past e.g. disposal of hazardous and nuclear waste and oil contaminated soils

To meet these challenges in Northwest Russia the following interventions and measures are deemed needed:

- Financing of public environmental services must be improved and the funds must be used efficiently to secure highest possible contribution to protection of the environment.
- Of particular importance is the recently approved Programme for Restructuring and Modernisation of the Housing Sector, which must be efficiently implemented to address some of the most pending financial issues. It is, however, crucial for its success that new investments are based on realistic environmental financial strategies.
- The legal and institutional reforms must be accelerated in order to secure an efficient framework for the public and private sector based on environmental sustainable principles
- State and privately owned enterprises must be forced to take up their environmental responsibilities and the polluter pays principle must be better promoted and enforced
- The concept of total water management must be emphasized in Northwest Russia to, amongst other, ensure lower water consumption and economically and environmentally suitable management of utilities.
- More comprehensive and holistic Natural Resource Management approach should be introduced.
- It is necessary to establish an institutional and financial setup that provides means and incentives for reducing energy consumption and increasing efficiency in energy production and supply
- Damage control plans for stored hazardous and nuclear waste must be developed and implemented as soon as possible.
- The citizens in Northwest Russia must be properly informed on the present environmental problems and challenges – as well as their role and responsibilities toward solving these
- Continued and – if possible – strengthened international environmental co-operation through well established alliances must be utilised in order to:
  - draw on experiences and lessons from other countries both with regard to environmental efficiency of different set-up for legal and administrative frameworks as well as transfer of know-how and cleaner technology to improve Best-Available-Technology (BAT) in Russia.
  - continue efforts to comply with international environmental agreements to maintain focus and attract international funding for most urgently needed environmental investments – of which many will be of transboundary significance

If these urgently needed intervention and measure are not being implemented the human health situation in Northwest Russia will further worsen and the economical recovery will be hampered in the medium and long run. Furthermore, the water quality and biodiversity of the Baltic Sea will be threatened.

6. Summary in Danish

Denne rapport er en strategisk analyse af de miljøudfordringer, som den nordvestlige del af Rusland står overfor. Rapportens indhold er blevet efterspurgt af de russiske miljømyndigheder i et samarbejde med Miljøstyrelsen, som en form for afslutning på det dansk-russiske arbejde. Formålet er at vise status og påpege muligheder for løsninger af opgaverne. Udgangspunktet for analysen er de miljøproblemer, som har en konkret indvirkning på Østersøen, nemlig vandkvalitet, affaldsbehandling og luftforurening fra energisektoren.
Østersøen er verdens største brakvandsområde, dels på grund af den ringe vandudskiftning, dels på grund af de mange floder, der udmunder i havet. Østersøen er afvandingsområde for den mest befolkningstunge del af det nordvestlige Rusland.

6.1 Miljøsituationen i Nordvestrusland

Den overordnede miljøsituation i Nordvestrusland er kendetegnet ved:

- Alarmerende miljøproblemer nedarvet fra sovjettiden, der kan forårsage uoprettelige skader på miljøet og i yderste konsekvens nye miljøkatastrofer på niveau med Tjernobyl-katastrofen.
- Spildevands- og vandforsyningsanlæg, lossepladser og affaldsbehandlingsanlæg er særdeles nedslidte.
- Selvom mængden af nyt, farligt affald og niveauet for luftforurening har været faldende gennem 90erne, kan hovedårsagen tilskrives nedgangen i bruttonationalproduktet, der er faldet forholdsvis mere end forureningsniveauet.
- Forsat økonomisk vækst vil bringe Nordvestrusland tilbage til tidligere alarmerende høje forureningsniveauer medmindre en række miljøtiltag gennemføres.

Miljøproblemer i vandsektoren

Spildevandsrensning

En af Østersøens væsentligste forureningskilder er urenset spildevand, hvoraf hovedparten kommer fra Nordvestrusland. En stor del af befolkningen er ikke tilknyttet offentlige kloaksystemer og spildevandsrensningsanlæg, og de systemer, der er adgang til, er utætte og i stigende grad ineffektive. På grund af de helbredsmæssige konsekvenser og den direkte trussel mod vandreservoirer er dette miljøproblem presserende.

Vandforbrug

Selvom vandforbruget per person er faldet væsentligt, er det stadig dobbelt så stort som i Vesteuropa, nemlig hele 260 liter/capita/dag. Det voldsomme overforbrug er resultatet af et dårligt vedligeholdt distributionssystem og et ineffektivt afgiftssystem.

Helbred

Ifølge Ruslands egen klassificering er de fleste russiske floder og søer registreret som "moderat forurenet" eller "forurenet". Forureningen er af bakteriologisk og kemisk art og skyldes primært utilstrækkelig spildevandsrensning. Da 70% af drikkevandet er overfladevand, udgør drikkevandet en stigende trussel mod befolkningens helbred.

Miljøproblemer i affaldssektoren

Mangelfuld og/eller utidssvarende affaldsbehandling i Nordvestrusland er medårsag til forureningen af Østersøen og til forringet vandkvalitet og forurening af jorden.

Farligt affald

Den klart mest presserende miljøtrussel er farligt affald. Den russiske industri producerer enorme mængder af farligt affald, og systemerne til indsamling og bortskaffelse er helt utilstrækkelige. Dertil kommer som et levn fra Sovjettiden mængder af farligt affald i usikrede lossepladser. Man regner med, at den akkumulerede mængde af farligt affald var 120 millioner tons i år 2000. Til sammenligning behandlede KommuneKemi, Danmarks behandlingsanlæg for farligt affald, 110.000 tons i år 2000. Det vil sige, at den samlede mængde farligt affald i det nordvestlige Rusland er mere end 1000 gange så meget, som KommuneKemi behandler om året.

Nukleart affald

Omkring 14.000 tons nukleart affald er oplagret i Nordvestrusland under mere eller mindre forsvarlige forhold. Store dele kommer fra nukleare energianlæg, men et særligt problem er brændsel fra 115 atomdrevne ubåde, der er taget ud af service. Nordvestruslands eneste facilitet, der kan behandle nukleare affald – men ikke alle former – er Mayak, hvor størstedelen af de 14.000 tons er opmagasineret.

Miljøproblemer i energisektoren

Stort energiforbrug

Den russiske økonomi er præget af et intensivt energiforbrug. Det er dels strukturelt betinget – Rusland har store energiintensive industrier, dels resultatet af et stort overforbrug på grund af lave energipriser. Ganske vist opfylder Rusland sine internationale forpligtelser til at reducere udslippet af SOx, NOx og CO2. Men reduktionen hænger nøje sammen med faldet i Ruslands bruttonationalprodukt og ikke med reelle forureningsnedsættende aktiviteter.

Institutionelle rammer

Tre niveauer

Forvaltningen af miljølovgivningen foregår i en lang række instanser, som findes på tre administrative niveauer: Føderalt, regionalt og lokalt/kommunalt. Samarbejdet mellem instanserne er ofte mangelfuldt. Ofte modarbejder de hinanden eller undlader at dele viden med hinanden.

Lovgivning

Uklar lovgivning

Selv om miljølovgivningen i de senere år har været genstand for et stort reformarbejde, er der lang vej igen. Lovgivningen er kompleks og inkonsistent, og det giver de regionale og lokale administrationer store muligheder for individuel fortolkning.

Dobbeltarbejde

Et konkret resultat af de forskellige fortolkninger af lovgivningen udmøntes i en lang række standarder, som hver for sig monitoreres af hver sin instans. For eksempel overvåges vandkvaliteten i Kaliningrad af ikke færre end otte forskellige instanser.

Finansieringsproblemer med miljøydelser og -investeringer

Behovet En af de største barrierer for at opfylde internationale konventioner og mål på miljøområdet er at finde finansiering. Behovet er enormt. Alene de HELCOM "hot spots", der er relateret til kommunal miljøforsyning i Rusland, blev i 1999 vurderet til at kræve investeringer på ca. 1.4 milliarder Euro.

Finansieringsproblemerne

Der er identificeret fire faktorer, som bidrager til finansieringsproblemerne: Lav indtjening fra brugerbetaling, få offentlige subsidier, ineffektiv planlægning og investering samt højt ressourceforbrug og ineffektivitet.

Finansieringsanalyser viser, at selvom hele investeringen i at forbedre den kommunale miljøforsyning kom som en gave, ville kommunerne ikke kunne bære de øgede drifts- og vedligeholdelsesomkostninger ved nye og mere avancerede anlæg.

Internationale finansieringsinstitutioner og multi- og bilaterale donororganisationer kan bidrage, men det mest presserende behov er at gennemføre nationale reformer, der kan rette op på de fire grundlæggende problemer. Rusland har dog taget et første, vigtigt skridt med sit nye otteårige reformprogram, der blev vedtaget i 2001.

6.2 Miljøudfordringerne fremover

Miljøudfordringerne inden for vand, affald og energisektorerne i Nordvestrusland er i prioriteret rækkefølge:

- Hurtigst muligt at begrænse yderligere miljøskader fra den nuværende utilstrækkelige opbevaring af de voldsomt store mængder af farligt og nukleart affald
- På kort og mellemlangt sigt:
  at øge produktionsniveauet uden at øge presset på det omgivende miljø
  at sikre rent drikkevand til befolkningen
  at reducere vand- og energiforbruget og begrænse affaldsmængderne
  at udskifte førstegenerations-reaktorerne – også klassificeret som verdens farligste – på atomkraftværkerne
- På længere sigt at reducere forureningsniveauet og løse de voldsomme miljøproblemer, fx ved at sikre en miljømæssig forsvarlig bortskaffelse af farligt og nukleart affald og oprensning af store arealer forurenet jord.

6.3 Nødvendige miljøtiltag

For at imødekomme miljøudfordringerne i Nordvestrusland er følgende tiltag identificeret som bydende nødvendige:

- Handlingsplaner for at afværge uoprettelige miljøskader fra utilstrækkelig opbevaret farligt og nukleart affald bør udarbejdes og gennemføres med det samme.
- Finansieringen af den kommunale miljøforsyning – herunder renovering og nyinvesteringer i vandforsynings-, kloak- og spildevandsrensningsanlæg og affaldshåndtering – skal forbedres og benyttes, hvor der er mest miljø for pengene
- Særlig vigtigt er en effektiv gennemførelse af det nyligt godkendte otteårige reformprogram. Det er afgørende for programmets succes, at disse miljøforbedrende nyinvesteringer tager udgangspunkt i realistiske finansieringsstrategier.
- Reformprocessen i Rusland bør yderligere styrkes for at sikre effektive og miljømæssige bæredygtige rammer for den offentlige og private sektor
- Statsejede og private virksomheder skal forpligte sig til de miljømæssige rammer, der sættes for dem, og "forureneren betaler"-princippet bør håndhæves

- Gennem oplysningskampagner bør befolkningen informeres om de miljøproblemer og -udfordringer, som området står overfor, og om den enkelte borgers rolle og ansvar for at løse dem
- Endeligt bør det internationale miljøsamarbejde fastholdes – og om muligt styrkes – for at:
  drage nytte af andre landes erfaringer mht. konkrete miljøløsninger – herunder teknologioverførsel – og forskellige administrative og juridiske tilgange til miljøbeskyttelse.
  fastholde fokus på miljøet ved at deltage i internationale miljøaftaler og øge muligheden for international finansiel støtte til de mest nødvendige miljøinvesteringer, der i mange tilfælde kunne afhjælpe potentielle miljøskader, der går ud over Nordvestruslands grænser.

Rapporten konkluderer, at hvis disse tiltag ikke gennemføres, vil sundhedssituationen i Nordvestrusland forværres yderligere, og den økonomiske genopretning vil på mellem og langt sigt være i fare. Endvidere vil vandkvaliteten og dermed også biodiversiteten i Østersøen blive væsentlig forværret.

Appendix 1: List of Literature

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Appendix 2: Hot spots identified in 1992 and their present status

List of JCP Hot Spots in the Baltic Sea catchment area

(the shadowed lines indicate the Hot Spots deleted from the list as **per 20 November 2002**)

Key	*Priority Hot Spots*	*Location*	*Country*	*Site name*	*Site type*
Bothnian Bay					
1		Bothnian Bay	Sweden	Rönnskärsverken	Industry (Metal Smelter)
2		Bothnian Bay	Finland	Metsä - Botnia Oy Kemi	Industry (Pulp & Paper)
Bothnian Sea					
3		Bothnian Sea	Sweden	Husum Kraft Mill (1)	Industry (Pulp & Paper)
4		Bothnian Sea	Sweden	Östrand (1)	Industry (Pulp & Paper)
5		Bothnian Sea	Sweden	Vallvik (1)	Industry (Pulp & Paper)
6		Dalälven River	Sweden	Dalälven	Mining Waste
7		Bothnian Sea	Finland	Outokumpu Group Harjavalta	Industry (Metal Smelter)
8		Bothnian Sea	Finland	Kemira Oy Vuorikemia	Industry (Titanium oxide)
Archipelago and Åland Seas					
9		Arch & Åland Seas	Finland	Fish Farming	Fish Farming
10		Archipelago Sea	Finland	Agriculture (2)	Agricultural Runoff
Neva River Basin / Lake Ladoga					
11		Lake Saimaa	Finland	YPT Joutseno	Industry (Pulp & Paper)
12		Lake Saimaa	Finland	Kaukas Lappeenranta	Industry (Pulp & Paper)
13		Lake Saimaa	Finland	E-G Kaukopää	Industry (Pulp & Paper)
14		Lake Ladoga	Russia	Syasstroi	Industry (Pulp & Paper)
15		Lake Ladoga	Russia	Volkhov	Industry (Aluminum)
Gulf of Finland					
16		Gulf of Finland	Finland	Sunila Oy - Kotka	Industry (Pulp & Paper)
17		Gulf of Finland	Finland	Helsinki Region	Municipal
18	X	Gulf of Finland	Russia	St. Petersburg	Connection Sewers
19	X	Gulf of Finland	Russia	St. Petersburg (Urban) (3)	Municipal & Industrial
20	X	Gulf of Finland	Russia	St. Petersburg (Suburban)	Municipal & Industrial
21		Gulf of Finland	Russia	St. Petersburg	Phosphorous Removal
22		Gulf of Finland	Russia	St. Petersburg	Industry (Metal Plating)
23		Gulf of Finland	Russia	St. Petersburg	Hazardous Waste
24	X	Gulf of Finland	Russia	St. Petersburg Region	Large Livestock Farms

Key	*Priority Hot Spots*	*Location*	*Country*	*Site name*	*Site type*
25	X	Gulf of Finland	Estonia	Narva	Power Plants (Oil Shale)
26		Gulf of Finland	Estonia	Kohtla Järve	Area Municipal & Industrial
27		Gulf of Finland	Estonia	Kehra	Industry (Pulp & Paper)
28	X	Gulf of Finland	Estonia	Tallinn	Municipal & Industrial
29		Gulf of Finland	Estonia	Tallinn	Industry (Pulp & Paper)
30		Gulf of Finland	Estonia	Gulf of Finland	Agricultural Runoff Programme
Western Estonian Coast					
31		Estonian Coast	Estonia	Haapsalu	Municipal & Industrial
32	X	Estonian Coast	Estonia	Matsalu Bay	Management Programme
Gulf of Riga / Daugava River Basin					
33	X	Gulf of Riga	Estonia	Pärnu	Municipal & Industrial
34		Gulf of Riga	Estonia	Paide	Municipal & Industrial
35		Gulf of Riga	Estonia	Vohma Meat Combine	Industry
36		Gulf of Riga	Estonia	Gulf of Riga	Agricultural Runoff Programme
37	X	Gulf of Riga	Estonia/La	Gulf of Riga Mgt	Management Programme
38	X	Gulf of Riga	Latvia	Sloka	Industry (Pulp & Paper)
39	X	Gulf of Riga	Latvia	Latbiofarm	Industry (Pharmaceutical)
40	X	Gulf of Riga	Latvia	Agriculture / Livestock	Agricultural Runoff Programme
41	X	Gulf of Riga	Lithuania	Siauliai	Municipal & Industrial
42	X	Daugava RB	Latvia	Riga (WWTP Phase II)	Municipal & Industrial
43		Daugava RB	Latvia	VEF Plant (Riga)	Industry (Metals)
44		Daugava RB	Latvia	RER Plant (Riga)	Industry (Metals)
45		Daugava RB	Latvia	Riga	Industry (Various)
46	X	Daugava RB	Latvia	Daugavpils	Municipal & Industrial
47		Daugava RB	Belarus	Vitebsk	Municipal & Industrial
Latvian Coast					
48	X	Latvian Coast	Latvia	Liepaja (3)	Municipal & Industrial
Nemunas River Basin					
49	X	Nemunas RB	Russia	Sovetsk	Industry (Pulp & Paper)
50	X	Nemunas RB	Russia	Neman	Industry (Pulp & Paper)
51	X	Nemunas RB	Lithuania	Kaunas	Municipal & Industrial

Key	*Priority Hot Spots*	*Location*	*Country*	*Site name*	*Site type*
52		Nemunas RB	Lithuania	Amalg Azotaz	Industry (Fertilizer)
53		Nemunas RB	Lithuania	Kedainiai	Municipal & Industrial
54		Nemunas RB	Lithuania	Kedainiai	Industry (Chemicals)
55		Nemunas RB	Lithuania	Panevezys	Municipal & Industrial
56		Nemunas RB	Lithuania	Panevezys	Industry (Food)
57		Nemunas RB	Lithuania	Marijampole	Municipal & Industrial
58		Nemunas RB	Lithuania	Alytus	Municipal & Industrial
59	X	Nemunas RB	Lithuania	Vilnius / Grigiskes	Municipal & Industrial
60	X	Nevezis RB	Lithuania	Agriculture / Livestock	Agricultural Runoff Programme
61		Nemunas RB	Belarus	Grodno	Municipal & Industrial
Lithuanian Coast					
62		Lith. Coast	Lithuania	Mazeikiai	Oil Refinery / Marine Terminal
63	X	Lith. Coast	Lithuania	Klaipeda	Municipal & Industrial
64		Lith. Coast	Lithuania	Cardboard Factory	Industry (Paper)
65		Lith. Coast	Lithuania	Palanga	Municipal
Lithuanian / Kaliningrad Coast					
66	X	Lith/Kal Coast	Lith/Russia	Kursiu Lagoon	Management Programme
Kaliningrad					
67	X	Kaliningrad	Russia	Kaliningrad	Municipal & Industrial
68		Kaliningrad	Russia	Pulp & Paper No 1	Industry (Pulp & Paper)
69		Kaliningrad	Russia	Pulp & Paper No 2 (4)	Industry (Pulp & Paper)
70		Kaliningrad	Russia	Kaliningrad	Hazardous Waste
71		Kaliningrad	Russia	Oil Bunkering Station	Industry
72		Kaliningrad	Russia	Agriculture / Livestock	Agricultural Runoff Programme
Kaliningrad / Polish Coast					
73	X	Kal/Pol Coast	Russia/Pol	Vistula Lagoon	Management Programme
Vistula River Basin / Baltic Coast of Poland					
74	X	Baltic Coast	Poland	Koszalin - Jamno WWTP	Municipal & Industrial
75	X	Baltic Coast	Poland	Gdynia - Debogorze WWTP	Municipal & Industrial
76.1		Baltic Coast	Poland	Gdansk - Wschod	Municipal
76.2	X	Baltic Coast	Poland	Gdansk Refinery	Industry (Oil refinery)
77	X	Vistula	Poland	Frantschach Swiecie	Industry (Pulp & Paper)

Key	*Priority Hot Spots*	*Location*	*Country*	*Site name*	*Site type*
78	X	Vistula	Poland	Bydgoszcz - Fordon WWTP	Municipal & Industrial
79		Vistula	Poland	Bydgoszcz - Kapusciska	Industry (Chemical)
80	X	Vistula	Poland	Torun	Municipal & Industrial
81	X	Vistula	Poland	Wloclawek -Anwil Plant	Industry (Chemical)
82		Vistula	Poland	Warsaw - Czajka WWTP	Municipal & Industrial
83.1	X	Vistula	Poland	Warsaw - Poludnie WWTP	Municipal & Industrial
83.2	X	Vistula	Poland	Warsaw - Siekierki Plant	Industry (Power plant)
84		Vistula	Poland	Warsaw - Pancerz WWTP (wastewater will be connected to Czajka WWTP)	Municipal & Industrial
85		Vistula	Poland	Lublin - Hajdow WWTP	Municipal & Industrial
86	X	Vistula	Poland	Krakow - Plaszow WWTP	Municipal & Industrial
87.1	X	Vistula	Poland	Krakow - Kujawy WWTP	Municipal & Industrial
87.2	X	Vistula	Poland	Krakow - Tadeusz Sendzimir Works	Industry (Steel)
88.1	X	Vistula/Odra	Poland	Katowice -Bytom/ Bytom Municipal Enterprise	Municipal & Industrial
88.2	X	Vistula/Odra	Poland	Katowice -Gliwice/ Waterworks & Sewerage Enterprise	Municipal & Industrial
88.3	X	Vistula/Odra	Poland	Katowice - Katowice, Myslowice,Siemianowice/Regional Enterprise of Waterworks and Sewerage	Municipal & Industrial
88.4	X	Vistula/Odra	Poland	Katowice - Tychy/ Regional Centre of Water and Wastewater Management	Municipal & Industrial
88.5	X	Vistula/Odra	Poland	Katowice Area - Duo-Stal in Bytom	Industry (Metallurgical plant)
88.6	X	Vistula	Poland	Katowice Area - Katowice Steel Plant in Dabrowa Gornicza	Industry (Steel plant)
88.7	X	Vistula	Poland	Katowice Area - Czechowice Refinery in Czechowice-Dziedzice	Industry (Oil refinery)
88.8	X	Vistula/Odra	Poland	Katowice Area - Przyjazn Coking Plant in Dabrowa Gornicza	Industry (Coking plant)
89		Vistula	Poland	Jaworzno Organika Azot Plant	Industry (Chemical)
90		Vistula	Poland	Zgierz - Boruta Dyestuffs	Industry (Chemical)
91		Vistula	Poland	Oswiecim - Dwory Plant	Industry (Chemical)

Key	*Priority Hot Spots*	*Location*	*Country*	*Site name*	*Site type*
92		Vistula	Poland	Bukowno -Boleslaw Works	Industry (Metals)
93		Vistula	Belarus	Brest	Municipal & Industrial
94	X	Vistula	Ukraine	Lvov	Municipal & Industrial
95	X	Vistula	Poland	Agriculture / Livestock	Agricultural Runoff Programme
96		Vistula	Poland	Upper Basin (7)	Salt Control
Oder-Odra River Basin					
97.1	X	Oder / Odra	Poland	Szczecin -Pomorzany WWTP	Municipal & Industrial
97.2	X	Baltic coast	Poland	Szczecin - Zdroje WWTP	Municipal & Industrial
98.1	X	Oder / Odra	Poland	Szczecin - Police Plant	Industry (Chemical)
98.2	X	Baltic coast	Poland	Szczecin - Skolwin Mill	Industry (Pulp & Paper)
99.1		Oder / Odra	Poland	Poznan - Centralna WWTP	Municipal & Industrial
99.2		Oder / Odra	Poland	Poznan - Left River Bank WWTP	Municipal & Industrial
100	X	Oder / Odra	Poland	Lodz WWTP	Municipal & Industrial
101		Oder / Odra	Poland	Zielona Gora WWTP	Municipal & Industrial
102.1	X	Oder / Odra	Poland	Prochowickie Poultry proc. plants	Industry (Food)
102.2	X	Oder / Odra	Poland	KGHM “Polska Miedz” Copper works “Glogow” in Zukowice	Industry (Heavy metals)
102.3	X	Oder / Odra	Poland	KGHM “Polska Miedz” Copper works “Legnica” in Legnica	Industry (Heavy metals)
103		Oder / Odra	Poland	Wroclaw WWTP	Municipal & Industrial
104		Oder / Odra	Poland	Wroclaw - Brzeg Dolny, Rokita Plant	Industry (Chemical)
105		Oder / Odra	Poland	Ubocz - Luban	Industry (Fertilizer)
106		Oder / Odra	Poland	Boleslawiec -Wizow Plant	Industry (Fertilizer)
107	Refer to 88	Oder / Odra	Poland	Katowice-West	Municipal & Industrial
108	Refer to 88	Oder / Odra	Poland	Katowice-West	Industry (Coke,Steel,Fertilizer)
109	X	Oder / Odra	CSFR	Ostrava	Municipal & Industrial
110	X	Oder / Odra	CSFR	Ostrava Area	Industry (Chem, P&P, etc.)
111		Oder / Odra	CSFR/Poland	Upper Basin (7)	Salt Control
112	X	Oder / Odra	Poland	Agriculture / Livestock	Agricultural Runoff Programme
113	X	Oder / Odra	Poland/Ger	Odra Lagoon mgt	Management. Programme

Key	*Priority Hot Spots*	*Location*	*Country*	*Site name*	*Site type*
Arkona Basin					
114		Arkona Basin	Germany	Greifswald	Municipal & Industrial
115		Arkona Basin	Germany	Neubrandenburg	Municipal & Industrial
116		Arkona Basin	Germany	Stralsund	Municipal & Industrial
117		Arkona Basin	Germany	Stavenhagen - Malchin	Municipal & Industrial
118		Arkona Basin	Germany	Agriculture	Agricultural Runoff Programme
Belt Sea					
119		Belt Sea	Germany	Lübeck	Municipal & Industrial
120		Belt Sea	Germany	Wismar	Municipal & Industrial
121		Belt Sea	Germany	Rostock	Municipal & Industrial
122		Belt Sea	Denmark	Agriculture (8)	Agricultural Runoff Programme
The Sound					
123		The Sound	Denmark	Copenhagen	Municipal
124		The Sound	Denmark	Agriculture (8)	Agricultural Runoff Programme
125		The Sound	Sweden	Agriculture	Agricultural Runoff Programme
Kattegat					
126		Göta älv River	Sweden	Skoghall	Industry (Pulp & Paper)
127		Kattegat	Sweden	Göteborg	Municipal
128		Kattegat	Sweden	Agriculture	Agricultural Runoff Programme
129		Kattegat	Denmark	Agriculture (8)	Agricultural Runoff Programme
Swedish Coast					
130		Swedish Coast	Sweden	Stockholm	Municipal
Bornholm Basin					
131		Bornholm Basin	Sweden	Nymölla	Industry (Pulp & Paper)
132		Bornholm Basin	Sweden	Agriculture	Agricultural Runoff Programme

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