BALTIC SEA ENVIRONMENT PROCEEDINGS

No. 83

THEMATIC REPORTS ON HELCOM PITF REGIONAL WORKSHOPS HELD IN THE BALTIC REPUBLICS

Riga, Latvia, 24 - 25 May 2000
Vilnius, Lithuania, 26 - 27 October 2000
Tallinn, Estonia, 1 - 2 March 2001

HELSINKI COMMISSION
Baltic Marine Environment Protection Commission
2001

For bibliographic purposes this document should be cited as:
HELCOM, 2001
Thematic Reports on HELCOM PITF Regional Workshops held in the Baltic Republics;
Riga, Latvia, 24-25 May 2000; Vilnius, Lithuania, 26-27 October 2000;
Tallinn, Estonia, 1-2 March 2001
Baltic Sea Environ. Proc. No. 83

ISSN 0357-2994

Thematic Reports on HELCOM PITF Regional Workshops held in the Baltic Republics

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Third Regional Workshop; held in Tallinn, Estonia, 1-2 March 2001

FOREWORD

Following structural reforms, carried out within the Helsinki Commission in 1999, the HELCOM Programme Implementation Task Force (PITF) decided to accept an offer by the Commission to take over, within its regular framework, the responsibility for implementation of elements 1-2 and 5-6 of the Baltic Sea Joint Comprehensive Environmental Action Programme (JCP) and to focus its own attention in the future on investment activities within elements 3 and 4 of the JCP. PITF also decided, in accordance with a recommendation by the Heads of Delegation of HELCOM, to set up a Preparatory Group to deal with the consequences of PITF reorientation.

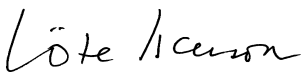
On the initiative of the PITF Preparatory Group two Regional Workshops were organized during 2000: in Riga, Latvia, on May 25-26 and in Vilnius, Lithuania, on October 26-27. A third Regional Workshop was held in Tallinn, Estonia, on March 1-2 this year. The main purpose of the Workshops was to provide a forum for members of PITF to meet local and regional representatives for authorities and management, responsible for investment activities in major point sources of pollution ("hot spots") and to share with them the experiences of JCP implementation.

In connection with the Regional Workshops, thematic reports on JCP implementation in "hot spots" have been elaborated by representatives of the host countries. The thematic reports are herewith submitted to HELCOM.

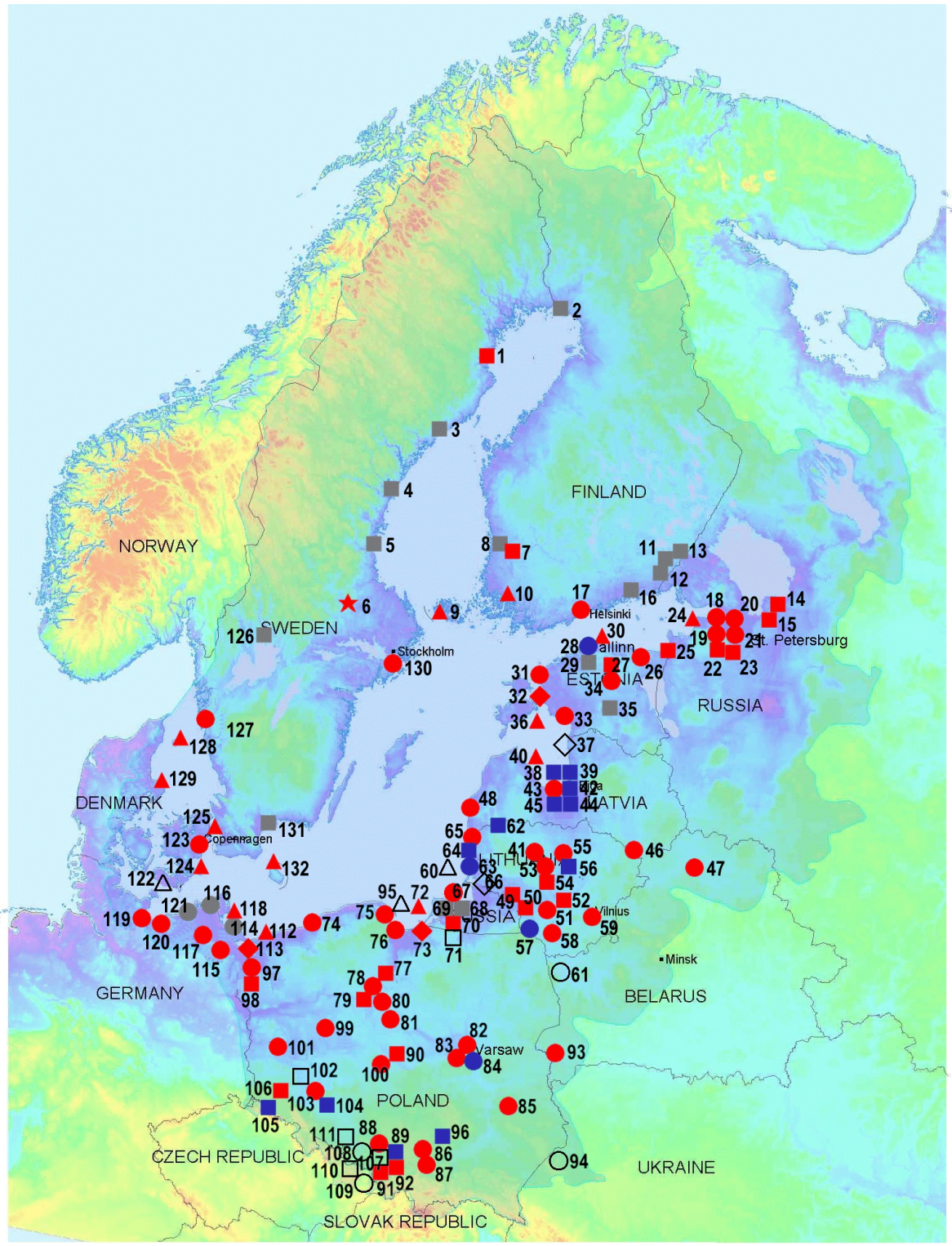
It should be noted that any opinion expressed in the reports does not necessarily reflect the view of HELOCM PITF.

Additional Regional Workshops will follow.

Helsinki, 18 June 2001



Göte Svenson
Chairman of HELCOM PITF
and Chairman of the Regional Workshops in Riga, Vilnius and Tallinn



JCP HOT SPOTS IN THE BALTIC SEA DRAINAGE AREA 1999

Industry	Municipal	Agriculture and Fish Farming	Waste / Coastal Manag.	Lagoon	
■	●	▲	★	◆	Removed
■	●	▲	★	◆	Activity ongoing
■	●	▲	★	◆	No activity
□	○	△	☆	◇	Information not received

SOIL AND WATER
Jaakko Pöyry Group

Thematic Report on the First HELCOM PITF Regional Workshop

Riga, Latvia 24-25 May 2000

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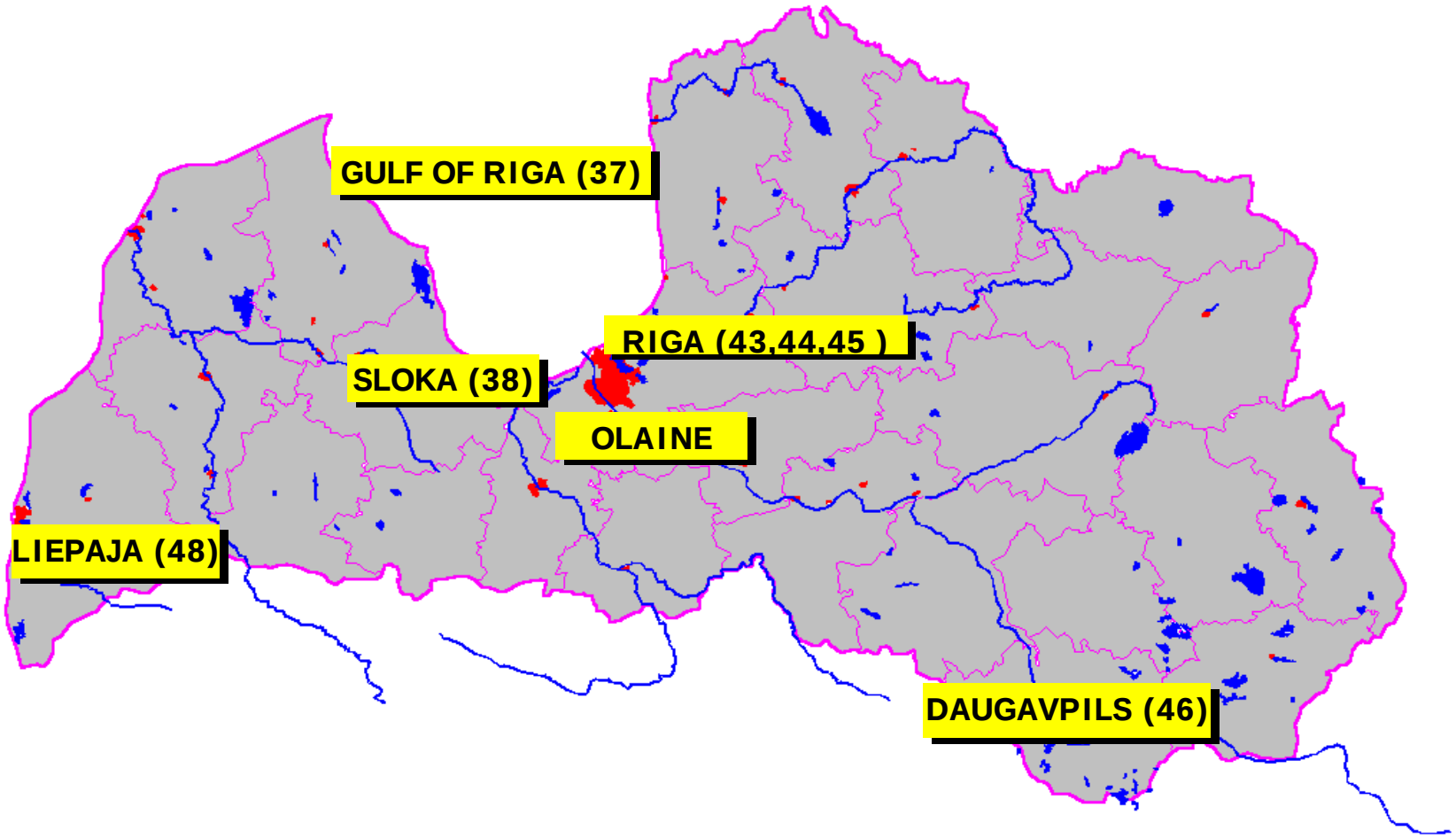


JCP HOT SPOTS IN LATVIA

INTRODUCTION

At the Ronneby Conference in 1990 the prime ministers and high political representatives of the countries surrounding the Baltic Sea initiated the Baltic Sea Joint Comprehensive Environmental Action Programme (JCP). The Programme was devised to restore the Baltic Sea to a sound ecological balance and to support the implementation of the Helsinki Convention, and its strategic approach to setting priorities was approved at the Diplomatic Conference in Helsinki in 1992.

Since then, the progress gained by the JCP has been remarkable. It is reflected partly by the various investments initiated by the JCP and the deletion of 18 Hot Spots from the list of Hot Spots by the year 2000. The updating and strengthening of the JCP in 1996 and 1998 confirmed its soundness, but still limited adjustments to the structure and content should be made. Additional focus on investment activities was among the adjustments demanded, and this demand was emphasized and confirmed as a priority of the Programme Implementation Task Force (PITF) by the Helsinki Commission (HELCOM) in the course of its review process.

There was some uncertainty at to what the narrower focus on investment activities in combination with pro-activity might mean. One fundamental question seems to be whether there still is – in view of later political developments and the outcome of the recent HELCOM review – room for a pro-active role on the part of the PITF in the investment field. There was, and still is, a need to reconsider this question against the background of developments during the implementation of Element 3 of the JCP.

In order to obtain a clearer perspective of the current problems of the PITF and other HELCOM organs and the options available to help alleviate the removal of obstacles to implementation, a series of regional workshops was proposed for representatives from the local, regional and national levels.

The first pilot workshop, which was organized by Latvia in Riga on 24-25 May 2000, can be seen as a test. The results and conclusions were reported to the PITF16/2000, and it was decided to arrange additional workshops. Furthermore, the PITF 16/2000

encouraged Latvia, the Preparatory Group, and the HELCOM Secretariat to prepare a joint thematic report on the assessment of Hot Spots in Latvia.

The assessment of Latvia Hot Spots has been a valuable exercise. The results reflect both the general and specific Latvian approach to the implementation of the JCP. The other PITF member countries should be able to use the results to prepare their own regional workshops, and the results should also be taken into account when the possible reorientation of the HELCOM PITF is considered.

FOREWORD

Almost 40 participants representing the HELCOM Programme Implementation Task Force (PITF), the Preparatory Group, local, regional and national authorities, and Hot Spot "owners" from Latvia took part in the First Regional Workshop of the HELCOM PITF.

Mr. Guntis Pukitis, State Secretary of the Ministry of Environmental Protection and Regional Development of the Republic of Latvia, opened the Workshop. In his opening speech the State Secretary reviewed the history of the PITF and mentioned that the work, carried out in close cooperation with international financing institutions and state authorities of the region, has resulted in significant improvements in the ecological condition of the Baltic Sea. However, it was stressed that the implementation of the main component of the Joint Comprehensive Programme (JCP) – investment in the largest pollution sources "Hot Spots" – has not resulted in impressive figures in terms of the deletion of Hot Spots from the HELCOM list. Therefore, the implementation of recommendations for updating and strengthening the JCP, including also the strengthening of the role of PITF, is very important.

The aim of the workshop was to decide whether there is still room for a pro-active role on the part of the PITF in the investment field since most of the HELCOM contracting parties have become members of the European Union (EU) and others are in the pre-accession stage. It was emphasized that the European Commission has recognized the Baltic Sea catchment area as a special region with high environmental quality standards in the enlarged European Union. The availability of EU pre-accession funds, as well as regional cooperation within the framework of the PITF, will definitely help to maintain this status. Therefore Latvia supports the possibility of additional activities for the HELCOM PITF and calls for a more-active implementation of the JCP.

Investment at Hot Spots (Element 3) is the core of the JCP, and the other five elements are crucial in supporting its long-term strategy and success. Significant changes have been made in the environmental protection sector since the adoption of the JCP and the definition of environmental "Hot Spots" in Latvia in 1992. The National Environmental

Protection Policy Plan and the Environmental Protection Action Programme were adopted. New legislation is constantly being introduced, and the EU approximation process is reinforcing this trend. State monitoring programmes have been adopted in conformity with HELCOM guidelines and also applied to Hot Spots.

It is essential that the assessment of Hot Spots covered by the JCP in Latvia be carried out according to the "Criteria for Inclusion and Deletion of Hot Spots", which were adopted by the PITF 14/99. A clear mechanism for the evaluation of Hot Spots is necessary, not only for the setting of procedures, but also for the deletion of Hot Spots from the HELCOM list. It is more important for the planning of necessary actions and investments with respect to Hot Spots. Clear criteria facilitate the re-evaluation of the state of Hot Spots, support further elaboration of national concepts or action programmes for Hot Spots, induce political initiative, and help to attract local investments.

The procedures used to assess Hot Spots in Latvia and the findings of these assessments are reflected in this thematic report. In spite of environmental improvements as a result of performed activities, several problems were identified during the course of the assessment as well. These problems are discussed in the summary of section 1. Section 2 outlines the action plan for deleting Latvian Hot Spots from the HELCOM list. The main conclusions of the First Regional Workshop are explained in section 3 of this report.

1. ASSESSMENT OF HOT SPOTS IN LATVIA

Organizational Procedures Used for the Assessment

In close cooperation with, and financial support from, the Nordic Investment Bank and several foreign consultants, Hot Spots were identified during the "Pre-Feasibility Study of the Gulf of Riga and the Daugava River Basin" in 1991 and 1992. Unfortunately, the selection process in the countries in transition often significantly depended on political decisions. In addition the selection was influenced by a lack of environmental awareness and precise environmental data. Nine environmental Hot Spots were identified and determined in the territory of Latvia on the basis of findings of the Pre-Feasibility Study. The identified spots were mainly the municipal waste-water treatment plants of the largest cities and certain industrial enterprises. One Hot Spot shared with Estonia – Gulf of Riga Management – was identified as well.

In order to assess the current state of all Hot Spots in Latvia, a research project was carried out within the "Assessment of HELCOM Hot Spots in Latvia" project.

The Ministry of Environmental Protection and Regional Development initiated the study. The State Environmental Consulting and Monitoring Centre acted as the client. The study was carried out by the Country Office of Latvia (REC Latvia) of the Regional Environmental Centre for Central and Eastern Europe. It was financed by the Latvian Environmental Protection Fund and was a research project in which independent experts collected data, visited sites, and interviewed top management representatives of relevant authorities. The study was carried out in two phases in the course of October 1999 – April 2000.

The major task of phase 1 was to reassess the decisions made in the early 1990s. An analysis of all available information and reports from 1991 – 1999 enabled changes to be evaluated and the enforcement of environmental legislation to be acknowledged. Better management practices were determined to be the main driving forces leading to the reduction of emissions, rather than the economic recession and reduced activities at

the Hot Spot. Forecasts of future developments at the spots were an essential aspect of the evaluation.

The following key issues were addressed during phase 1 of the assessment:

- Estimation of current pollution load and the identification of measures undertaken to reduce it since 1992
- Analysis of studies and project reports and investments in Hot Spots, including HELCOM PITF questionnaires (1995 –1999)
- Assessment of whether or not the initial recommendations were initiated according to the pre-feasibility study carried out in 1991–1992
- Review of national programmes and corresponding monitoring programmes in relation to Hot Spots.

The report on the first phase of the research could not be considered as the final version of the report on the environmental state of HELCOM Hot Spots in Latvia, as the main task of phase 1 was the assessment of data availability and permanency and the assessment of possible future developments at Hot Spots.

The findings of the first phase of the project were discussed in an experts' workshop on 22–23 January 1999. General conclusions were drawn about the status of the Hot Spots. These conclusions, together with the report on the assessment itself, were forwarded to the relevant institutions with a request for comments. The report of phase 1 was produced in Latvian (118 pages), and it served as background material for a more extensive analysis of Hot Spots.

After the data gaps and other shortages were corrected, Hot Spot evaluation was carried out during phase 2 of the study according to the criteria put forth by the HELCOM PITF on their deletion from the Hot Spot list (HELCOM PITF 14/99). This phase of the project was carried out on the basis of both the results and findings from the first phase and the comments and suggestions provided by the involved parties.

It is important to note that the PITF "Criteria for the Deletion of Hot Spots" significantly facilitated the step-by-step assessment procedure for Hot Spots.

The objective of the study was to provide up-to-date data on the status of all Hot Spots in Latvia. However, Hot Spot No. 37, the Gulf of Riga Management, was exempted due to the unclear initial definition of this – in point of fact – large ecosystem Hot Spot. Later the PITF 16/2000 supported the proposal of Latvia to (1) carry out an assessment, in consultation with Estonia, of problems at this Hot Spot and (2) propose measures that would lead to its deletion from the HELCOM list. The findings of this joint research work can be found in the joint Latvian/Estonian report to the PITF 17/2000 meeting.

The project "Assessment of HELCOM Hot Spots in Latvia" was given high political priority, and an expert commission was nominated by the Minister to evaluate the results and make decisions on further measures to help eliminate Hot Spots.

Findings

Municipal Hot Spots

There are three priority municipal Hot Spots in Latvia. They are located in the largest cities – Riga, Liepaja and Daugavpils – and were included in the list of Hot Spots mainly because of their high pollution load from insufficiently treated municipal and industrial waste water emitted to the Gulf of Riga and the Baltic Sea. In addition, Liepaja had a highly polluted former military site that emitted major polluting substances such as oil products and heavy metals into its harbour.

To ensure waste-water treatment according to HELCOM standards and to reduce the pollution load to the Baltic Sea, investment projects were initiated in these Hot Spots in the mid-1990s. The investments consisted of loans, grants, and subsidies from state and municipal funds. The investment structures of these projects are reflected in Annex 2 of this report. Important investments have been made to help improve the environmental quality by international financing institutions – the Nordic Environment Finance Corporation (NEFCO), the World Bank (WB), the Nordic Investment Bank (NIB), the European Investment Bank (EIB), and the European Bank for Reconstruction and Development (EBRD), as well as by EU PHARE programmes. Successful implementation of the environmental projects has, to a large extent, been dependent on the responsiveness of and financial support from the bilateral cooperating partners. The closest and financially most important cooperation has been set up with Sweden, Denmark and Finland.

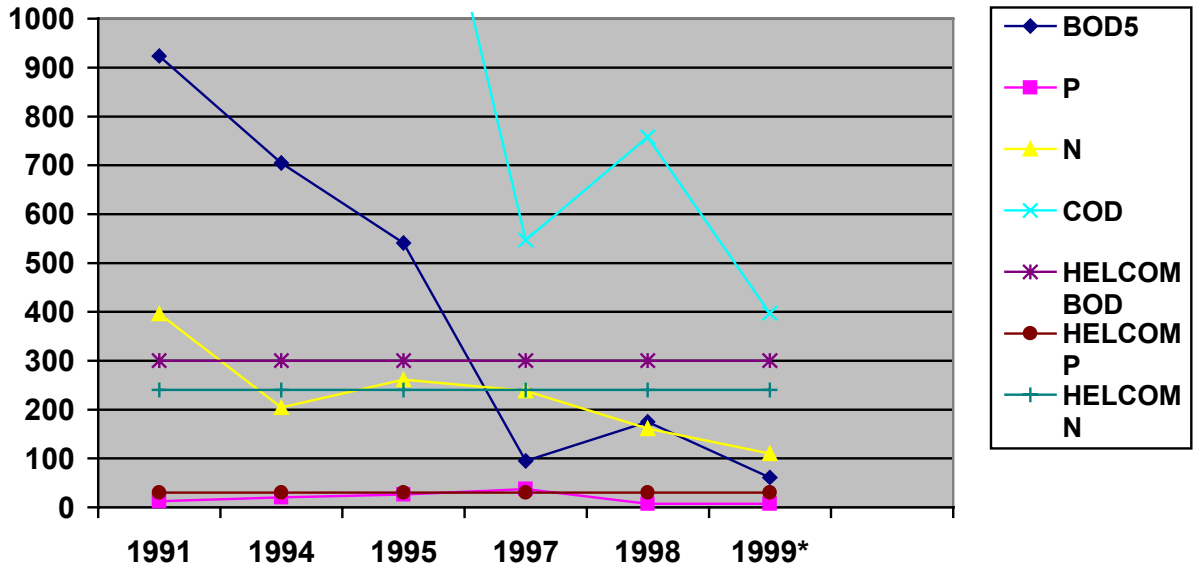


Figure 1. Pollution emitted to the Baltic Sea from the Liepaja WWTP, tons/year (*) – January – October 1999

All of the priority measures initially recommended for improving the ecological situation have been implemented in **Hot Spot No. 48 – Liepaja City and Harbour**. The Liepaja waste-water treatment plant (WWTP) has been completed (reconstructed) according to HELCOM requirements, and the pollution of Liepaja harbour has been investigated. The WWTP was commissioned on 25 May 1998. The evaluation of the improvements in waste-water treatment efficiency was based on a comparison with the parameters of 1991. There had been a 15-fold decrease in the discharge of BOD_5, a 1.5-fold decrease in total phosphorus, a 4-fold decrease in total nitrogen, and a 14-fold decrease in chemical oxygen demand (COD) (Figure 1). Altogether 96.5% of all waste water from Liepaja city is now drained to a WWTP and treated according to HELCOM requirements. Unfortunately, the reconstruction of the water supply and sewage system and the removal of waste-water discharge from the former military site (the Karaosta district), the most polluted area in the city, had not been included in the Liepaja Environment Project. Therefore, about 3.5% of the total waste water of Liepaja is still emitted into the Baltic Sea untreated.

In comparison with the municipal waste-water treatment problem, Liepaja harbour pollution was not given priority. Therefore, after the water system of Liepaja has been improved, the clean-up of pollution in the Liepaja harbour will be the next priority.

In light of the major prerequisites already realized, the expert commission recommended that formal procedures for the deletion of Liepaja from the HELCOM list of Hot Spots be started after the Karaosta project is launched.

Although the **Riga WWTP (No. 42)** was defined as a Hot Spot only because of the WWTP, the "Riga Water and Environment Project" was broadened to provide greater improvement. The renovation and extension of the "Daugavgriva" WWTP is one of the sub-projects of the Riga Water and Environment Project. The Daugavgriva WWTP is the largest waste-water treatment plant in the Baltic region. The phosphorus and nitrogen concentrations of the waste water will be significantly reduced, and the HELCOM requirements will be met once the project has been fully implemented.

At the same time, there were several reasons for suspending the procedures to delete the Hot Spot from the HELCOM list in 2000, since some important project components could not be handled until the official completion of phase 1 in 2001. The Ministry's expert commission is of the opinion that procedures to delete this Hot Spot from the HELCOM list should begin immediately after phase 2 of this project is launched.

Similarly, there are several reasons for suspending the procedures to delete the **Daugavpils WWTP (No.46)** from the list of Hot Spots. After the completion of the short-term project, the problems involving the reduction of pollution will only be partially solved – the project will ensure waste-water treatment for organic matter, including phosphorus removal in the biological treatment plant. A biological WWTP, which will also handle nitrogen removal, will be constructed during the *long-term project* that comprises phase 2 (completion planned by 2010). It is premature to decide on the deletion of the Daugavpils WWTP from the list of HELCOM Hot Spots. The final assessment can be performed only after the completion of phase 2.

Step 2 of the PITF criteria for deletion requires a comparison of the monitoring results with the relevant HELCOM Recommendations. HELCOM Recommendation 9/2,

*"*concerning measures aimed at the reduction of discharge from urban areas by the use of effective methods in waste-water treatment", and Recommendation 16/9, "nitrogen removal at municipal sewage treatment plants", are applicable to municipal Hot Spots. After the evaluation of the municipal Hot Spots in Latvia, it can be concluded that the concentrations of organic matter and nutrients in waste water have significantly decreased during the last few years and progress is being made towards compliance with the HELCOM requirements.

Step 3 of the general procedures for municipal Hot Spot elimination requires that the effects of site clean-ups and monitoring programmes be assessed. Relevant monitoring (hydrochemical and hydrobiological, PLC, internal monitoring, self-monitoring, monitoring of the quality of recreational and bathing waters) is to be initiated according to Latvia's state monitoring programmes.

At the same time, one of the source-specific considerations for the deletion of a Hot Spot from the Hot Spot list is the requirement calling for waste-water sludge management. In spite of improvements, serious problems have occurred with the handling and disposing of municipal sludge in accordance with international requirements at all the municipal Hot Spots. Non-compliance with source-specific considerations and step 3 of the general procedures is one of the main reasons for keeping the aforementioned Hot Spots on the HELCOM list.

Industrial Hot Spots

A pre-feasibility study was carried out in several industrial enterprises, mainly in machine manufacturing, food processing and thermoelectrical power plants, in Latvia in 1991–1992. At the same time, a specific number of plants was not included in the study, and thus a comparative analysis was a problem. Five industrial Hot Spots were defined in Latvia according to the pre-feasibility study. They were four industrial enterprises and industry in Riga as such. Unfortunately, the Latvian economy experienced significant changes soon after the inclusion of industrial Hot Spots in the list. The economic decline was associated with decreasing environmental pressures as a result of less production and consumption. Production-related water and energy consumption fell significantly, along with the emission of local municipal waste, toxic waste and waste water from industries.

In addition, new developments in the field of environmental legislation became increasingly important in the industrial sector, as did such new instruments as a natural resources tax, ecological expertise, environmental impact assessment, and regular reporting on the use of natural resources and pollution. The adoption of legislation concerning pollution and related legal acts will regulate such mechanisms of environmental protection as integrated pollution permits, environmentally acceptable technologies, production safety, and the like.

After the evaluation of industrial Hot Spots in Latvia according to PITF criteria for deletion, it should be concluded that most of the enterprises no longer correspond to the initial definition of a Hot Spot. They are no longer significant polluters of the Baltic Sea, and, in some cases, there are no longer any grounds for considering them to be industrial Hot Spots.

The most important reason for including the **industrial enterprises of Riga (No. 45)** in the list of Hot Spots was the highly polluted waste water from the galvanic industry (about 56 shops). Several other industrial branches (e.g., yeast production with unacceptably high levels of COD in the discharged waste water, high concentrations of metals from the leather industry, etc.) were mentioned as well. The **RER plant – Riga**

Electro machine building plant (No. 44) in Riga – was one of the major electrical engineering enterprises in Latvia, with 5500 employees, in the late 1980s. It produced a vast range of heavy electromechanical products, motors and a variety of consumer products. The plant was included in the list of Hot Spots because of its high concentrations of heavy metals in its waste water. The galvanic shop, which was previously considered the main source of heavy metals at the plant, now operates irregularly. The total discharge of heavy metals has been in line with Latvian standards during the last few years.

The **radio and telephone exchange plant** (**VEF) in Riga (No. 43)**, together with its affiliates, was the largest industrial enterprise in Latvia with 16 000 employees in the late 1980s. There were four galvanic shops, four WWTPs and a boiler house in the territory of the VEF in 1991. A high concentration of heavy metals in industrial waste water was also the reason for it being included in the Hot Spot list for this enterprise.

Changes in the industrial sector of Riga resulted in a considerable reduction in production or a cessation of activities in its largest enterprises with galvanic shops. For example, the VEF plant no longer exists in the same form as in the beginning of the 1990s. It was split into about 20 different facilities or companies. The last of its facilities to perform electroplating with copper was closed on 3 May 2000 (already after the assessment of Hot Spots had been completed).

The galvanic shops still in existence in Riga are associated with WWTPs. According to observations made during the last few years, large problematic enterprises no longer exist. The amount of heavy metals in the sludge of the WWTP has decreased, and all the necessary requirements for the concentrations of heavy metals have been fulfilled. The best indices are those for zinc, which range from about 80% to 90% of the Latvian standard.

Enterprises are regularly presenting statistical reports on water and air pollution, as well as reporting the amounts of hazardous waste, to the Regional Environmental Board. The largest enterprises perform self-monitoring. More attention is paid to technological and management improvements, and therefore they also promote environmental protection.

With respect to the concentrations of heavy metals in galvanic shops, limited by Recommendation 16/6, the requirements of the municipal enterprise Riga's Water are already stricter than those of HELCOM. Therefore, its operating plants should not cause any problems. However, for irregularly operating facilities, it will not be possible to enforce this Recommendation.

The adoption of the Law on Pollution and its related legal acts requiring integrated pollution permits for the largest industrial enterprises will set a time frame for the introduction of the "best-available technologies" in the appropriate industrial sectors.

It should be mentioned that a comprehensive and correct evaluation of step 2 of the PITF Procedures is not possible without a careful selection of the most significant pollution sources from the currently existing industrial plants. According to the assessment, the pollution characteristics have changed since the Pre-Feasibility Study (1991 – 1992). Some branches of food processing and the chemical industry have succeeded galvanics as the most problematic. Most of these enterprises are not yet linked with the Riga WWTP. An audit made of these plants to clarify the status of existing technologies, emissions and the compliance with appropriate HELCOM Recommendations would be advisable once these plants have been connected to the Riga WWTP.

As for the VEF plant, it is evident that it has lost the characteristics of a Hot Spot. The formal procedure to delete it from the list should start in 2000. An objective evaluation of the current situation and future development plans of the RER plant led to the conclusion that also this Hot Spot is no longer as great a polluter of the Baltic Sea as earlier. However, if the possible potential of production and pollution is taken into account, it is probably too early to start procedures to remove the RER plant from the list.

At the same time, the management of collected galvanic waste within plant facilities is problematic (step 3 of the procedures). The solution to this problem is hampered by the long-lasting procedure of privatization and the uncertain future markets of production (RER), as well as by the splitting of a company into several smaller companies (VEF).

Industrial sludge, even in small amounts, is disposed of within the facilities of the enterprises but not in special sites or landfills.

It should be mentioned that precise consideration of the degree to which the enterprises meet PITF criteria is problematic because none of the criteria correspond to the current status of several enterprises.

The pollution from industrial Riga has been reduced. However, until all plants have been linked to the Riga WWTP, the completion of the privatization process, as well as the solution to the hazardous waste problem, it is too early to delete industrial Riga (Hot Spot No. 45) from the list of Hot Spots.

The **Sloka pulp and paper mill (No. 38)**, a state enterprise, is located in Jurmala, 28.5 km from the Lielupe River estuary into the Gulf of Riga. The mill was the only powerful pulp production enterprise in Latvia. Its capacity in the very beginning of the 1990s was 70,000 tonnes of unbleached sulphite pulp annually. In addition, there were 8 paper machines in the mill up until 1988, when three of the eight were shut down. Until the cessation of production in 1994, five machines produced about 20 different kinds of paper.

The main environmental problems in Sloka were related to water and air pollution due to fact that the WWTP launched in 1976 could not meet several of the quality parameters (mainly concerning COD) for treating industrial waste water.

Considerations for the deletion of the Sloka pulp and paper mill from the list could be based on the fact that the plant ceased production five years earlier and is bankrupt. The chemical-pulping equipment has been dismantled, and there are no plans for reintroducing pulp production in this territory. When all of the aforementioned reasons are taken into account, there are no longer any grounds for considering the former plant an industrial Hot Spot. However, the future of the WWTP of the former pulp and paper mill is still unsettled. Since the cessation of production, the WWTP has operated only at reduced capacity, and it mainly treats the municipal waste water of Jurmala. When HELCOM Recommendations concerning municipal waste-water treatment (9/2 and 16/9) are applied to the Sloka WWTP, it is evident that the WWTP does not fulfil the

requirement of Recommendation 9/2 with respect to the annual average of total phosphorus. Industrial waste-water sludge is disposed of in the territory of the WWTP. The territory of the 100-year-old plant could be locally polluted. However, it is unlikely that this pollution would have a significant impact on the ecosystem of the Lielupe River and, furthermore, the Baltic Sea.

The **A/S Olainfarm pharmaceutical plant (No. 39)**, privatized in 1997, is an enterprise in Olaine that produces a wide range of medical products and their packaging. According to the existing standards, production in the late 1980s and early 1990s exceeded the capacity of the WWTP for the treatment of all waste water. Several kinds of biologically active substances were produced, and more than 40 substances were emitted to the air. The industrial waste was disposed of in a special dumping-ground for chemical waste, which, from the mid-1970s on, has significantly polluted the groundwater.

According to the Hot Spot assessment, the plant had reduced its emissions to the air and water considerably since the early 1990s, due to diminished production and changes in production patterns.

Recommendation 20E/6, on requirements for discharging waste water from the chemical industry, is directly applicable to the Olaine pharmaceutical plant. There was an 87% reduction in COD in Olainfarm in 1999, with an annual average concentration of 91.6 mg/l. Requirements for discharging into water bodies with respect to the concentrations of total phosphorus in effluent and total nitrogen have also been fulfilled. When the character of production and the low amounts of heavy metals in sludge are taken into account, and also the results of the analysis carried out by REB, the implementation of the requirements should not cause any problems.

At the same time, it should be taken into account that the WWTP also treats the municipal waste water of Olaine. According to the assessment, the requirements of the Recommendations concerning waste-water treatment at municipal WWTPs (9/2 and 16/9) have not been fulfilled.

The industrial hazardous waste disposal and the historical pollution of the soil and groundwater around the Hot Spot are still unsolved, and they cause harmful effects to the surrounding environment (step 3 of the procedure). Furthermore – the pollution area is expanding. An environmental action plan was set up and accepted for the plant in 1998. However, the plan has only partially been implemented due to the economical situation of the plant.

Olaine is one of the possible sites for setting up a landfill for hazardous waste. The selection of this site would be a real pre-condition for the closing of the already existing waste disposal ground. It is recommended that the Hot Spot status be maintained until all the identified problems have been solved.

Agriculture and livestock farming

During the Pre-Feasibility Study (1991–1992), the estimated nitrogen and phosphorus loads from agriculture to the aquatic environment were estimated to be 45,000 – 60,000 tonnes and 800 tonnes per year, respectively. The nitrogen load on the freshwater ecosystems in Latvia is predominantly (65%–85%) caused by agricultural runoffs. However, the determination process was significantly influenced by a lack of environmental knowledge and precise environmental data. As a result, most of the territory of Latvia, with runoff into the Gulf of Riga basin, was determined a Hot Spot called "Agriculture and livestock farming".

During 1991–1999 agricultural production and the environmental impact of agriculture has decreased significantly in Latvia. Research in small catchments indicates that the pollution from agriculture does not reach the pollution level of the Nordic countries. Nevertheless, it can influence runoff quality in catchments with intensive farming, and there is a trend towards an increase in the nutrient runoff in the central part of the country.

With their current levels of production, most of the farms do not have a negative impact on the environment. However, data on the environmental impact of large animal farms show the highest percentage of total pollution. Large animal farms with a high density

of livestock may be considered agricultural Hot Spots with heavy impact on water quality.

The amount of fertilizers used in Latvia is 3–4 times lower than the amount needed for maintaining sustainable soil fertility. Consequently, during the coming 3–5 years, an increase in agricultural runoff is not expected. If the SAPARD programme is successful, especially regarding manure management on large farms, a reduction of the negative impact of agriculture on the environment could even be possible.

Legislation is needed to limit animal density and manure storage and application, as are measures to protect the water and regulations regarding the environmental impact of farming practices developed in connection with environmental permits for animal farming.

Efforts to educate farmers, as well as control and management measures, should focus on the remaining former large-scale farms and on the new private farmers whose education, knowledge, and managerial and farming skills are not sufficient. The GAP Code was defined and accepted by both the Ministry of Agriculture and the Ministry of Environmental Protection and Regional Development in 1999. Gradually some of the paragraphs of this code will be included in legislation. The establishment of adequate legislation and a state-financed action programme for supporting farmers in the implementation of most of the HELCOM Recommendations in Latvia is necessary.

The establishment of a monitoring network for non-point source pollution similar to that in Nordic countries should be a priority task in Latvia. Four or five monitoring sites, covering different climates, soils, slopes and farming practices, should be established, and the harmonization and introduction of methods that are already widespread in the Nordic countries has to be adopted in Latvia.

The monitoring of point source pollution, regarding large animal farming units, will be continued. The location and impact of large animal farms as agricultural Hot Spots has to be investigated in respect to animal density, manure storage capacity, soils, and the like.

Summary

The most significant positive effects for the quality of the environment in Latvia can be found in the municipal waste-water treatment sector. To fulfil commitments made under the Helsinki Convention, water projects in the three largest cities of Latvia – Riga, Daugavpils and Liepaja – were initiated in the early 1990s. Especially successful was the Liepaja Environment Project. It is one of the first and largest internationally financed projects for environmental protection in the Baltic states. After the full implementation of the Riga Water and Environment Project, as well as the Daugavpils project at a later stage, the HELCOM and EU requirements will be met.

In order to solve water supply and waste-water treatment problems in small Latvian towns, the State programme "Water Supply and Waste-water Treatment in Small and Medium Sized Towns of Latvia", also called "800 plus", was established as part of the National Baltic Sea Protection Programme. The implementation of this programme corresponds to the recommendations for updating and strengthening the JCP (adopted by the HELCOM 19/1998 Ministerial Session), which also call for improved water supplies and waste-water treatment in small and medium size municipalities. Therefore, the improvement of the environmental status of the Gulf of Riga will mainly be due to improvements in water and waste-water sectors.

In spite of environmental improvements in municipal Hot Spots, as a result of introduced activities, several problems were identified during the course of the Hot Spot status study. For municipal Hot Spots the following problem areas were identified:

- waste-water sludge processing
- waste-water sludge deposition
- nitrogen removal (Daugavpils WWTP, task for long-term project)
- connection of the former military site in the Karaosta district in Liepaja to a WWTP.

It should be mentioned also that the first half of the 1990s showed a sharp decline in the economy of Latvia, when numerous, previously problematic branches of heavy industry, machine building and electronics enterprises ceased production or considerably reduced it. Other branches, such as food processing (e.g., Riga yeast and

meat processing plants) and textile industries, have changed technologies or profile, split into smaller units or established new units. In other cases, previously large enterprises have been split into smaller facilities whose activities differ from industrial entrepreneurial production. At the same time, some other significant pollution point sources have been identified.

With respect to the evaluation of industrial Hot Spots according to PITF criteria for deletion from the HELCOM Hot Spot list, it can be concluded that most of these Hot Spots no longer correspond to their initial definition as a Hot Spot. They are no longer significant polluters of the Baltic Sea, and, in some cases, there are no longer any grounds for considering them industrial Hot Spots.

The main reasons for the changes that have occurred in the industrial sector, which finally resulted in improvements in the environment, are the following:

- rapid decline of industrial production in 1991 – 1995 due to the transition from a centrally planned economy to a market economy
- development of environmental legislation
- reconstruction of the Riga WWTP
- introduction of environmental standards and cleaner technologies.

At the same time, problems were identified, especially regarding the implementation of step 3 (site clean-up effects) and source-specific considerations.
The following major problems must still be solved with respect to industrial Hot Spots in the years to come:

- safe disposal of hazardous or chemical waste (all industrial spots)
- disposal of industrial waste-water sludge (Sloka, No. 38)
- historical pollution of soil and groundwater in Olaine (Olainfarm, No. 39)
- connection of all industrial enterprises on the left bank of the Daugava river in Riga to a WWTP (No. 45)
- decision concerning the future of the WWTP in Sloka (WWTP for Jurmala).

The indicated problems will be solved according to the National Hazardous Waste Management Strategy and national programmes.

During the course of the assessment and problem analysis, emerging issues were outlined in the First Regional Workshop, namely, former military facilities (Karaosta district in Liepaja city) and related problems.

2. ACTION PLAN TOWARDS THE DELETION OF HOT SPOTS FROM THE HELCOM HOT SPOT LIST

A special commission appointed by the Minister of Environmental Protection and Regional Development made the decisions for the additional necessary actions towards the elimination of Hot Spots in Latvia. The report "Assessment of HELCOM Hot Spots in Latvia", as well as the results of the First Regional Workshop, were taken into account during the decision-making process. Decisions were made regarding Hot Spots according to both sector and each Hot Spot specifically.

As regards **municipal Hot Spots as a whole**, it was decided that the Ministry of Environmental Protection, when setting priorities for attracting investments, should support projects promoting solutions for the identified problems of Hot Spots. Regional environmental boards were requested to set up a mandatory requirement for the management of waste-water sludge according to the regulations of the Cabinet of Ministers, "On the Use of Waste-water Sludge in Agriculture and Territorial Improvement", which also ensures control and supervision.

For **industrial Hot Spots as a whole**, it was recognized that an interministerial working group should be established to set up a management programme according to environmental requirements for hazardous and chemical waste, as well as unused raw materials and production according to the National Hazardous Waste Management Strategy. It was decided that an additional inventory of historical hazardous wastes should be made when statistical reports on hazardous waste are prepared, firstly, in respect to the deletion of Hot Spots from the HELCOM Hot Spot list or privatization. At the same time, better control of statistical reports is necessary.

The Commission passed a decision to start a formal procedure for the deletion of Hot Spot No. 43, the VEF plant, already in 2000.

Regarding Hot Spot No. 40, **agriculture and livestock farming**, a unanimous decision was passed to leave the spot on the list. The following steps towards its deletion are necessary: (1) the elaboration of an agricultural pollution prevention programme and a corresponding action programme by the interministerial (ministries of environmental protection and agriculture) working group and (2) the development of an agricultural runoff monitoring programme for the Daugava River basin within the framework of the Daugava River Project (Latvia – Sweden). Participation in the GEF Baltic Sea Regional Project and the PITF working group on agriculture is important.

For management of the **large ecosystem Hot Spot, No. 37 (Gulf of Riga Management)**, it was recommended that an interministerial agreement be prepared "on the protection and use of transboundary waters and the Gulf of Riga" between the ministries of environmental protection of Latvia and Estonia and that a research study be carried out on the situation and on environmental trends of the Gulf of Riga, including its coastal zone (according to decision 7.3. of PITF 16/2000). The implementation and development of HELCOM marine monitoring and PLC programmes are of utmost importance.

Concrete actions and a timetable, according to the decisions of the ministerial commission, as well as findings of the assessment and regional workshop, towards the deletion of Hot Spots in Latvia from the HELCOM Hot Spot list are shown in Table 1.

Table 1. Necessary actions needed for the deletion of Hot Spots in Latvia from the HELCOM Hot Spot list

Hot Spot No.	Hot Spot name/type	State	Project presence	Necessary actions	Proposal for deletion
1	2	3	4	5	6
37	Gulf of Riga Management (Latvia/Estonia), management programme	According to the 4th periodic assessment and Latvian – Estonian joint study	State monitoring programmes according to PLC and COMBINE programmes of HELCOM Integrated coastal zone management (ICZM) projects Investment strategy for the coastal zone Development of a GIS database for the coastal zone	1) To carry out a research study on the state and environmental trends of the Gulf of Riga, including its coastal zone, in cooperation with Estonia (dec.7.3, PITF 16/2000) and to assess the need for elaboration of the deletion mechanism for "large ecosystem Hot Spots" 2) To prepare and sign an agreement "on the protection and use of transboundary waters and the Gulf of Riga" between the ministries of the environment of Estonia and Latvia 3) To continue and develop marine environment monitoring and PLC programmes according to HELCOM requirements	According to the results of research
38	Sloka pulp & paper mill, (Jurmala), pulp & paper industry	Production ceased, equipment dismantled, recommencement of pulp production not planned The WWTP - on the basis of a contract – is used by the Jurmala municipality water enterprise	Assessment of options for the future development of the Jurmala city water services and waste-water treatment, including the Sloka WWTP, within the framework of the state "800+" programme	1) To adopt the development plan for water services and a WWTP for Jurmala city within the framework of the state "800+" programme, selecting the most appropriate proposal 2) To carry out an assessment of historical pollution and site remediation – to solve the disposal of industrial waste-water sludge according to existing legislation, defining the responsibility of the enterprise and local authority	To start formal procedures for the deletion after the imple-mentation of actions listed in column 5

39	A/S Olainfarm (Olaine), pharmaceutical industry	Privatized in 1997 Emissions reduced significantly due to changes in production patterns WWTP of the enterprise used for industrial and municipal treatment <u>Problems</u>: hazardous chemical waste disposal and historical pollution of soil and groundwater still unsolved According to EIA, Olaine - one of the possible sites for hazardous waste landfill	Introduction of ISO quality standards	1) To set up a long-term action programme on the improvement of the state of the environment in the enterprise, taking into account the project on the introduction of ISO quality standards 2) To carry out additional monitoring of groundwater contamination and the state of deep drills 3) To develop concrete proposals for the final uitilization of hazardous chemical waste	No pre-conditions for deletion Deletion after identified problems are solved (step 3 of the criteria)
40	Agriculture and livestock farming, agricultural runoff programme for Latvia	Pollution load decreased, but a trend exists towards an increase in nutrient runoff in central Latvia Large animal farms – Hot Spots with heavy impact on water quality	Agricultural runoff monitoring programme for small catchments (international projects and Environmental Protection Fund budget)	1) To establish an interministerial (environmental protection and agriculture) working group to elaborate the programme on agricultural pollution prevention and a corresponding action programme 2) To elaborate a monitoring programme for agricultural runoff for the Daugava River basin 3) To continue participation in the PITF working group on agriculture and the GEF Baltic Sea Regional Project, component 2	No pre-conditions for deletion
42	Riga WWTP (phase 2), municipal	Daugavgriva WWTP commissioned Management of fixed problems started	Riga Water and Environment Project Phase I to be completed by the end of 2000	1) To take actions according to the existing project plan 2) To construct a sludge depository and establish composting fields according to project plans	To start formal procedures for deletion after the launching of phase 2

43	VEF plant (Riga), industry (metals)	All galvanic shops of the VEF have been dismantled The Hot Spot no longer corresponds to the initial definition of a Hot Spot and can no longer be considered a polluter of the Baltic Sea			To start the formal procedures for deletion in 2000
44	RER plant (Riga), industry (metals)	Possible to fulfil HELCOM requirements for the heavy metal content of waste water at the *existing* low production capacity In case of successful privatization of the plant, an increase in production and pollution possible	No	1) To provide safe disposal of hazardous waste in an appropriate landfill 2) To provide for the disposal of industrial sludge in a special site	After identified problems are solved and depending on the results of privatization
45	Various industrial plants (Riga), industry	Hot Spot does not correspond to its initial definition and can no longer be considered a significant pollution source of the Gulf of Riga Significance as a Hot Spot decreased due to changes in the industrial sector, the completion of the Riga WWTP and developments in environmental legislation Some of the most significant industrial pollution sources are not yet linked to the Riga WWTP	Introduction of cleaner technologies and quality systems, ISO 9000, ISO 14000, etc.	1) To carry out an inventory of hazardous waste and increased control 2) To evaluate the compliance of the information on waste water flow and technologies for the deletion of the Hot Spot from the Hot Spot list	To start formal procedures after tasks in column 5 have been completed

46	Daugavpils WWTP, municipal	Biological treatment plant (phosphorus removal) to be commissioned in mid-June 2000	Daugavpils Water and Sewerage System Project (1996 – 2001) Phase 2, planned 2000 – 2010	1) To establish safe sludge disposal fields according to environmental requirements 2) To start a long-term project on the extension of a biological treatment plant with nitrogen removal (completion by 2010)	After completion of long-term project
48	Liepaja city and harbour, municipal (waste-water treatment), oil combating	Reconstructed WWTP (according to HELCOM requirements) in 1998 Karaosta district (territory of harbour – former military site) not linked to the WWTP (3.5% of untreated waste water enters the Baltic Sea)	-	1) To connect the Karaosta district (former military site) to a WWTP 2) To develop a programme for assessing the pollution level in the Karaosta district and the safe deposition of polluted soil	To decide on deletion from HELCOM Hot Spot list after the activities listed in column 5 are initiated

3. CONCLUSIONS

In light of recent developments, HELCOM has advised the PITF to reconsider its focus of activities and has established a "Preparatory Group" to highlight issues relevant for consideration.

The Preparatory Group has – as its first step – proposed a series of regional workshops with representatives from local, regional and national levels.

At the invitation of Latvia the first pilot workshop was held in Riga on 24-25 May 2000, and it offered an opportunity for the actors dealing with Hot Spots to meet with representatives from local, regional and national authorities.

The international financial institutions expressed their interest in being involved in the PITF, mainly due to the focus of PITF on investment activities, but also in connection with the exchange of ideas on the following topics:

- status of the environment of the Baltic Sea and the surrounding region
- progress achieved to date
- ways to improve the environment
- best-practice cases in formulating and implementing the specific projects.

The workshop noted that the accomplishments in Latvia within the framework of the JCP have been very satisfactory. (See sections 2 and 3 of this report concerning the summary of the assessment and action plans for the deletion of Hot Spots from the HELCOM list). The absence of decisions to delete Hot Spots from the list does not properly reflect the progress made in Latvia. Nevertheless, several environmental problems still need attention.

The workshop strongly recommended an adjustment of the original Hot Spot definitions to meet current conditions, particularly taking into account the complexity of large marine ecosystems.

The instrumental role of legislative and institutional developments in the successful implementation of JCP Element 3 was emphasized. Latvia's Law on Natural Resources Tax includes economic incentives and sanctions and also safeguards the funding of local environmental management.

The special problems of agriculture as a main polluter of the Baltic Sea call for stronger attention.

The workshop, while underlining the importance of continued government coordination and the engagement in investment activities, expressed the view that increasing involvement of the private sector in JCP implementation is desirable, as is the delegation of responsibility to municipalities.

As a means of strengthening coordination between PITF activities and bilateral cooperation in the environmental field of the Baltic Sea, it would be desirable to invite the PITF to Baltic donor meetings.

The findings of the workshop confirmed the soundness of the basic approach of the JCP. These findings should serve as a reminder against undertaking changes that are too drastic with respect to the methods used by the PITF.

The workshop supported the continuation of the PITF as the coordinating body for the implementation of the JCP and recommended that a series of workshops be held, as proposed by the Preparatory Group, thus keeping in mind the importance of involving regional authorities, in particular in agriculture and industry, with the view of strengthening an integrated approach.

In summary of the results of the Riga workshop, it should be recognized that the thorough assessment of the environmental situation in Latvia enabled the country to define the actions still necessary and set up a timetable aimed at the deletion of its Hot Spots from the HELCOM Hot Spot list. In parallel the findings encourage the PITF to continue its work and to help define its new role, which is targeted towards a stronger focus on investment activities.

Main environmental legislation related to Latvian Hot Spots

- **Law on Environmental Protection (6 August 1991, amended in 1997, 2000)** An "umbrella" law on environmental protection.

- **Environmental Protection Policy Plan (EPPP) for Latvia (1995)** The EPPP adheres to principles of global environmental policy and forms the basis for the additional development of environmental protection policy in Latvia.

- **Environmental Protection Action Programme (EPAP) (1997)** The EPAP is an action programme supplementing the EPPP; it takes into account respective measures for every priority indicated in the EPPP in order to achieve the set aims.

- **Law on Environmental Impact Assessment (EIA) (31 August 1998)** The objective of this law is to evaluate the level of potential environmental hazards posed by economic or other activity. The law includes a screening procedure based on a list of activities for which an EIA is mandatory; this list corresponds with the EU EIA directive.

- **Law on Pollution (to be adopted in 2001)** The objective of this law is to set measures for eliminating pollution and limiting and preventing hazards to the environment and human health. The integrated pollution prevention system will be introduced according to an IPPC directive.

- **Law on Chemical Substances and Chemical Products (1 January 1998)** The objective of the law is to prevent and eliminate possible hazards to the environment, human health and property as a result of exposure to chemical substances or chemical products due to their inherent properties. The law, together with supporting regulations, sets provisions for handling chemicals and chemical products and these provisions define competent supervision and control functions.

- **Law on Hazardous Waste (30 March 1993)** This law applies to all activities that generate, collect, sort, process, transport, store or dispose of hazardous waste. It defines hazardous waste classification in categories. Supporting regulations give more-detailed provisions on the reporting and division of waste, as well as the control of dangerous waste.

- **Law on Waste Management** An "umbrella" law; to be adopted in 2001.

- **Law on Natural Resources Tax (14 September 1995, amended in 1996)** This is the main law on economic instruments for the environment. It aims to limit mismanagement in the use of natural resources and environmental pollution by limiting the production and sale of products harmful to the environment, supporting sustainable development strategy in national economy, and creating a financial basis with which to fund environmental protection activities. The instruments used in the law can be divided into the following three types: the tax system as such, the related licensing market and the tax relief system.

- **Regulations of the Cabinet of Ministers on Water Use Permits (22 April 1997)** The regulations specify detailed requirements concerning the information that has to be included in permit applications. They also define emission standards as "maximum permissible concentrations for waste water". They determine type of use, quantity, precautions, limits and other restrictions. In association with the regulations, certain new "water quality objectives" were adopted, in accordance with HELCOM Recommendations and EU directives on water quality.

- **Regulations of the Cabinet of Ministers on Air Quality (15 June 99)**

- **Regulations of the Cabinet of Ministers on the Use of Sewage Sludge in Soil Fertilizing and Territorial Improvement (9 September 1997)** The regulations include requirements on anthropogenic loads and methods for determining and controlling these loads in order to avoid a direct or indirect negative cumulative impact on the environment, living organisms, soil, waters and plants. Sludge is divided into four groups, and different restrictions apply, for example, as regards the

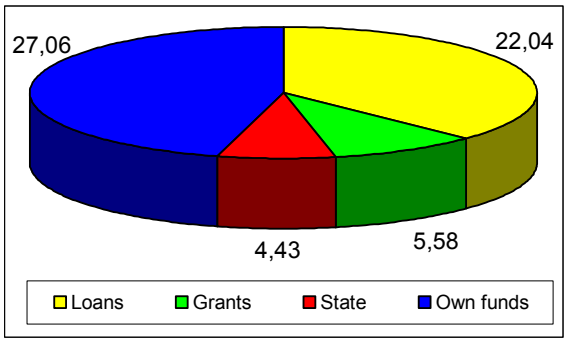
content of heavy metals. The regulations set the procedure for the use of sludge and control.

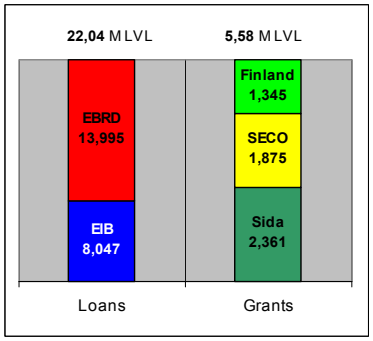
- **Regulations of the Cabinet of Ministers on the State Environmental Monitoring (16 December 1997)** The regulations set the structure, financial sources, coordination of state environmental monitoring, and public access to information. The conception on the State Monitoring System of Latvia was adopted by the Cabinet of Ministers in February of 1997.

ENVIRONMENTAL INVESTMENT POLICY IN LATVIA

Riga Water and Environment Project

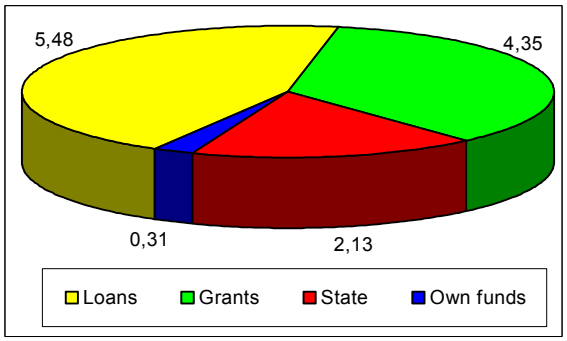
(59,11 M LVL)

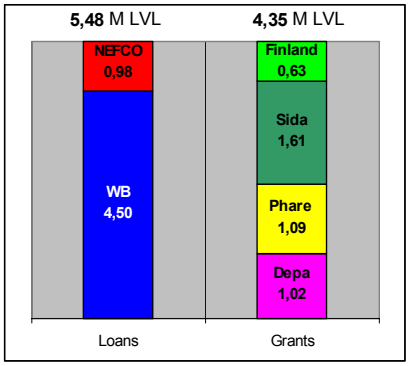




Daugavpils Water and Waste-water Project

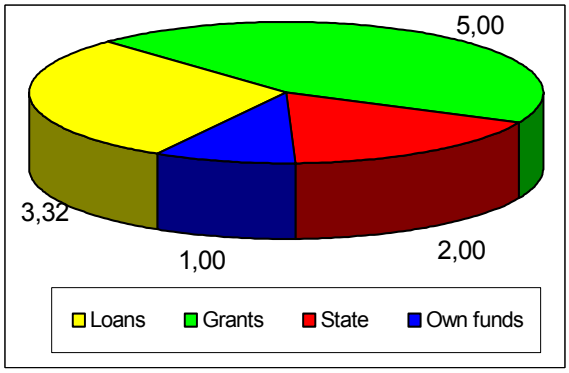
(12,87 M LVL)

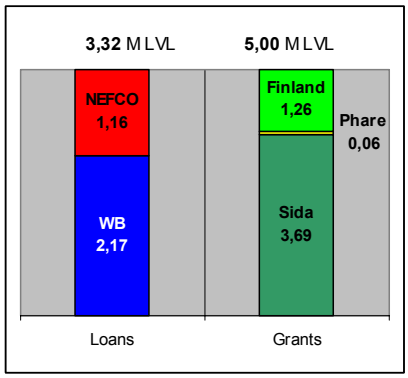




Liepaja Environment Project

(11,32 M LVL)





Thematic Report on the Second HELCOM PITF Regional Workshop

Vilnius, Lithuania 26-27 October 2000

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INTRODUCTION

The 'Baltic Sea Joint Comprehensive Environmental Action Programme' (JCP) was launched in 1992 by the Ministers of all the countries in the Baltic Sea catchment area. This programme focuses on the decisive reduction of pollution, in order to restore the Baltic Sea to a sound ecological balance. It contains proposals for action to abate and reduce pollution from both point sources and diffuse sources. In the first instance, one hundred and thirty two 'Hot Spots' were identified, including both sites and sources of significant pollution. Sixteen of these Hot Spots were located in Lithuania.

The actions proposed by JCP include large-scale investments for the following purposes:

- The construction or upgrading of municipal and industrial waste-water treatment plants.
- The implementation of new industrial technologies.
- Improvements to the management of agriculture.
- Improvements to the management of coastal zones.

As one of the partners in the implementation of the 1992 'Baltic Sea Joint Comprehensive Environmental Action Programme', Lithuania took on the organisation of the Second HELCOM PITF Regional Workshop in co-operation with the HELCOM Secretariat and members of the Preparatory Group. This Workshop was held in Vilnius on 26 and 27 October 2000, hosted by the Ministry of Environment of Lithuania. During the Workshop, a comprehensive analysis was made of all sixteen Lithuanian Hot Spots. Participants included representatives from the Ministry of the Environment and from local government and industrial management in the cities and municipalities concerned, guests from Estonia, Finland, Latvia and Russia, representatives of the HELCOM Secretariat and members of the HELCOM Programme Implementation Task Force (HELCOM PITF). Local experts presented reports on measures, which had already been carried out, and those which were planned or in process of preparation. It was clearly demonstrated that, with the assistance of international financial institutions and bilateral donors, Lithuania had made considerable progress in implementing the Action Programme.

The welcome speech in the Workshop was made by Mr. Danius Lygis, the Minister for the Environment. Mr. Göte Svenson, Chairman of HELCOM PITF, was elected Chairman of the Workshop. The two keynote speakers were Mr. Arturas Daubaras, the Lithuanian Vice-Minister for the Environment, and Mr. Tord Holmström, representative of the Nordic Investment Bank. An account of investment activities and problems was delivered by Mr. Holmström, and an overview of the results of the assessment of Lithuanian Hot Spots was presented by Mr. Daubaras. This assessment, which was carried out according to the criteria for inclusion and deletion of Hot Spots adopted by HELCOM PITF, will facilitate the further elaboration and fuller development of programmes and actions within Lithuania with the aim of increasing the overall effectiveness of the 'Baltic Sea Joint Comprehensive Environmental Action Programme' (JCP) in all aspects of the implementation of its recommendations.

Assessment of Hot Spots in Lithuania

There are eight Lithuanian municipal/industrial, one municipal, and five industrial Hot Spots included in the JCP. One additional Hot Spot was designated under the category of 'Agriculture/Livestock'. Together with the Russian Federation, the Curonian (Kuršių) Lagoon Management has been included in the list of JCP Hot Spots because of the difficult ecological situation pertaining to the Lagoon's ecosystem. The results of the comprehensive analysis of Hot Spots made during the Workshop are presented below.

1. Municipal Hot Spots

Hot Spot No. 41 - The Šiauliai WWTP
Municipal and Industrial

With its 160,000 inhabitants, Šiauliai is the fourth largest city in Lithuania. Šiauliai has not only been categorised as a Hot Spot in itself but has also contributed to transboundary pollution, since the treated waste water which it discharges into the River Kulpe flows into the territory of Latvia.

The Šiauliai secondary Waste-Water Treatment Plant (WWTP) was constructed in 1967. This was one of the first secondary waste-water treatment plants to be built on this scale in Lithuania. Hence, it is not surprising that by 1993 the Šiauliai WWTP was no longer functioning adequately.

The changes in the amounts of treated waste-water and pollutant discharges since 1993 can be seen in the following graphs:

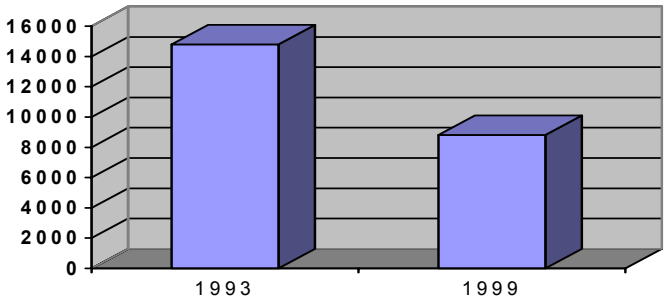

Figure 1. Amounts of waste water discharged, in 1000s of cubic metres per annum

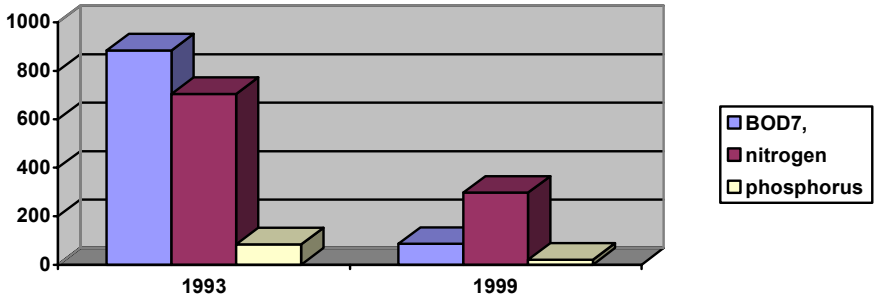

Figure 2. Amounts of BOD_7, nitrogen and phosphorus discharged

The amounts of pollutants discharged have decreased considerably. Nevertheless, the concentrations of nitrogen and phosphorus in effluent water are still above both national and international standards.

As these charts clarify, the Šiauliai WWTP needs to be renovated. Thus, it was decided that a new WWTP should be built. Implementation of the Šiauliai Environment Project, which was started in 1996, is one of the key components in the HELCOM Joint Environmental Programme. The financial resources for this project are presented in the following chart:

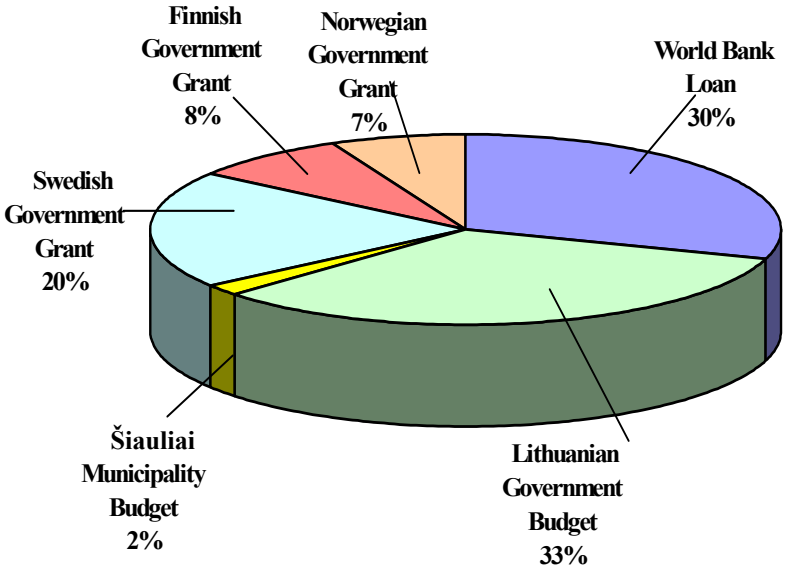

Figure 3. Financial sources for the Šiauliai Environment Project

The Šiauliai Environment Project includes both water and waste water. Within the scope of these two components, six separate projects needed to be set up. Since the inception of the Šiauliai Environment Project in 1996, three projects have already been implemented.

The deletion procedure for the Šiauliai Hot Spot (No. 41) will be started in 2004, following the full completion of the waste-water component in the Šiauliai Environment Project.

Hot Spot No. 51 - The Kaunas WWTP
Municipal & Industrial

Kaunas, the second largest city of Lithuania, is situated at the confluence of the two largest Lithuanian rivers, the Nemunas and the Neris. Until the end of 1999, all household waste water from Kaunas was discharged into the receiving waters without any treatment at all. According to the assessment provided by the Lithuanian authorities, Kaunas was discharging 90% of all the untreated waste water of Lithuania into these rivers.

The Kaunas Water Company carries out its activities of water and waste-water management within the city of Kaunas, which has a population of 415,000. About 90% of the city's inhabitants are connected to the drinking water network and around 86% to sewerage. The Kaunas Water Company has a Service and Supply Agreement with Kaunas Municipality. The Municipality of Kaunas is also the sole owner of the Company.

The changes in the amounts of treated waste-water and pollutant discharges can be seen in the following graphs:

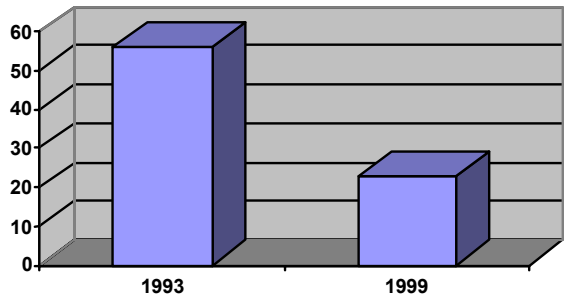

Figure 4. Amounts of waste water discharged, in 1000s of cubic metres per annum

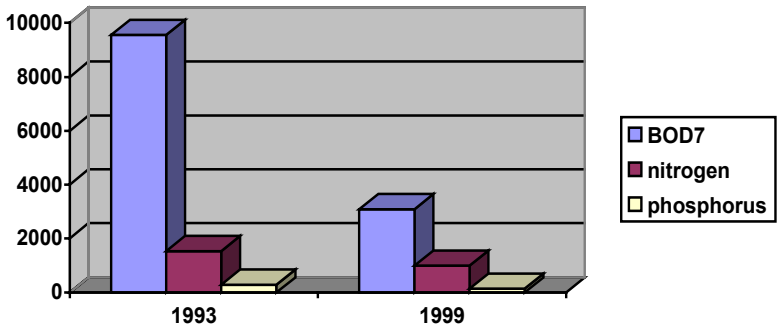

Figure 5. Amounts of BOD_7, nitrogen and phosphorus discharged

The decrease in the pollution load to the River Nemunas shown in the above graph has been achieved thanks to the building of a WWTP. At the moment, although the waste water receives only primary treatment in the Kaunas WWTP, this is a significant achievement in terms of environmental quality.

In 1995, in collaboration with consultants and international financiers, the Kaunas Water Company developed a four-year priority investment programme for the improvement of its technology. The title of this programme is 'The Kaunas Water and Environment Project'. It has a budget of 80 million USD and is currently at the final stage of implementation. The construction of a waste-water treatment plant has been the largest consituent part of this project.

The preparatory works for the construction of this WWTP were started in 1991. The official starting date for construction was April 22, 1992.

The plant was built as a separate construction, and until the year 1995 was financed out of the Lithuanian national budget, with subsidies from the Swedish Government. Even though the funding from these sources has since proved to be insufficient, without it the eventual completion of the construction of the WWTP and the installation of its works would not have been possible at all.

The starting date for the Treatment Plant was September 16, 1999.

The efficiency of treatment has been improved as follows:

- BOD7 has been reduced by 60%.
- Suspended solids have been reduced by 80%.
- Phosphorus has been reduced by75%.

During the year 2000, all waste water was directed for treatment to the new WWTP, with the result that the environmental situation improved dramatically.

The Project was presented to the Committee established at the Ministry of Environment of Lithuania and was approved by this Committee as one of the projects to be financed by ISPA 2001 grants. The preliminary budget is about 25 million USD, which also covers the extension of the network.

Thus, according to the current action plan, the procedure leading to the deletion of Hot Spot No. 51 will start to be implemented in 2005.

Hot Spot No. 53 - The Kėdainiai WWTP
Municipal and Industrial

Kėdainiai is a town of 36,000 inhabitants in the middle of Lithuania. The Kėdainiai WWTP discharges its waste water into the River Nevėžis, which flows into the River Nemunas. In former times, Kėdainiai used to be a highly industrial city. For this reason, the Kėdainiai WWTP was designed for a large volume of water (32,000 cubic metres daily). The city currently produces 8,000 – 9,000 cubic metres daily. In this situation, the WWTP works ineffectively. Its problems are illustrated by the following chart:

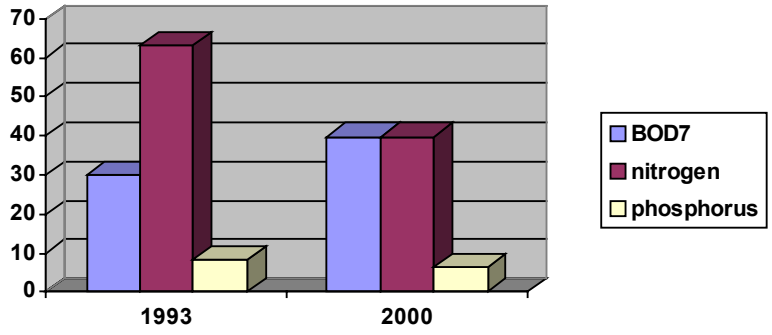

Figure 6. Amounts of $BOD_{7,}$ nitrogen and phosphorus discharged

As can be seen from this graph, despite decrease in nitrogen and phosphorus disharges, hardly any significant positive changes are apparent in the overall quality of operation of the Kėdainiai WWTP. Thus it is clear that either the plant needs to be reconstructed or an entirely new plant needs to be built. In 1996, a feasibility study was made, which included proposals for reconstruction. Unfortunately, to date the Kėdainiai municipality has not succeeded in its attempts to requisition the necessary financial resources to solve these problems**.**

Thus, the Kėdainiai Hot Spot (No. 53) is unlikely to be deleted before 2006.

Hot Spot No. 55 - The Panevėžys WWTP
Municipal & Industrial

With 140,000 inhabitants, Panevėžys is the fifth largest city in Lithuania. Its treated waste water is discharged to the River Nevėžis.

The Panevėžys Waste-water Treatment Plant was built in 1978, and was designed with a hydraulic capacity of up to 56,000 cubic metres daily. Following the extension of the Waste-water Treatment Plant in 1988, its hydraulic capacity increased to a maximum of 70,000 cubic metres daily.

The changes in the amounts of treated waste-water and pollutant discharges may be seen in the following graphs:

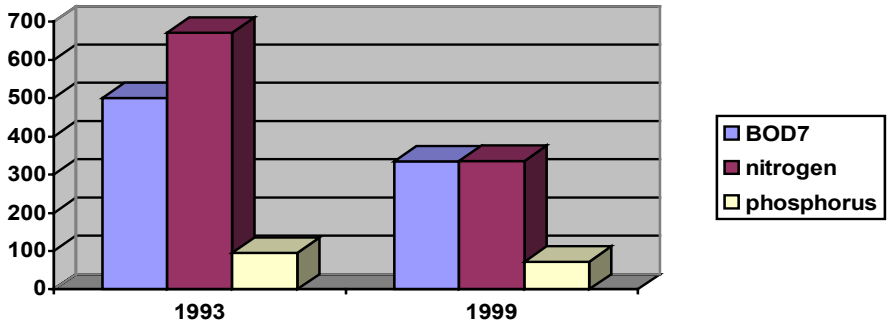

Figure 7. Amounts of waste water discharged, in 1000s of cubic metres per annum

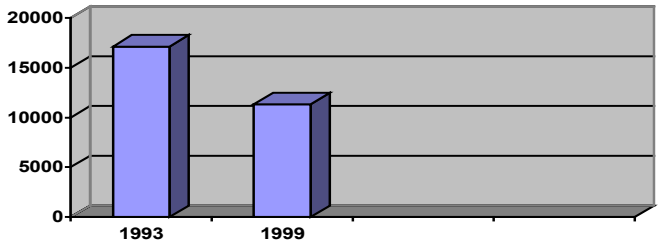

Figure 8. Amounts of BOD_7, nitrogen and phosphorus discharged, in tons per annum

The amounts of pollutants discharged have decreased considerably. Nevertheless, the concentrations of pollutants in the effluent water are still above both national and international standards. To address the problems of waste-water treatment, a project for the reconstruction of the Panevėžys WWTP is being carried out.

The financial resources for this project are presented in Table 1:

Table 1. Financial sources for Panevėžys WWTP reconstruction project

Financial resources in thousands of LITAS ***(in thousands of EUROS)***	**Until 2000**	**2000**	**2001**	**2002**	**2003**	**2004**	**Total**
Loan (from EIB)			**2,000** ***(505)***	**11,800** ***(3,000)***	**8,000** ***(2,025)***	**1,855** ***(470)***	**23,655** ***(6,000)***
Lithuanian funds	**25**	**1,000**		**3200**	**9200**	**2985**	**16,410**
PHARE		**2,000** ***(505)***	**9,600** ***(2,434)***				**11,600** ***(2,939)***
Own funds	**1,935**						**1,935**
Total	**1,960**	**3,000**	**11,600**	**15,000**	**17,200**	**4,840**	**53,600**

This first stage of the Panevėžys WWTP reconstruction project will not solve all the problems. The second stage has already been planned. Nevertheless, after the first stage of the project, which will be completed in 2004, the effluent water from Panevėžys WWTP will meet both national and international water quality standards.

It is therefore planned to delete Hot Spot No. 55 by the end of 2004.

Hot Spot No. 57 - The Marijampolė WWTP
Municipal and Industrial

Marijampolė is a town in a southern part of Lithuania with a population of 52,000. The waste water from Marijampolė is discharged into the River Šešupė, a tributary of the River Nemunas.

The first WWTP in Marijampolė was built in 1973. By 1975, secondary waste-water treatment was already in place.

The Marijampolė WWTP was renovated in 1991 but still has not become particularly effective. The amounts and concentrations of pollutants in its effluent water have stayed at the same level and even increased.

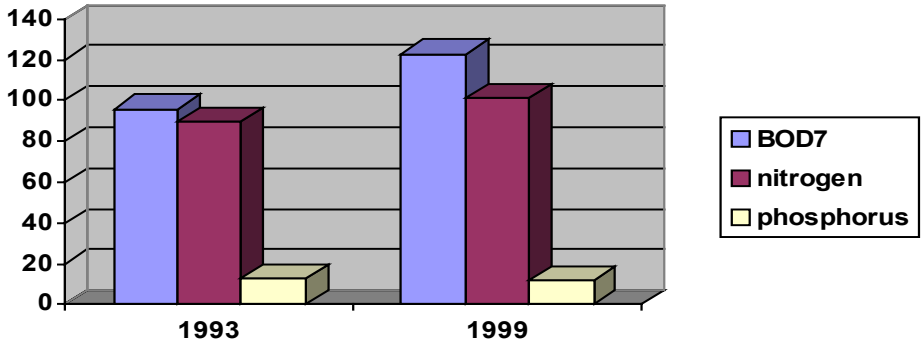

Figure 9. Amounts of BOD_7, nitrogen and phosphorus discharged, in tons per annum

The last stage in the reconstruction of the Marijampolė WWTP, which started in 1998, should be completed by 2001-2002. Following reconstruction, the waste water will undergo tertiary treatment.

It is therefore proposed that the Marijampolė Hot Spot (No. 57) will be deleted from the list by 2003-2004.

Hot Spot No. 58 - The Alytus WWTP
Municipal and Industrial

Alytus is the sixth largest city in Lithuania, with 78,000 inhabitants. Its treated waste water is discharged into the River Nemunas. Before 1989-1991, the Alytus WWTP had a treatment capacity of only 35,000 cubic metres for primary treatment and 25,000 cubic metres for secondary treatment, and by the end of this period it no longer proved capable of treating the total volume of its waste water effectively. The BOD_7 of its effluent water reached 60-70 milligrams per litre. Thus, preparations for its reconstruction were started in 1989, and the reconstruction programme itself was set in motion in 1991. The original project consisted of two parts:

- extension of its secondary treatment capacity to 40,000 cubic metres.
- extension of its secondary treatment capacity to the 90,000 cubic metres.

When Lithuania joined the Helsinki Convention in 1992, the amounts of waste water began to decrease. As a result, a new reconstruction project which included the removal of nitrogen and phosphorus was implemented and developed. The new WWTP was completed in 1999, with the help of the Danish Government.

The changes in the amounts of treated waste-water and pollutant discharges may be observed from the following graphs:

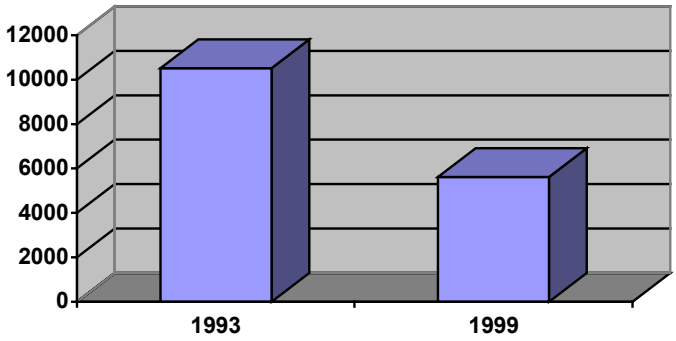

Figure 10. Amounts of waste water discharged, in 1000s of cubic metres per annum

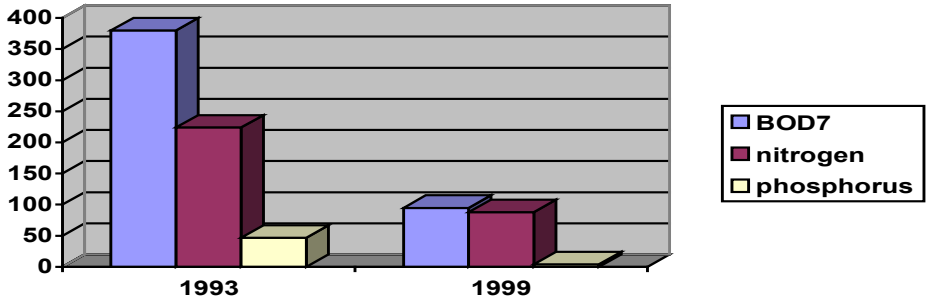

Figure 11. Amounts of BOD_7, nitrogen and phosphorus discharged, in tons per annum

The quality of treated waste water currently meets national and HELCOM standards.

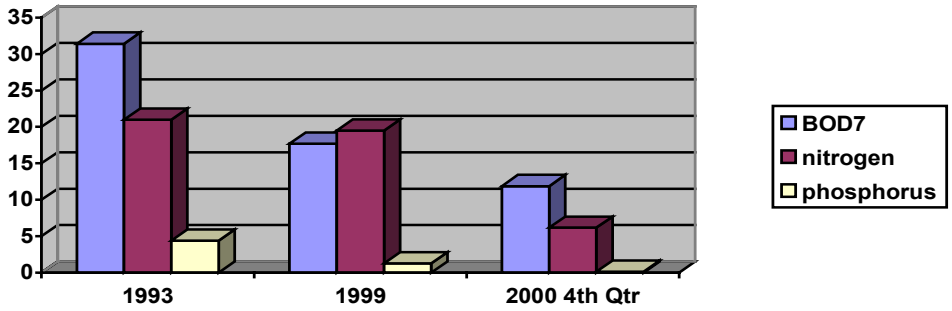

Figure 12. Concentration of BOD_7, nitrogen and phosphorus in effluent water , in milligrams per litre

It is therefore proposed that the deletion procedure of Hot Spot No. 58 from the list will be started in 2001-2002.

Hot Spot No. 59 - The Vilnius WWTP Municipal & Industrial

With a population of 580,000, Vilnius is the capital of Lithuania and its largest city. It covers an area of 290 square kilometres.

The first designs for the Vilnius WWTP were made in 1965. The construction of the waste-water treatment plant with a primary water treatment process took eleven years to complete, between 1975 and 1986.

In 1992, waste water in Vilnius was still receiving no more than primary treatment and thus Vilnius was clearly a Hot Spot.

Since 1997, however, all waste water has also undergone secondary treatment. The treated waste water is now discharged into the Neris, the second largest Lithuanian river, which flows into the Nemunas and thence into the Baltic Sea.

The changes in the amounts of treated waste water can be seen in the following graphs:

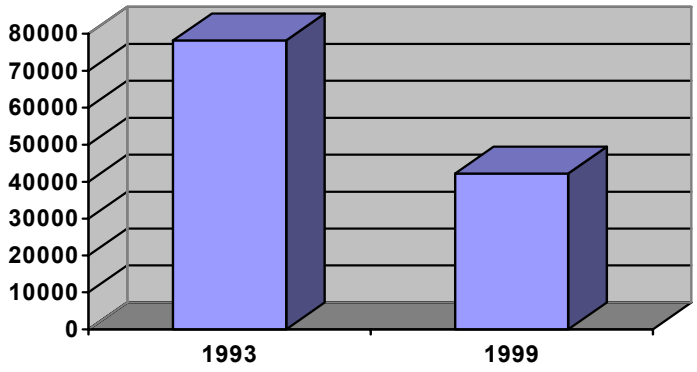

Figure 13. Amounts of waste water discharged, in 1000s of cubic metres per annum

The decrease in the amount of waste water and the modernisation of the Vilnius WWTP have had especially encouraging and positive results on the environment.

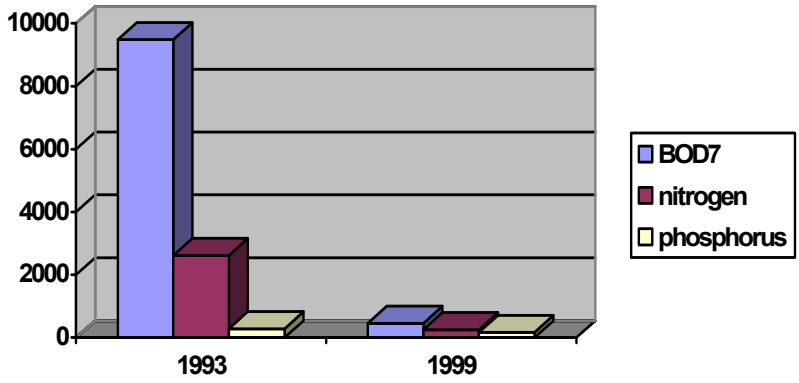

Figure 14. Amounts of BOD_7, nitrogen and phosphorus discharged, in tons per annum

As this graph shows, there have been huge decreases in the amounts of pollutants discharged. These have been achieved thanks to the introduction of secondary waste-water treatment. The concentration of phosphorus is still about 3.9 milligrams per litre. The most recent stage in the modernisation of the Vilnius WWTP commenced in 1999, and the tertiary treatment of waste water will be started in 2002-2003. It is expected that following this modernisation, the concentrations of pollutants in the effluent water will be as follows:

- BOD_7 – 15 mg/l. This target has already been achieved.
- Nitrogen – 12 mg/l. This target has already been achieved.
- Phosphorus - 1.5 mg/l. The level in 1999 was 3.5 milligrams per litre.

It is therefore planned that the deletion procedure for Hot Spot No. 56 will commence in 2002-2003.

Hot Spot No. 63 - The Klaipėda WWTP
Municipal and Industrial

Klaipėda is the third largest city in Lithuania and the only Lithuanian port. Located on the coast of the eutrophicated Curonian lagoon, Klaipėda was directly responsible for marked detrimental effects on the marine environment.

As a city with a population of 210,000, Klaipėda used to discharge a considerable amount of polluted water into the lagoon. However, the collapse of industry has had a positive influence on the environment. The emission of polluted water has decreased considerably:

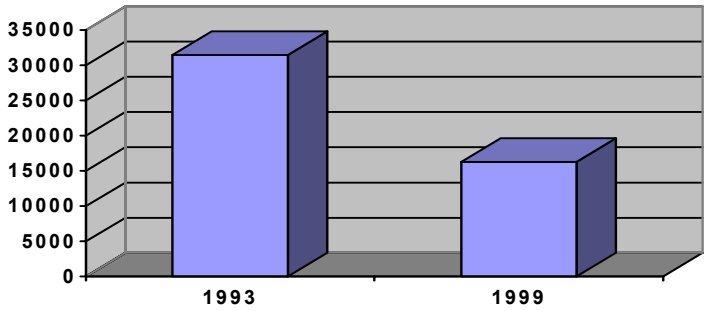

Figure 15. Amounts of waste water discharged, in 1000s of cubic metres per annum

In 1998-1999, Klaipėda introduced the secondary and tertiary treatment of waste water. The total investments in the new WWTP amounted to 18 million USD. Together with the decrease in the volume of waste water, the programmes funded by these investments have resulted in an impressive reduction in the pollution load.

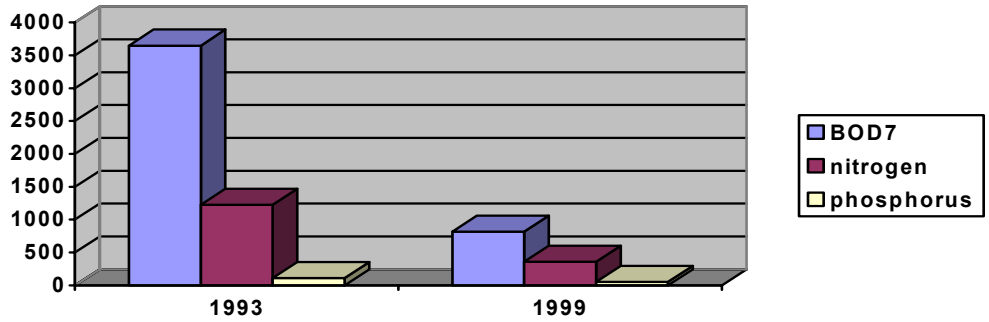

Figure 16. Amounts of BOD_7, nitrogen and phosphorus discharged

Owing to certain adjustments needed for the normal functioning of the WWTP, the concentration of several pollutants still exceeds both national and international water

quality standards. The actions required for these adjustments will be completed by summer 2001.

It is therefore planned to delete Hot Spot No. 63 in 2001-2002.

Hot Spot No. 65 - The Palanga WWTP
Municipal

Palanga is a major resort on the Lithuanian Baltic coast. For this reason, the number of inhabitants fluctuates between 20,000 in the wintertime and 100,000 during the summer. The treated waste water from the Palanga WWTP is discharged directly into the Baltic Sea. Both of these factors have been major causes of concern for Lithuanian environmentalists.

The Palanga WWTP for primary waste-water treatment was designed in 1987, with a capacity of 32,000 cubic metres per annum. It took six years to complete construction of the works, between 1987 and 1993. Between 1993 and 1999, the waste water in Palanga continued to receive only primary treatment. The treated waste water was pumped and discharged 3 kilometres offshore.

Clearly the decrease in the amounts of waste water has not been as significant in Palanga as in other Lithuanian towns. This results from the variations in water consumption over the year in a resort town which has no industry other than tourism.

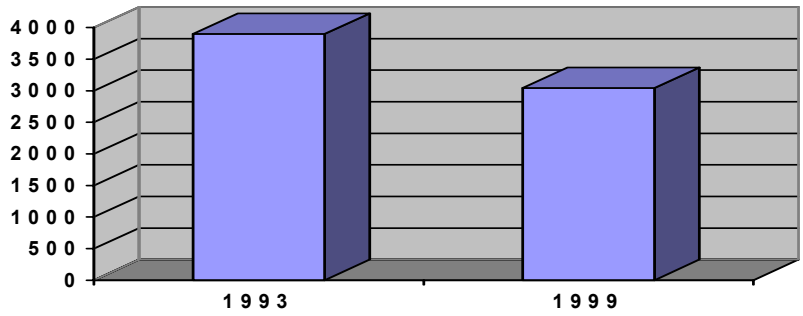

Figure 17. Amounts of waste water discharged, in 1000s of cubic metres per annum

In 1993, the construction of the second part of the Palanga WWTP for the secondary treatment of waste water was started, including the removal of nitrogen and phosphorus.

The structure of financing for this project, which totals 5 million USD, is presented in the following table:

Table 2

Source	Amount of funds in, thousands of USD	Percentage
State Budget	3678	74
PHARE	1125	23
Municipality	125	3

The secondary treatment of waste water commenced in autumn 1999.

The changes in pollutant discharges can be seen in the following charts.

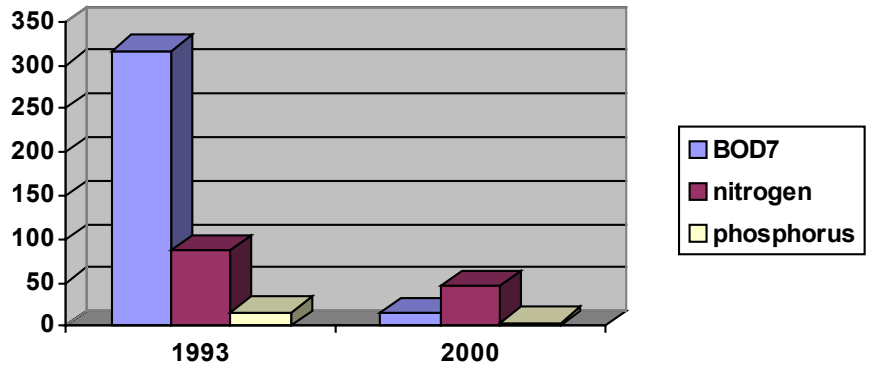

Figure 18. Amounts of BOD_7, nitrogen and phosphorus discharged, in tons per annum

The amounts of pollutants discharged have decreased considerably. Due to the further actions needed for adjustments, the concentration of nitrogen in the effluent water has not yet diminished to the target-levels set by HELCOM, although it is very close to them:

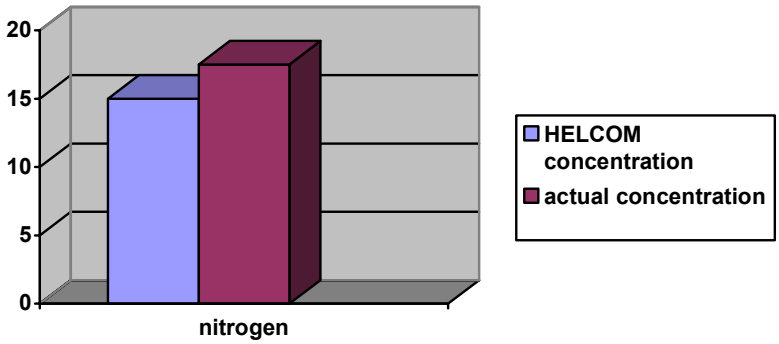

Figure 19. Concentration of BOD_7, nitrogen and phosphorus in effluent water (mg/l) in a year 2000

It is planned that by 2001 the concentration of nitrogen in the effluent water will not exceed 14 mg/l.

It is thus planned that the proposal to delete Hot Spot No. 65 from the list will be presented in 2001-2002.

2. Industrial Hot Spots

Hot Spot No. 52 - JSC (joint stock company) Achema (formerly the Azotas Fertiliser Plant) Fertiliser industry

This fertiliser plant has a long history. Its first production was of ammonia, in 1965. Following several reconstructions and further upgrading, its principal current products are ammonia, carbamide, ammonium nitrate, nitric acid, carbonic acid, and various composite fertilisers for gardeners.

Despite the increase in production, emissions of hazardous substances into the atmosphere decreased from 38,000 tons in 1981 to 6,400 tons in 1999. The main component of these emissions is carbon monoxide. At present, the nitric acid workshop is under reconstruction. It is expected that the emissions of carbon monoxide will decrease by more than 60-70% after reconstruction.

The Company's allocations for the requirements of environmental protection amount to between 0.8 and 0.9 million USD annually.

The plant uses 9.6 million cubic metres of water from the River Neris annually. The domestic-fecal and chemical polluted discharges are pumped into the Jonava biological WWTP. Only the rainwater run-off from two special reservoirs is discharged into the River Neris without exceeding the set limits.

In 1991, the discharge from the plant into the waters amounted to 53 tons of BOD_5, 50 tons of total nitrogen and 0.9 tons of total phosphorus. The plant also released 450 tons of SO_x into the air. Measures were then proposed for the reduction of discharges, including the construction of a station for trapping contaminated subterranean water and the introduction of some modern technology, Following the implementation of these measures, the waste water flow decreased by 81% between 1991 and 1998. The waste-water discharges and air emissions also decreased considerably: namely, BOD_5 by 87%, N-tot by 41%, Total phosphorus by 80% and SO_x by 85%. The water pollution control programme was supported by USAID.

The scales of emissions of hazardous substances into the air and water from the Achema Fertiliser Plant in 2000 are presented in Tables 3 and 4:

Table 3. Air pollution from Achema

Production/pollutant	EFMA norms (new production)	EFMA norms (existing production)	JSC Achema
Ammonia/NO_x	0.45	0.9	0.65
Nitric acid/ NO_x	1.6	4.2	0.32
Carbamide/dust	0.25	0.4	0.21
Carbamide/NH_3	0.25	0.83	0.78

Table 4. Water pollution from Achema

Production/pollutant	EFMA norms (new production)	EFMA norms (existing production)	JSC Achema
Ammonia/NH_3	0.1	0.1	0.03
Carbamide/NH_3	0.0025	0.1	0.07
Ammonium nitrate/	0.2	0.2	0.02

The Achema Fertiliser Plant has made very substantial progress in environmental protection over the last few years. It is already a candidate for deletion from the list of JCP Hot Spots.

The final decision about deletion will be taken after a comprehensive review of the factory.

Hot Spot No. 54 - JSC Lifosa (formerly the Kėdainiai Chemical Fertiliser Plant) Chemical Fertilizer Industry

The factory started operating in 1963 with the production of sulphuric acid. The plant was designated as a Hot Spot because of its waste-water discharges. It currently produces sulphuric acid, phosphoric acid, single and granulated superphosphate, diammonium phosphate and aluminium fluoride.

In 1991, the main pollution consisted of 38 tons of N-tot and 47 tons of Total phosphorus discharges into the water, and 1,619 tons of SO_x emissions into the air. In the period between 1991 and 1998, the waste-water flow decreased by more than two thirds, while N-tot discharges decreased by 45 % and Total phosphorus discharges by 28 %. Emissions of SO_x into the air decreased by 80 %. A one-year waste minimisation project was put into effect in 1996, which was funded by USAID.

All necessary technological processes have now been installed for the purification equipment: namely, cyclones, scrubbers, absorbers and filters.

In 1998, the third stage of the plant reconstruction was completed. Instead of fuel oil containing a large amount of sulphur, natural gas started to be used as fuel. SO_2 emissions into the atmosphere were eliminated and NO_x emissions were significantly decreased. Since 1997, NO_x concentrations in emissions from the plant have been less than 10 milligram per cubic metre. A further important factor has been the use of technological heat for the city's heating system and hot water supply, which has also had the effect of decreasing the load and emissions from the municipal boiler-house.

In the last two years, the real concentrations in emissions of fluorine hydrogen and ammonia into the air have been successfully reduced to levels which no longer exceed the HELCOM norms. These are now less than 5 milligrams per cubic metre for HF, and 50 milligrams per cubic metre for ammonia (*see Figure 20).*

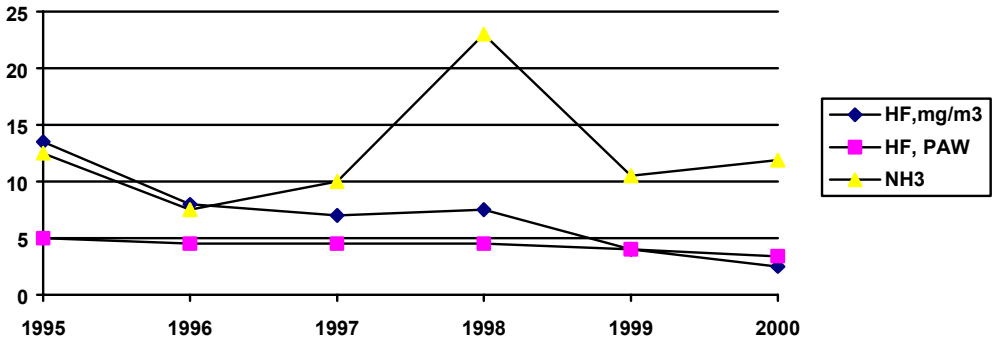

Figure 20. Concentrations HF and NH_3 in emissions from the Lifosa Plant

The chart presents the concentrations of HF and NH_3 in the emissions from the Lifosa Plant's Diammonium Phosphate Workshop, and HF emissions from its Phosphoric Acid Workshop. HF and NH_3 emissions are calculated in milligrams per cubic metre.

In Table 5 below, the annual average concentrations of pollutants in the plant's waste-water discharges are presented:

Table 5. Concentrations of pollutants in waste-water discharges

Year / Pollutant	1996	1997	1998	1999	2000
BOD_7, mgO_2/l	4.1	6.0	8.1	9.3	8.4
Suspended solids, mg/l	12	20	14	18	17
N-tot, mg/l	4.7	7.4	10	7.6	11
Total phosphorus, mg/l	12	24.8	16	11	5.6
Fluorides, mg/l	1.9	1.4	1.3	1.1	1.3

The Lifosa Plant still has some problems with Total phosphorus concentrations in its discharges. It has set itself the task of decreasing Total phosphorus by ≤ 5 milligrams per litre within two years. In 2001, the Company plans to allocate 0.13 million USD for the development of environmental monitoring, and aims to be awarded the the ISO 14001 Certificate.

The decision about starting the deletion procedure from the list of Hot Spots will be taken only after a comprehensive analysis has been made of all emissions by pollutants from the plant.

Hot Spot No. 56 - SC Sema (The Panevėžys Alcohol Refinery) Food Processing Industry

The plant was selected as a Hot Spot because of its high pollution load. In 1991, its discharges were 3,100 tons of BOD_5 into the water and 4 tons of SO_x into the air. In 1994, the estimate for improvements was 0.15 million EUROS.

Between 1991 and 1998, because the plant had almost ceased production, the waste-water flow was reduced by 95% and emissions of SO_x were reduced by 99%. An environmental assessment was carried out at the plant, supported by Denmark. The new cost estimate for the upgrading of its technology was 0.17 million EUROS.

The plant now is connected to the Panevėžys sewerage system and the municipal biological WWTP. As a result, there are hardly any more discharges to the environment.

Documents are currently being prepared for the proposal to delete this plant from the list of JCP Hot Spots.

Hot Spot No. 62 - JSC Mažeikių Nafta (The Mažeikiai Oil Refinery and Marine Terminal)

The Mažeikiai Oil Refinery and Marine Terminal was designated as a Hot Spot due to its high discharges of oil, total phosphorus and total nitrogen. In 1991, its discharges were:, total nitrogen 550 tons; total phosphorus, 57 tons; and oil, 3.3 tons. The plant also released 3,370 tons of SO_x into the air. The proposed measures to reduce pollution involved reconstruction of the plant and the construction of a waste-water treatment plant.

Since 29 October 1999, the ownership of Mažeikių Nafta (MN) has been restructured as follows: 59% is now owned by the Government of Lithuania, 33 % by Williams International Company and 8% by other private shareholders. Williams International was invited by the Government of Lithuania to be the strategic investor for its oil sector, on the basis of this company's experience and expertise. Since then, the MN senior management team has been constituted from Williams's personnel, and they will administer the Company under a 15-year management services contract.

Between 1991 and 1998, the waste-water flow decreased by 70%. The waste-water discharges also decreased significantly. Unfortunately, the emissions of both SO_x and NO_x into the air increased by 173%. This was due to a substantial increase in the burning of fuel oil by local people and industries.

It should be noted that when the refinery was originally constructed, it was decided that the refinery would provide waste-water treatment services to Mažeikiai, which was then a small town with no other waste-water treatment plant. However, during the period when the refinery was being constructed and its operations were beginning to get under way, the town grew to its present size of 47,000 inhabitants. Thus the waste-water component from the city itself has had a significant effect on Mažeikių Nafta's overall

discharges. Until 1996, waste water from both the refinery and the city was treated and discharge was effected by pumping it directly into the Baltic Sea. The refinery's waste water was still being pumped into the Baltic Sea until 1997, while the city's waters were treated and released directly into two nearby rivers, the Skudulas and the Dubulas. Both of these rivers flow into Latvia, where they merge into the River Varduva, then flow into the River Venta and are eventually released into the Baltic Sea at Ventspils. However, since November 1999, discharges into the Baltic Sea have been stopped, and all the treated waste water has been discharged into these local rivers. It is not anticipated that the resumption of pumping directly into the Baltic Sea will be necessary.

Figure 21 indicates the total number of tons of crude oil refined per annum by MN between 1997 and 1999:

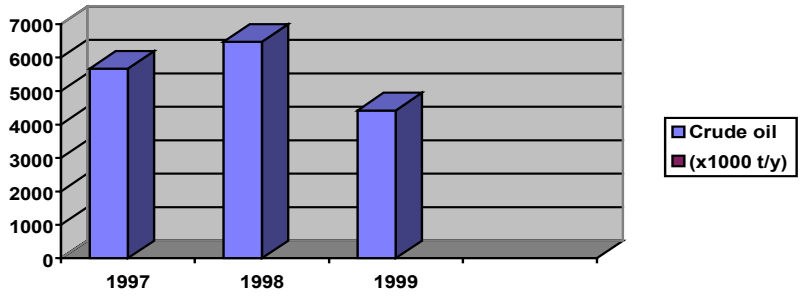

Figure 21. Crude oil refined by MN between 1997 and 1999

The discharges of tracked pollutants in the waste water for the years 1993-1999, both from the Refinery itself, from the city of Mažeikiai, and their total combined quantity, are shown in Figures 22 - 25. The comparative annual average concentrations of pollutants in discharges are presented in Figures 26 – 29.

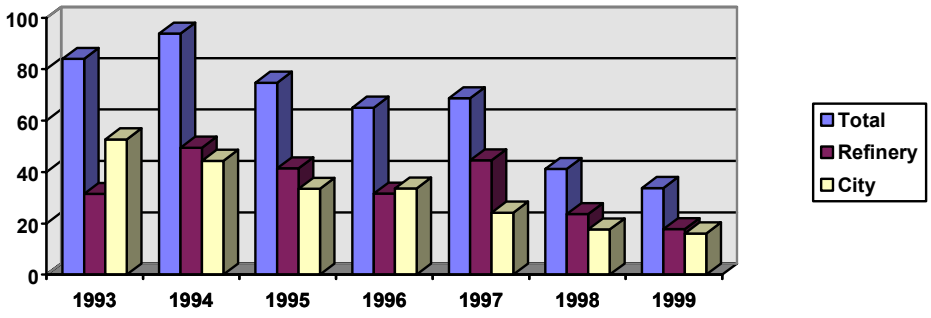

Figure 22. Discharges of BOD_7 (tons) in waste water between 1993 and 1999

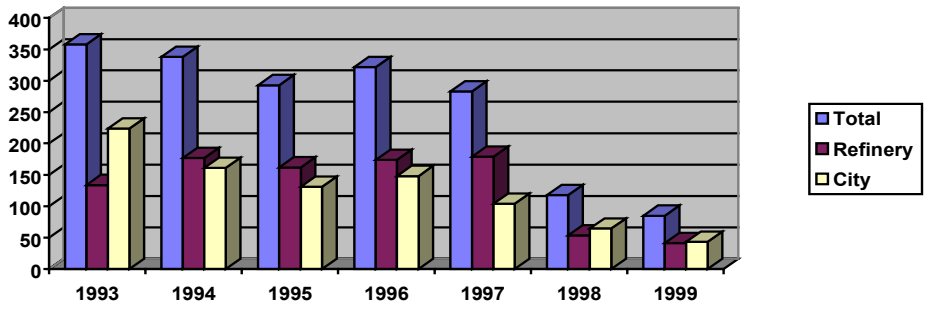

Figure 23. Discharges of N-tot (tons) in waste water between 1993 and 1999

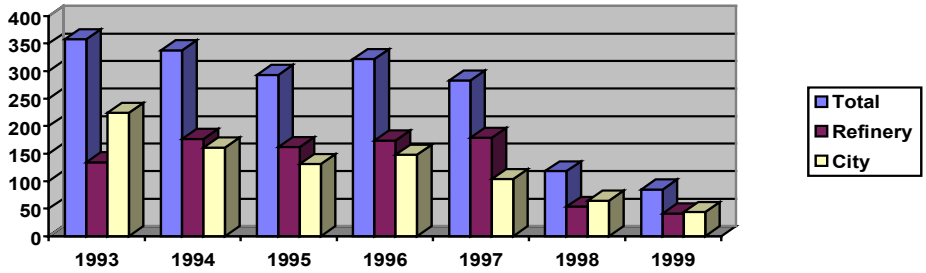

Figure 24. Discharges of Total phosphorus (tons) in waste water between 1993 and 1999

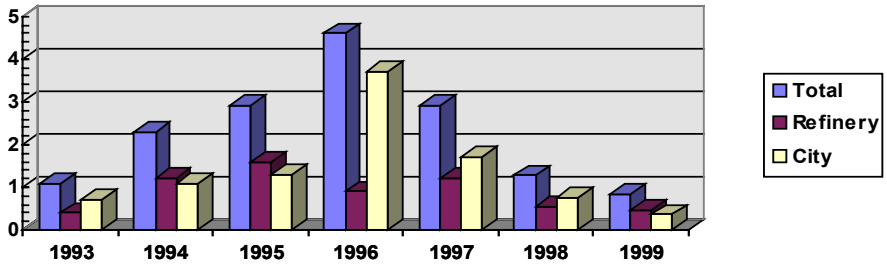

Figure 25. Oil discharges in waste water (tons) between 1993 and 1999

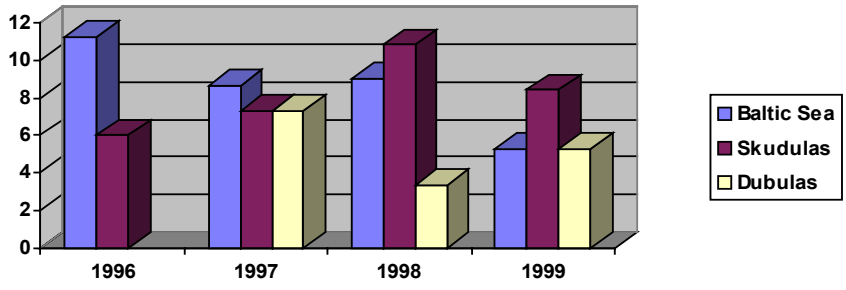

Figure 26. BOD_7 concentrations (mg O_2/l) in discharges into the Baltic Sea and into small rivers, the Skudulas and the Dubulas

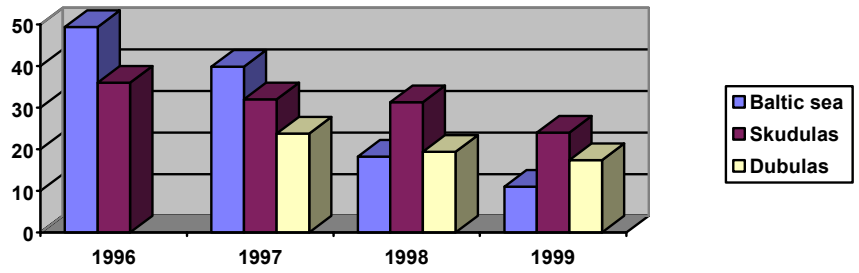

Figure 27. N-tot concentrations (milligrams per litre) in discharges

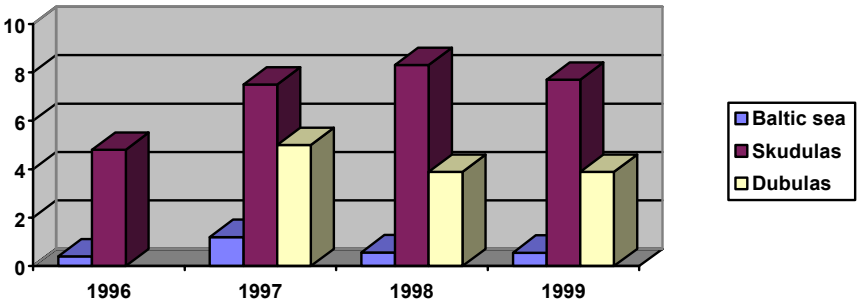

Figure 28. Total phosphorus concentrations (milligrams per litre) in discharges

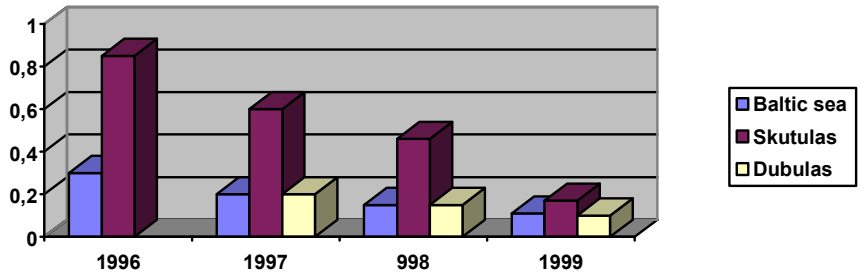

Figure 29. Oil concentrations (milligrams per litre) in discharges

Air emissions of SO_2 and NO_x from the refinery's operations for the years between 1997 and 1999 are presented in Figure 30:

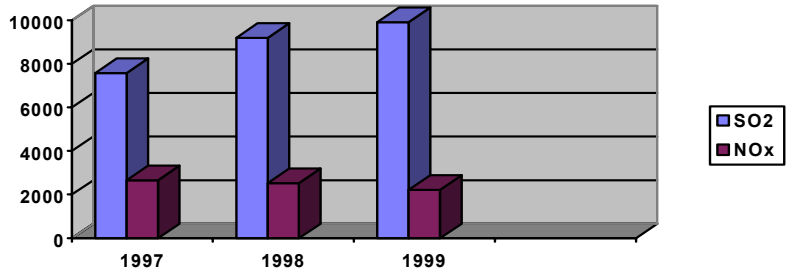

Figure 30. Air emissions from oil refinery operations (in tons per annum)

The emission parameters currently meet the applicable Lithuanian regulations. Mažeikių Nafta has several projects to reduce air emission pollution in its modernisation plans, which will be initiated in the near future.

The MN Modernisation Programme includes the following changes:

- Improvement of material balances and inventory control.
- Increasing capacity utilisation.
- Increasing quality and yields.
- Improvement of delivery logistics.
- Improvement in efficiency and reduction of costs.
- Improvement in the environmental performance of the plant and its products.

With their focus on the environment, MN's plans include the incorporation of the latest technology for new process units in order to reduce atmospheric emissions and minimise energy consumption. When EU Directives are adopted by Lithuania from 2005 onwards, fuel production will meet EU specifications for sulphur, benzene, olephins and aromatics. Additional environmental projects will include: the reduction of sulphur emissions from the refinery, thanks to the installation of a larger and more effective recovery-capacity; a reduction in the emissions of volatile organic compounds (VOC) from certain gasoline tanks, thanks to the installation of internal floating roofs; and a reduction of VOC emissions from tank car and track loading racks, thanks to the installation of vapour recovery systems.

Mažeikių Nafta has recently completed environment-related studies of subsurface conditions and an environmental audit of the entire system. It is also currently conducting a waste audit, which will establish the nature and quantities of waste within the refinery, as well as disposal options and waste management guidelines for future operations.

The Butinge Oil Tanker Terminal started its operations in October 1999 and by November 2000 had loaded or unloaded 3,646,000 tons of crude oil onto or from thirty nine ships. The terminal has been constructed to the latest technology and standards. With the exception of one accident involving a loading hose spill due to defective equipment, the terminal has operated with only minimal air emissions during the filling of all the tankers and onshore storage tanks.

Hot Spot No. 64 - The Klaipėda Cardboard Factory
Paper Industry

The Klaipėda Cardboard Factory, which is located in a Lithuanian seaport, had the characteristics of a real Hot Spot. The effluent water had a BOD which was consistently high for this type of industry.

The changing economic situation of the last decade has not favoured the fulfilment of all the environmental measures planned for the Klaipėda Cardboard Factory. The paper mill was even shut down for several years. However, in 1995, production was restarted and has since grown. Since 1999, the Klaipėda Cardboard Factory has mainly used waste paper as the main material for its production.

Changes in effluent amounts and BOD_7 can be seen in the following charts:

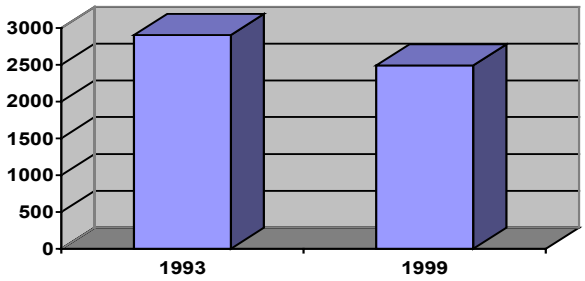

Figure 31. Amounts of waste water discharged, in 1000s of cubic metres per annum

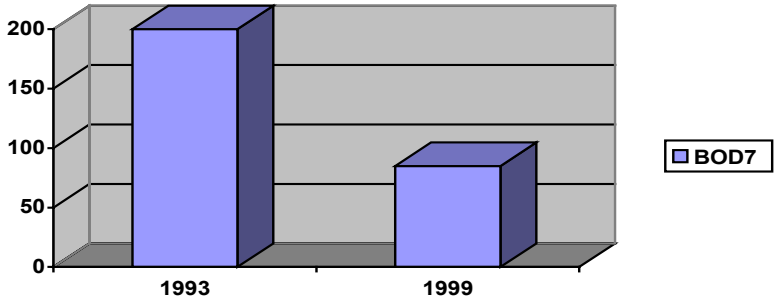

Figure 32. Concentration of BOD_7 in effluent water, in milligrams per litre

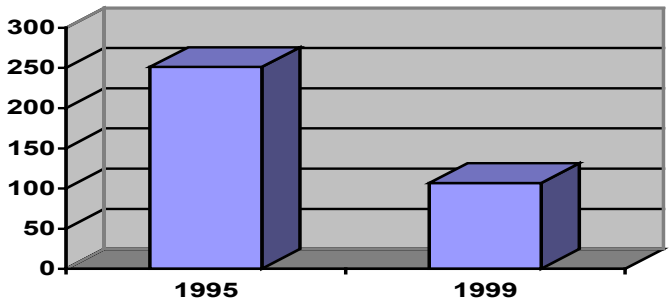

Figure 33. Effluent discharge per ton of production

It is clear from these charts that although some progress has been made, the current situation remains far from satisfactory.

The concentrations of pollutants in the effluent water are still much higher than either national or international standards recommend. To solve the waste-water treatment problems in the Klaipėda Cardboard Factory, the reconstruction of the existing WWTP and the building of a new WWTP for the local area are planned. According to these plans, the treatment of all the waste water from the Klaipėda cardboard factory will be in conformance with national and international standards by 2003. However, to be realistic, some delay can be expected.

It is thus planned that the deletion procedure for Hot Spot No. 64 will be started in 2005-2006.

Hot Spot No. 60 - Agriculture/Livestock

Agriculture has traditionally played an important role in the Lithuanian economy, and continues to do so. It is not surprising that in the years of the 'planned economy', with its cheap fertilisers and agricultural production plans, agriculture made such a strong impact on the environment. However, the economic changes over the last decade have considerably altered the picture.

The changes in the use of fertilisers and livestock production are demonstrated in the following charts:

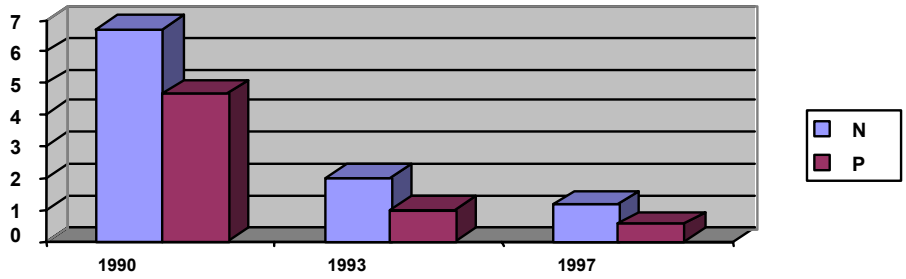

Figure 34. Fertilisation, nitrogen and phosphorus (kg/ha)

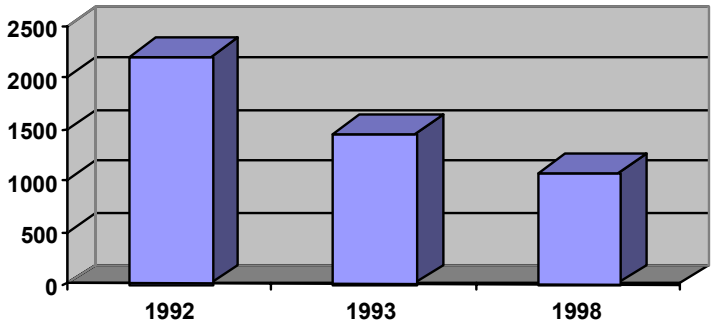

Figure 35. Livestock production, in thousands of heads

As may be seen from these graphs, the amounts of both fertilisers used and of livestock production have decreased considerably. There has also been a significant decrease in the nutrients load from diffuse sources. The nutrient load per hectare is much lower in Lithuania than in West European countries such as The Netherlands or Denmark, with their more highly developed agriculture. Nevertheless the water monitoring data show that, far from going down, nitrogen and phospohurs concentrations in Lithuanian rivers are actually increasing. No adequate explanation has yet been provided for this phenomenon.

Overall, by implementing the EU directive and HELCOM requirements on nitrates, Lithuania has done a a considerable amount of work, especially in the preparation of its 'Code for Good Agricultural Practice', not to mention the development of a monitoring system, the building of manure storage facilities, and other measures. The building of adequate manure storage facilities still remains the most costly and difficult component in this sector.

It is thus difficult at present to plan a definite time-schedule for the deletion of Hot Spot No. 60. It is estimated that this could be achieved by 2007-2008.

Lithuanian-Russian Hot Spot No. 66 - The Kuršių (Curonian) Lagoon Coastal Lagoon/Wetland

The Curonian Lagoon occupies an area of less than 1,600 square kilometres. 413 square kilometres of this area belongs to Lithuania and the rest lies in the territory of the Kaliningrad region of Russia. The wetland area of the mouth of the River Nemunas, which consists of about 2,000 square kilometres, lies on the east side of the Lagoon. This area is only 0-5 metres above the Baltic Sea level and a considerable part of it is flooded during the spring and autumn freshets. The average depth of the Lagoon is 3.8 metres. The volume of water is 6 cubic kilometres. The Lagoon is separated off from the Baltic Sea by the narrow sandy Kuršių (Curonian) Spit, which has a length of about 100 kilometres.

The Curonian Lagoon gathers its water in from an area of 100,458 square kilometres or about 6% of the watershed of the Baltic Sea. Of this territory, 48% lies in Byelorussia, 46% in Lithuania and 6% in the Kaliningrad region of Russia. About 5 million inhabitants live within the drainage area of the Lagoon. The Lagoon is polluted not only by municipal and industrial Hot Spots – namely the cities of Alytus, Grodno, Jonava, Kaunas, Kėdainiai, Marijampolė, Neman, Panevėžys, Sovetsk and Vilnius – but also by agriculture and livestock from cattle-breeding farms. Additionally, the industrial city and port, Klaipėda, lies in the northern part of the Curonian Lagoon.

Nearly all the river water – that is 98% of it, or 22 cubic kilometres – flows into the lagoon from the River Nemunas. A tributary of the River Pregol, the Deima, contributes about 1 cubic kilometre of the water. The inflow of the coastal waters into the Lagoon fluctuates between 14 and 34 cubic kilometres per year. Annually, about 23 cubic kilometres of fresh water – that is, about 5% of all the river input – flows into the Baltic Sea.

The first symptom of the eutrophication of the waters in the Lagoon occurred in prewar times. But year by year, the volumes of the agricultural, industrial and municipal waste water increased, especially following the period between 1955 and 1965. This period marked the beginning of the heavy eutrophication of the Curonian Lagoon, due to the poor water quality of the River Nemunas. The large amounts of nutrients have caused the intensive formation of plankton. Thick blue-and-green algae covers the surface of the water, causing it to become bluish green on sunny days. The blooming of the water algae to its maximum intensity is usually observed during the warm period from June until approximately the middle of September. The almost complete absence of oxygen has resulted in the widespread demise of fish stock, and their floating and putrefying corpses can be observed in the waters almost every year. In May 1979, about 420 tons of fish were lost.

Variations in the loads of phosphorus, nitrogen and petroleum hydrocarbons from the Curonian Lagoon to the Baltic Sea are presented in Figures 36-38, calculated in tons per annum.

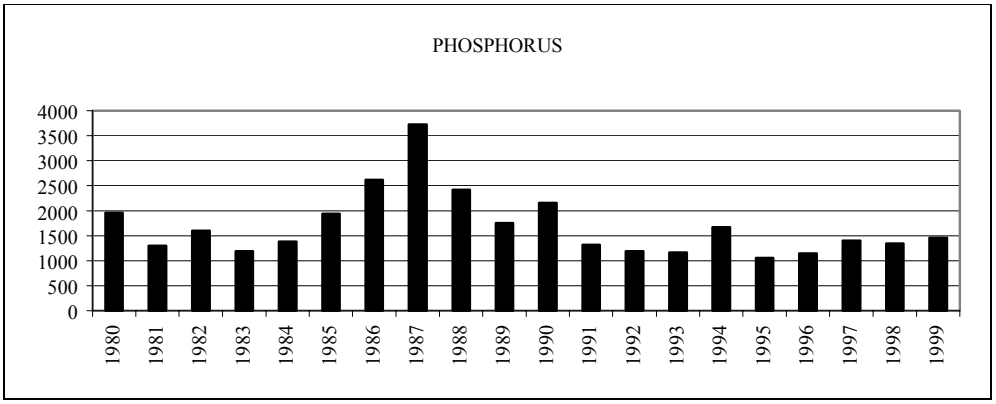

Figure 36. Trend of phosphorus load from the Lagoon to the Baltic Sea, in tons per annum

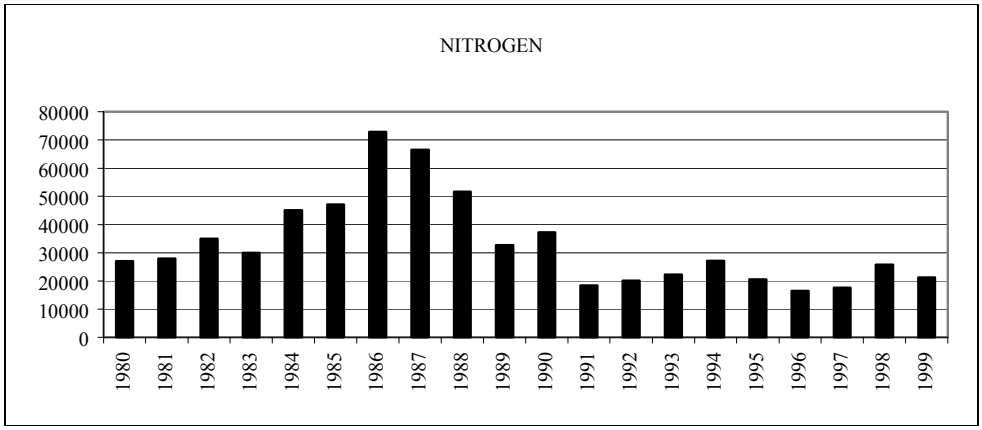

Figure 37. Trend of nitrogen load from the Lagoon to the Baltic Sea, in tons per annum

About 80% of nitrogen and 50% of phosphorus reaching the Baltic Sea from the Lagoon originates from agriculture, which thus makes a high contribution to eutrophication. However, considerable progress has been made in Lithuania: since 1990, the usage of fertilisers and pesticides has shown a dramatic decrease.

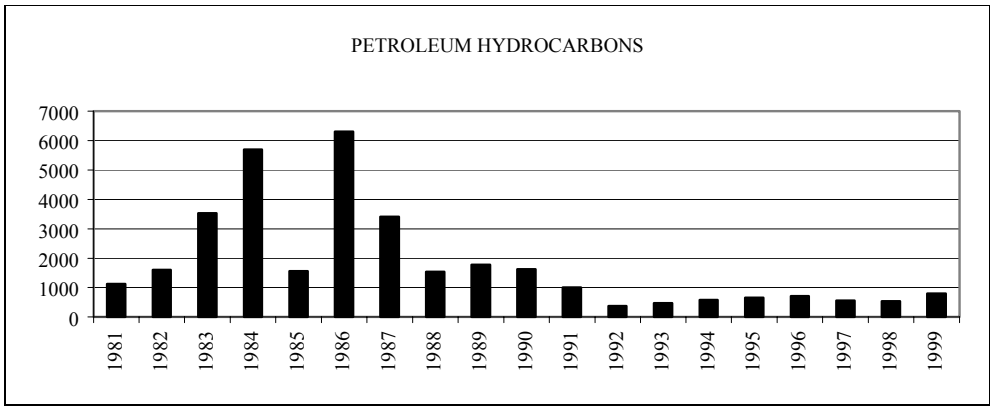

Figure 38. Trend of petroleum hydrocarbons load from the Lagoon to the Baltic Sea, in tons per annum

The HELCOM PITF Working Group on Management Plans for Coastal Lagoons and Wetlands (HELCOM PITF MLW) was established in February 1993. The major objective of the work of MLW has been to contribute to an ecologically sustainable development in the coastal areas of the Baltic Sea Region, as identified in JCP's Component 4, under the title: 'Management Plans for Coastal Lagoons and Wetlands'. Support has been provided to the MLW Working Group by the WWF (World Wildlife Fund) in the form of secretarial facilities and the encouragement of informal dialogue among decision-makers and interested groups across the borders of the countries, in accordance with the principles and methodology of the Integrated Coastal Zone Management (ICZM). The practical implementation of the ICZM principles has provided the main impetus for the elaboration of the ICZM plans for six pilot areas along the Eastern Baltic coast. In the period between 1993 and 1999, the part of the Curonian Lagoon shared by Lithuania and the Kaliningrad Region of Russia constituted one of the areas designated within Component 4. This project has included the Nemunas River Delta and has meant particular attention being given to the following:

- The development of an integrated bilateral management plan for the Curonian Lagoon.
- Public participation and institutional capacity building.
- Identification of the priority activities which need to be implemented.
- Preparations for the implementation of the management plan.

While some of the plans have already been integrated into the national planning system for the management of these natural areas, other ideas still require more detailed development if the full-scale implementation of the integrated planning and management concept is to be ensured. The continuing development of the Lithuanian-Russian-Belarus trilateral co-operation regarding the Nemunas River Basin will be one of the most important factors to determine the future of the Lagoon. This will be based on a feasibility study outlining how possible scenarios in upstream conditions will impact on the Baltic Sea, and particularly on the environment of the Curonian Lagoon.

Thus it is still too early to specify a date for the deletion of Hot Spot No. 66 from the list.

CONCLUSIONS

Assessment of the sixteen Lithuanian Hot Spots confirms that Lithuania has taken a huge step forward in implementing the JCP with regard to its municipal and industrial Hot Spots. It has now become possible to set procedures in motion for the deletion of some of them from the list of Hot Spots: namely, the Alytus Municipal and Industrial WTTP, the Palanga Municipal WWTP and the Panevėžys Alcohol Refinery. Moreover, the WWTPs in some of the larger cities like Vilnius and Klaipėda are now very close to fulfilling HELCOM requirements. More detailed information on Lithuanian Municipal and Industrial Hot Spots is presented in Table 6.

Table 6. Amounts of pollutants discharged from Municipal and Industrial Hot Spots, in tons per annum

Hot Spot No.	Name	1993			1999			Preliminary year of deletion
		BOD_7	N-tot	P-tot	BOD_7	N-tot	P-tot	
41	Šiauliai	769	704	84	86	297	20	2004
51	Kaunas	8307	1526	289	3085	988	144	2005
53	Kėdainiai	26	63	8.8	40	40	6.5	2006
55	Panevėžys	54.9	67	96	72	336	72	2004
57	Marijampolė	83	90	12	123	101	12	2003-2004
58	Alytus	331	224	47	96	87	4	**2001**
59	Vilnius	8250	2618	290	461	252	172	2002-2003
63	Klaipėda	3172	1227	112	818	360	53	2001-2002
65	Palanga	276	88	16	208	74	10	**2001**
Total		**24468**	**6607**	**962**	**5252**	**2535**	**498**	

It should be emphasised that the overall reduction in the pollution load from municipal and industrial Hot Spots since 1993 has been highly impressive. Figure 39 provides the clearest indication of this progress:

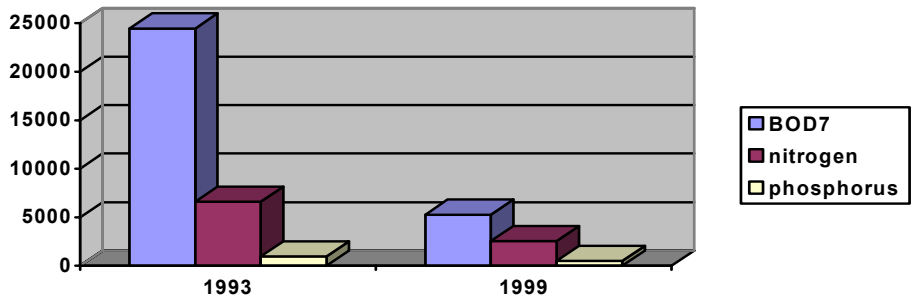

Figure 39. Amounts of pollutants discharged from Municipal and Industrial Hot Spots in Lithuania, in tons per annum

Most of the WWTPs desginated as Hot Spots are now under reconstruction and will achieve desirable results over the next few years. The main obstacles to more rapid progress are as follows:

1. The construction of urban waste-water treatment plants requires huge financial investment. Since a large proportion of the costs of construction and maintenance needs to be passed on to water consumers, there is a risk that over-rapid development could have negative social and economical consequences.
2. Since Lithuania is currently seeking accession to the European Union, large financial resources and efforts need to be allocated to meeting the wide range of other requirements stipulated by the EU Directives, and not only those connected with the JCP list of Hot Spots.

Despite all the difficulties, however, progress at some of the Hot Spots has already reduced pollution to desirable levels, and it has now become possible to set the process in motion for their deletion from the JCP list. In addition to the Alytus and Palanga WWTPs mentioned above (Nos 58 and 65), the Panevėžys JTC Sema Alcohol Refinery (No. 56) is now also ready for immediate deletion from the list. The private companies JSC Achema and JSC Lifosa (Nos. 52 and 54) have already reduced pollution to levels which enable discussion to begin about their deletion from the list of Hot Spots too. Furthermore, the Mažeikiai Oil Refinery (No. 62) is currently being modernised. The first phase of modernisation will be completed by the end of 2005 and the second phase by the end of 2010. Thus the deletion of Hot Spot No. 62 from the list will become possible in several years' time.

Table 7. presents the combined overall changes in the amounts of main pollutants from all Lithuanian point sources:

Table 7. Discharges of pollutants from point sources, t/year

Pollutant	1993	1999	Reduction
BOD_7	34900	10000	72%
N-tot	10208	3923	62%
Total phosphorus	1534	750	52%

As has been shown on page 31, the use of fertilisers and livestock production in Lithuania has decreased considerably over the last few years. The nutrient load per hectare is much lower in Lithuania than in West European countries. Nevertheless, the water monitoring data show that nitrogen and phosophorus concentrations in Lithuanian rivers are not going down. For this reason, it has not yet become possible to determine the concrete deletion time for Hot Spot No. 60 from the list.

In general, the development of an environmental protection policy in Lithuania, in combination with the country's strategy for environmental investments, provides a solid foundation for the expectation that the JCP targets will be achieved in Lithuania by the years 2008-2010.

Thematic Report on the Third HELCOM PITF Regional Workshop

Tallinn, Estonia 1-2 March 2001

List of Contents

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Introduction

The third Programme Implementation Task Force (PITF) Regional Workshop was held in Tallinn on 1 and 2 March 2001. It was organised by the Estonian Ministry of the Environment in co-operation with the Secretariat of the Helsinki Commission for Baltic Marine Environmental Protection (HELCOM) and members of the PITF Preparatory Group.

Participants in the Workshop were welcomed by Mr. Harry Liiv, Deputy Secretary General of the Estonian Ministry of the Environment. The Chairman of the HELCOM PITF, Mr. Göte Svenson, was elected Chairman of the Meeting and Mr. Harry Liiv, from the Ministry of the Environment, was elected Co-Chairman.

The Meeting was addressed by two key-note speakers from Estonia, Mr. Harry Liiv and Mr. Marko Tuurmann, and by one representative of the International Financial Institutions (IFI's) which are members of PITF, Mr. Roland Randefeldt of the Nordic Investment Bank (NIB).

Mr. Tuurmann described the environmental situation in Estonia with regard to water-related issues. He drew attention to problems relating to both water consumption and water quality, focusing especially on point-source pollution and how the country's taxation system addressed pollution. He explained that the HELCOM Recommendations on industrial and municipal waste-water treatment had already been integrated into Estonian legislation. Moreover, Estonia, donor countries and the IFI's had invested more than 700 million Estonian krone (EEK) in order to minimise the pollution load from Hot Spots. Further actions to minimise both non-point source and point-source pollution would be taken in accordance with the principles formulated in the European Union's Water Framework Directive (WFD). The establishment of targets to protect the Baltic Sea and management plans for river basins throughout the region were considered to be relevant issues for the future progress of PITF towards achieving high standards in water quality.

As representative of the IFI's which were members of PITF, Mr. Roland Randefelt of the NIB reported on challenges in environmental investments in Estonia.

The Workshop received information on all ten of the Estonian Hot Spots, and note was taken of the assessments made on each of them. During the course of the Workshop, the condition of all these Hot Spots was thoroughly analysed and discussed. It was clarified that they represented different site types: five of these involved municipal and industrial waste-water treatment; two were industrial; one was agricultural; and one involved a coastal lagoon and wetland area.

It was emphasised that a necessary pre-condition for any adequate approach to these Hot Spots was the upholding and maintenance of the existing legal and institutional framework. The EU Water Framework Directive provided a further necessary challenge, and adjusting to it would require revisions to the entire Estonian water management system.

Hot Spot No. 26 – Kohtla-Järve Region
Municipal and Industrial

The industrial region of Kohtla-Järve has a population of around 80,000. The main environmental problems are caused by an oil shale based industrial complex, and are specifically related to the treatment of domestic and industrial waste water, ambient air protection and waste management.

Treatment of domestic and industrial waste water

The large amount of toxic industrial waste water, which has mainly been caused by the chemical industry, has created a highly complex problem for the treatment of waste water in the region. The preliminary scheme for the treatment of waste water in the Kohtla-Järve industrial region was drafted in the 1960's and partly put into operation in the 1970's. This initial scheme aimed to overcome problems involved in the separate treatment of industrial waste water by establishing a common treatment system for both domestic and industrial waste water.

The analysis made was as follows. Industrial waste water in this area contains toxic organic substances from oil shale burning, including oil products, phenols, hydrocarbons and other compounds. Thus, to create a sound environment for degrading such biological compounds, it was considered that the effective treatment of industrial waste water could best be accomplished by the use of the nutrients which were already contained in domestic waste water.

Unfortunately, however, this plan was never fully implemented. The regional waste-water treatment plant in Kohtla-Järve, which was built in 1978, is called the 'AS Viru Biopuhastuse Treatment Plant'. Its domestic and industrial waste water comes from Kohtla-Järve, Kiviõli and Püssi. Its aeration tanks are designed with a capacity of 54,700 cubic metres per day (m^3/d). The regional treatment plant deposits its waters into the Gulf of Finland via a deep-sea outlet approximately three kilometres from the coast. However neither the so-called 'clean water' from AS Nitrofert nor the industrial waste water from the Kohtla-Järve Thermal Power Station passed through the WWTP, and nor did storm water. All these waters were discharged directly into a deep-sea outlet pipe. Moreover, after the amortization of the regional WWTP in 1978, the treatment of waste water stopped meeting even its previous required objectives. Reconstruction was started in 1996 but was curtailed in 1998 owing to lack of money.

Nevertheless, thanks to the establishment of a new pilot project, since 1999 the pumping station and secondary pumping station have been put back into operation, as well as two secondary sedimentation tanks and two propeller pumps. For this reason, the concentrations of suspended solids and Biological Oxygen Demand (BOD_7) in the treated waste water have decreased. On the other hand, the amounts of liquid wastes, involving sewage sludge and sediments, have increased. These liquid wastes have been pumped up onto the oil shale ash slag heaps**,** thereby polluting the run-off water which descends from their slopes. The reason for this procedure has been the absence of any adequate sewage sludge treatment system.

The annual trends in the pollution load from the Kohtla-Järve industrial region into the River Kohtla in 1994-2000 are shown in Table 1. The main reason for the decrease in this pollution load has been the lessening of economic activity over the last decade.

Table 1

Load of Volatile Phenols into The River Kohtla

1994	1995	1996	1997	1998	1999	2000
16	21	32	25	18	6.3*	1.9*

* - monophenols

Even so, the pollution of The River Purtse and The River Pühajõgi by industrial waste water and untreated domestic waste water still continues. Most of the waters from these polluted rivers are discharged into the Gulf of Finland. Since August 1999, the waste water from the town of Jõhvi has also been directed to the Viru Biopuhastus AS WWTP in Kohtla-Järve. All this means that steps still need to be taken to enablle the water quality in the River Pühajõgi to recuperate.

Furthermore, the biologically and mechanically treated waste water from the town of Kohtla-Järve, including the districts of Ahtme and Kukrus, does not yet meet quality requirements. These districts still discharge part of their waste water into the River Pühajõgi, so that it also ends up in the Gulf of Finland.

In previous times, the oil shale industry polluted the whole of the River Purtse estuary and basin. The surface run-off from the oil shale slag heaps, which was owned by the AS Viru Keemia Grupp (previously AS Kiviter), was discharged without any kind of treatment into the River Purtse, from which it flowed into the Gulf of Finland. Since 1996, various steps have been taken to enable the surface water run-off to be collected from these oil shale ash slag heaps. In 1997, a pumping station was built to collect the surface water run-off. Once collection reservoirs had been installed, the amount of waste water discharged into the River Kohtla decreased by approximately 19%, which in turn served to decrease the pollution load of volatile phenols into the river by approximately 22%, i.e. 7 tons per year. However, it was then realised that the dams were leaking and needed to be repaired. While these repairs were being carried out, the pollution load into the River Kohtla increased again because, during this period, the collected water was diverted from the WWTP and discharged directly into the deep-sea outlet.

The collection reservoirs were obviously inadequate and unable to prevent the continuing pollution from the oil shale ash slag heaps. Owing to lack of money, in 1998 the works which were intended to solve the problems relating to surface water run-off were curtailed. In 1999, the oil shale industry decreased its production and was even closed down for a while. In 1999 and 2000, part of the surface run-off from these heaps was pumped either into an outlet pipe which was discharged directly into the sea or through the regional WWTP. In 1999, 147 cubic metres daily (m^3/d) were directed through the waste-water treatment plant, and in 2000, 550 m^3/d. This had the further effect of decreasing the pollution loads of the River Purtse and the River Kohtla. In aiming to decrease the unnecessary load on the WWTP, the only water to be discharged directly into these rivers was storm water, which is relatively clean.

The discharge of volatile phenols and bi-phenols into the River Kohtla has decreased rapidly over the last three years. However, it needs to be borne in mind that the waste water which is still being discharged into the River Kohtla contains not only phenols but also other toxic organic compounds. The primary aim at present is put a complete stop to any surface water from the oil shale ash slag heaps running into the River Kohtla.

If inland water bodies and coastal waters are to be properly protected, the following measures will need to be implemented:

- Technical requirements and norms will need to be established and put in place, with full consideration given to the particular technologies which need to be used in certain industries, such as the thermal treatment of oil shale minerals, the producing of oil products, etc.

- Existing waste-water treatment plants and waste-water collection systems will need to be replaced or rebuilt, including a new pumping station and pipelines for the AS Viru Biopuhastus Water Treatment Plant, as well as the collection and treatment of the highly polluted waste water in the run-off from the AS Viru Keemia Grupp's semi coke depositories.

- A feasibility study will need to be carried out for the Ahtme Waste-water Treatment Plant, in order to determine whether its waste water should be discharged into the Kohtla–Järve Treatment Plant via the pumping station in Jõhvi, or the existing waste-water treatment plant should be renovated.

- The pumping of water and sludge into the industrial wastes depository will need to be stopped, in order to reduce the negative impact of liquid wastes.

Air pollution

The Kohtla-Järve Power Station is the oldest power station in Estonia to continue to use oil shale. It has been doing this since 1949. This power station is located on the western side of the town of Kohtla-Järve, which borders onto the area belonging to the AS Viru Keemia Group. Thus, these two companies may be considered to be responsible for a combined impact zone. With a capacity of 56 megawatts (MW), the power station consumes approximately 580,000 tons of oil shale per annum. The preliminary proposal was that only multi cyclone should be used to remove fly ash emissions from the power station's nine boilers. However, since multi cyclones were no more than 75-80% efficient, the resulting air emissions together with smoke gases still amounted to approximately 5,000 tons per annum. Thus, until 1988, the power station was the largest polluter of the town. In 1988 and 1989, additional electromagnetic filters were introduced.

As was foreseen in the project plan, the rate of efficiency of removal has now gone up to 99.13%. A new exhaust stack with a height of 150 metres has also been built. In order to improve the central heating provisions for the town, an additional thermal power station using oil has been built. Emissions from that plant have also been directed into high exhaust stacks.

However, in practice, the real level of treatment undergone by the exhaust gases is still lower than the above figures indicate. One of the reasons for this is as follows: in order to clean up the electromagnetic filters, the electromagnetic fields need to be switched off periodically. However, whenever this happens, dust inevitably gets into the filters, which has the unfortunate knock-on effect of increasing the emissions of dust in the exhaust gases. Even so, the total emissions of fly ash have decreased to fewer than 1,300-1,400 tons per annum, and for this reason the dust concentrations around the electric power station have now reached levels which are in compliance with the permitted limits established by the Estonian Ministry of the Environment

The heaviest polluters among the chemical industries in Estonia are in Kohtla-Järve, and the heaviest air polluter of all is the Viru Keemia Grupp (previously AS Kiviter), which is also the country's largest chemical plant. The Viru Keemia Group has a wide

production range and most of its production units release dangerous emissions into the air. The compositions and amounts of these emissions vary according to the particular technologies in use. The company's main areas of production are:

- The thermal processing of oil shale, amounting to approximately two million tons per annum, the extraction of raw shale oil from it, and the processing of this raw oil in order to produce different types of oil.

- The production of hydrocarbons such as benzene, toluene, etc., using imported raw oil.

The thermal processing of oil shale involves a highly specific type of production. The main production units and equipment deployed in this particular process include: gas generator stations, generator gas treatment and utilisation stations, as well as units for the disposal and utilisation of manufacturing wastes from the treated oil shale.

During this process, the generator gas, which is a by-product of the thermal processing of oil shale, is burned to provide energy. However, most of the sulphur dioxide produced by burning this generator gas during the thermal treatment of oil shale is emitted into the air. This amounts to 400-500 cubic metres (m^3) of sulphur dioxide (SO_2) per ton of oil shale. Thus the amount of SO_2 emitted is directly dependent on the volume of the generator gas and on the efficiency of the gas treatment plant. In order to reduce SO_2 emissions from the generator gas utilisation plants, a special treatment facility was designed to separate hydrogen sulphides from the generator gas. According to the design of this facility, the reduction of hydrogen sulphide prescribed for the treatment plant was to be from 6 - 9 grams per litre (g/l) down to 1 g/l. However, using this equipment has not yet produced the desired results. The average reduction has remained between 0.5 and 2 g/l, i.e. approximately twice as much as anticipated.

Furthermore, volatile organic compounds, including phenols, are released into the air from the heavy oil sedimentation tanks which are situated in several locations: in the gas generator stations, in the oil shale preparation stations and in the storage area.

The production of aromatic hydrocarbons derives from the rectification process, i.e. from the process involved in separating different fractions from the oil. The SO_2 is emitted into the air via exhaust stacks. Hydrocarbons (primarily benzene and toluene) are emitted into the air when the products are pumped into reservoirs, as well as through the ventilation system.

Another company, AS Nitrofert, owns facilities which produce ammonium, urea and mineral fertilisers. Its production is based on imported materials, including natural gas (methane). Its main products are approximately 180,000 tons of urea per annum, as well as ammonium. The substances which pollute the air include ammonium, nitrogen oxides, carbon oxide and dust.

Another company in the region, Velsicol Eesti AS, emits toluene by producing benzoic acid. Its designed capacity is for the production of 40,000 tons of benzoic acid per annum and 1,500 tons of sodium benzoate per annum by using toluene as the raw material.

Table 2

Amounts of Pollutants Emitted in the Kohtla-Järve Region

Year	Solid particles	SO_2	CO	NOx
1990	6,458	12,266	3,022	1,032
1991	6,700	12,200	2,500	600
1992	4,600	9,000	1,300	600
1993	3,700	8,800	800	400
1994	2,800	10,900	800	900
1995	2,600	9,900	900	700
1996	1,800	12,600	700	800
1997	1,580	12,115	628	748
1998	1,377	11,810	527	777
1999	1,055	11,009	517	693

Waste Management

The technology being used to produce oil shale oil is not efficient because part of the organic matter remains unused, and this results in the release of various hazardous substances as by-products. The main constituent of these wastes is semi coke, although other oil shale industry wastes are also produced in smaller amounts. In previous years, wastes from the oil shale industry were disposed of in the landfill site for industrial waste in Kohtla-Järve.

The practice of disposing of semi coke by dumping it into the Kohtla-Järve landfill started in 1938. To date, the total amount of semi coke disposed of in this way amounts to approximately 70 million tons. No complete set of chemical analyses has yet been performed to determine the exact content of the various toxic compounds in semi coke. As for the precise contents of the organic matter in oil shale wastes and in the sub-products of the retorting process, these seem to be even more problematic. There are basically two types of waste produced by oil shale processing: namely, the solid wastes from the processing of the shale itself, and the liquid wastes from the oil which has already been processed from the shale.

In oil shale, approximately 31.7 % of the content is organic matter, and in semi coke, 9.3%. However, the specific content of this organic matter is still not known. Meanwhile, although the content of toxic substances in the run-off water from the waste depositories has been determined, the precise origin of these substances is not known either.

Currently, these oil shale waste depositories constitute the biggest areas of concern for environmental quality control. Future activities aimed at reducing their negative environmental impact are as follows:

- to put a stop to the disposal of liquid wastes on slag heaps.
- to close down the depository of oil shale tars.
- to close down the depositories of hazardous substances.
- to start treating the leakages from semi coke depositories.

Table 3

Amounts of Deposited Wastes between 1995 and 2000

Type of Waste	1995	1996	1997	1998	1999	2000
Oil Shale Semi Coke	778,179	820,812	861,262	538,549	392,318	515,542.2
Oil Shale Tar Wastes	7,213	6,195	3772.8	4,242.5	384	1,153
Acid Tars	-	-	8.0	40.0	89.7	115.2
Sulphur-containing Wastes	1,731	2,057	1,823	1,194	20	200
Total	**79,399.8**	**833,785.9**	**872,163.7**	**548,474.8**	**396,049.7**	**521,186.4**

Hot Spot No. 28 – Tallinn WWTP
Municipal and Industrial

With a population of 408,300, Tallinn is the capital of Estonia. This represents approximately 30% of the population of the whole country.

The city was included in the HELCOM List of Hot Spots as the largest source of pollution in the whole of Estonia. At the beginning of the1980's the pollution load, measured in terms of BOD_7 exceeded 10,000 tons per annum. Before 1980, Tallinn's sewage water was pumped without treatment into Tallinn Bay via a three-kilometre-long deep-sea outlet. The first stage in upgrading the mechanical treatment plant was launched in 1980. The maximum capacity of the plant was 250,000 cubic metres daily (m^3/d). Four years later, in 1984, the construction of the second stage of mechanical and chemical treatment facilities was finalised.

However, it became clear that this mechanical-chemical treatment was insufficient either to meet HELCOM requirements or to protect the Bay of Tallinn. The BOD_7 values in the discharged waste water exceeded 150 milligrams per litre (mg/l) and the phosphorus concentration was over 3 mg/l.

Work on building biological treatment facilities started in 1986. However, within five years of that date, it had become clear that the standard Soviet design was still not providing the required level of efficiency. Thus, in co-operation with the Finnish Ministry of the Environment, all aspects of operations of the Waste-water Treatment Plant (WWTP) were reviewed, and the necessary improvements began to be put in place. 80% of the costs of revising this project were financed by Finland. The first stage in upgrading the biological treatment facilities commenced in 1993. The cost of this was 90 million Estonian Krone (EEK) 1, including 24 million EEK in assistance from Finland.

The capacity which was achieved as a result of this first stage of reconstruction enabled all the waste water to be treated in accordance with HELCOM Recommendation 9/2, which is applicable to dry seasons. However, because of Tallinn's combined sewerage system, one third of the city's storm water was also being directed into the WWTP. This meant that, during the rainy seasons, this first upgrade was incapable of treating the total volume of waste water. For this reason, work on the design of the second stage started during the actual period of construction of the first.

The second phase of construction, which involved widening and rebuilding a large section of the sewage treatment plant, was launched at the end of 1995 and completed in spring 1998. As a result of these works, the capacity of the treatment plant increased to 350,000 m^3/d. This means that, now, even during heavy rains, all the waste water can be treated in accordance with recommendations. Since the average amount of sewage water is about 150,000 m^3/d, the maximum capacity of the treatment plant is now more than twice that of this average.

The cost of the second stage of this project was 444 million EEK, including a 95 million EEK loan from the EBRD and an assistance grant amounting to 50 million EEK from Finland and Switzerland. In the construction works, equipment which had been dismounted from the Helsinki WWTP was also used. To meet the cost of the

1 The Estonian Krone is pegged against the EURO and the Deutschmark:
1 EURO = 15.6466 EEK; 1 DEM = 8 EEK. These are permanently fixed exchange rates.

treatment plant, 75% of the total amount was provided by local resources and the state budget, while 11% was contributed by foreign assistance and 14% by an EBRD loan.

In addition to the construction of the WWTP, a good deal of funding has been invested in the repair and upgrading of existing sewage pipelines and in the building of new ones. For example, between 1997 and 2000, 312 million EEK was invested in the sewage system. The total investment in water management of Tallinn during this period amounted to 1,161 million EEK.

Trends and patterns in the pollution load and in the quality of discharged waste water are presented below in Figures 1 - 6.

Figure 1

Amounts of Treated Waste Water between 1982 and 1999 (in 1,000 m^3)

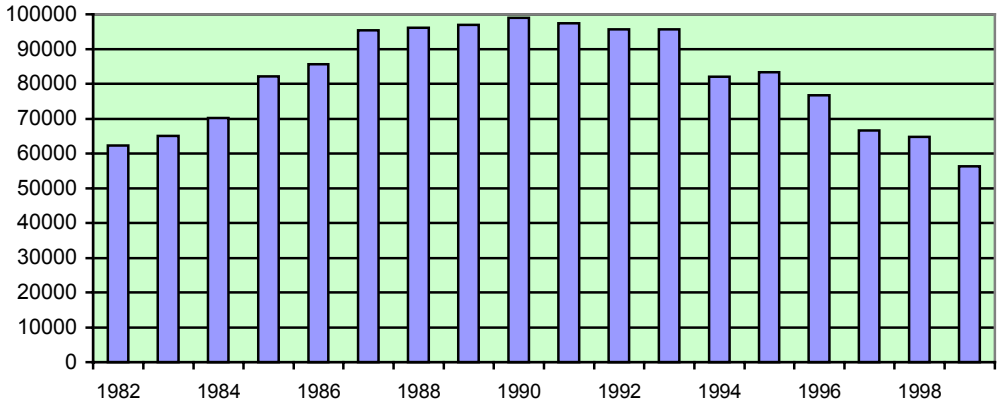


Figure 2

Dynamics of BOD_7 Load between 1982 and 1999 (in tons)

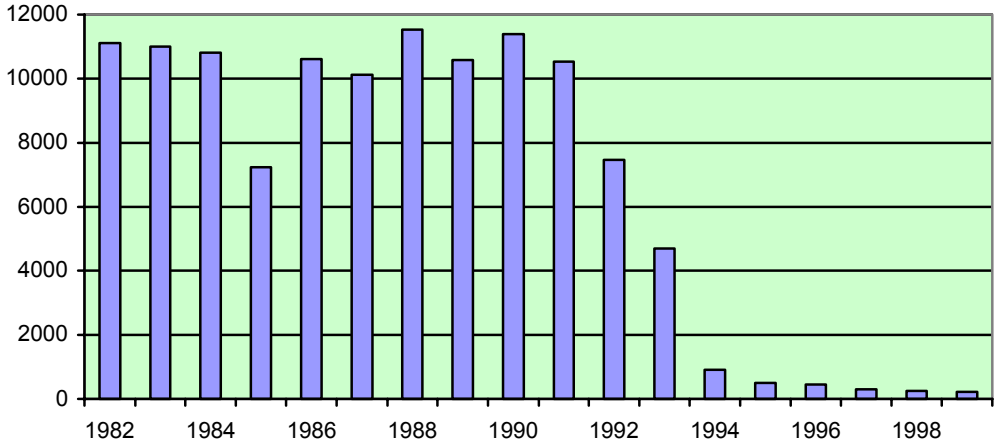


Figure 3

Dynamics of Phosphorus Load between 1982 and 1999 (in tons)

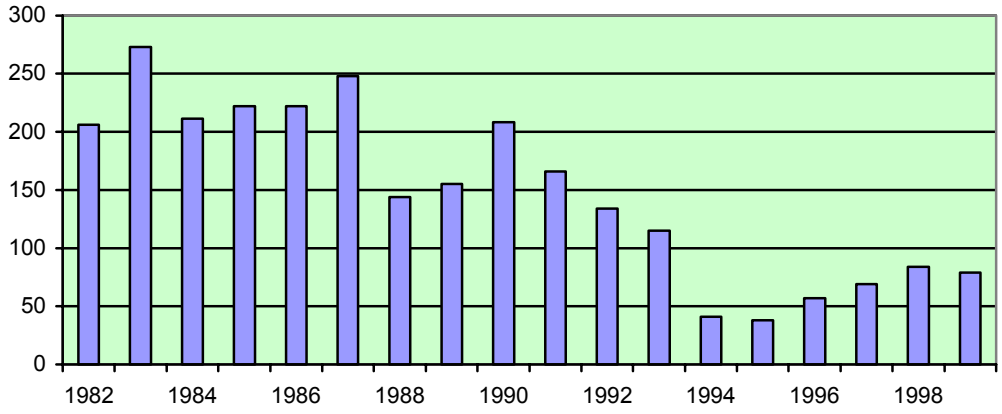
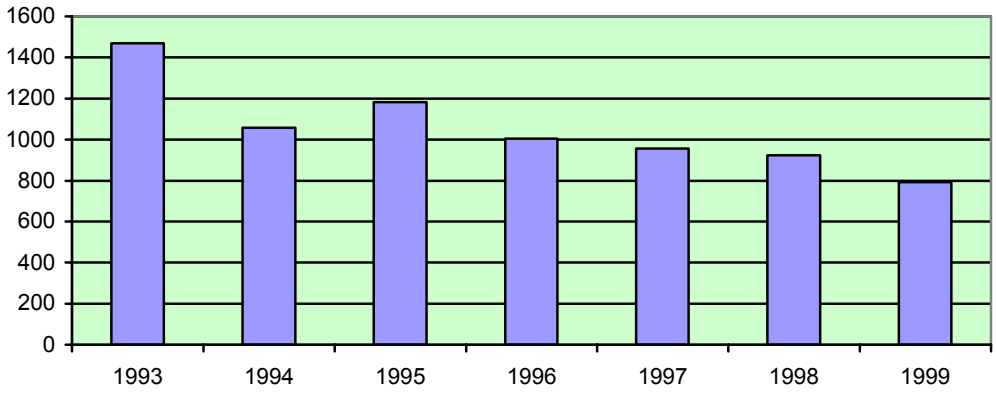


Figure 4

Dynamics of Nitrogen Load between 1993 and 1999 (in tons)



As the figures presented above clearly reveal, there has been a remarkable decrease in organic pollution. The 1999 level represents approximately 0.05 of the level in 1990. The figures also demonstrate that, by comparison with the decrease in the pollution load of organic matter, little progress has been made in phosphorus and nitrogen removal. The increase in the phosphorus load during recent years can be explained, firstly, by the fact that Tallinn did not use coagulant in 1998 or 1999, because it had already reached the required concentration of 1.5 milligrams of phosphorus per litre (mgP/l) without coagulant. The other reason for this recent increase in the phosphorus level has been the rise in the overall incoming load to the WWTP. However, Estonian legislation has provided for a maximum permitted phosphorus concentration in Tallinn of 1.5 mgP/l from the year 2001 on, which means that a further decrease in the phosphorus load can be expected without it. From the year 2001 the required phosphorus concentration for Tallinn according to Estonian legislation is 1.0 mgP/l.

Figure 5

BOD_7 and Nitrogen Effluent Concentrations between 1993 and 1999 (in mg/l)

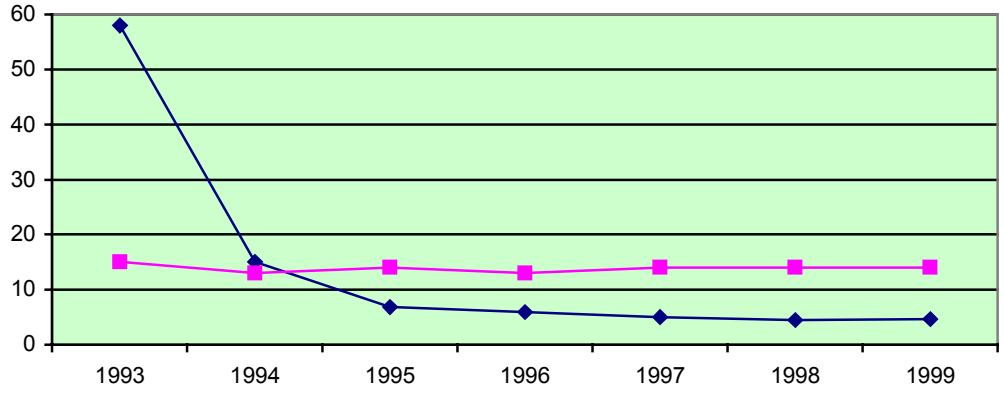
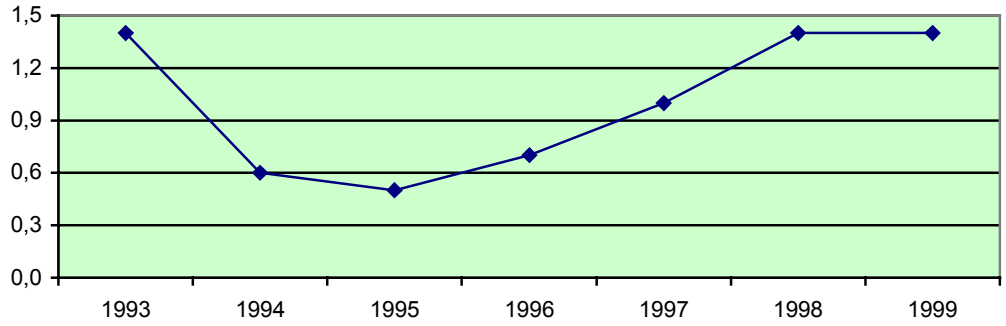


Figure 6

Phosphorus Effluent Concentrations between 1993 and 1999 (in mg/l)



Currently, the only problem which remains to be solved at the Tallinn WWTP is nitrogen removal. The goal is to reach the level of 10 milligrams of nitrogen per litre (mgN/l) by the year 2003. The required treatment effect could be ensured by constructing a biofilter for the final treatment of the waste water, but the problem is the high cost of this method, which amounts to approximately 300 million EEK. At present, various possible solutions are being considered, including the upgrading and rebuilding of aerotanks, the pre-treatment of water returning to the WWTP from sludge treatment, and the use of methanol.

At present, all the sludge produced in the waste water treatment process is itself being treated. Half of it is being deposited onto the landfill and the other half is composted with peat, wood fibre and sand. The difficulty is that the current sales outlets for this compost are not keeping up with the quantities of sludge which are being produced. However, the WWTP management is now actively engaged both in exploring new markets for the compost and in improving its quality. In future, the compost may be used more extensively in agricultural and green areas, as well as for covering in landfills and quarries. The potential for the production of granules for use as fertiliser is also being considered.

As a result of the water protection measures which have been implemented in Tallinn over the last decade, the water quality of Tallinn Bay has improved considerably. Stroomi Beach was re-opened in 1998 after being closed more than twenty years.

The privatisation of AS Tallinna Vesi (Tallinn Water plc) was finally ratified in January 2001. As a result, the majority of the company's shares passed to the International Water and United Utilities Consortium. This Consortium is now legally required to fulfil a number of obligations, all of which have been stated in the privatisation contract. Among these are the specific requirements that all built-up areas must be supplied with sewage pipelines by the year 2006, that the digital mapping of all underground pipelines must be worked out, and that the number of leakages must be decreased by 25%.

Hot Spot No. 31 – Haapsalu WWTP

Municipal and Industrial

Since 1976, the Government of Estonia has been exploring the best way to ensure the preservation of the unique curative mud resources in Haapsalu Tagalaht Bay, including the construction of a modern WWTP for Haapsalu. A mechanical WWTP was built in 1981.

In 1988, in the second phase of development, plans were drawn up and submitted which incorporated biological treatment. However, the Expert Committee for State Construction turned down the submission because this design was based on Soviet equipment and technologies.

However, 1988 was the time when the independence process was beginning to get under way in Estonia and, around this time, the local authorities set about establishing contacts with Swedish and Finnish grant-giving bodies and financial organisations. As a result, two separate studies were undertaken and published: 'The Haapsalu Sewage Treatment Plant – A Pre-Feasibility Study' in June 1991, and 'An Outline Pre-Investment Study for The Haapsalu Sewage Treatment Plant' in March 1992. These studies, which were financed by the Swedish Agency for International Technical and Economic Cooperation (BITS), formed the basis for the negotiation of loans from the EBRD and the Nordic Investment Bank (NIB) and also for several grant applications to Swedish and Finnish financial organisations.

Despite the strong support and encouragement of the Government of Estonia, the negotiations with the EBRD and NIB for a loan to construct the Haapsalu Waste-water Treatment Plant remained unsuccessful.

Then, in the summer of 1993, Lääne County Council set up informal contacts with representatives of the World Bank (WB), as a result of which the WB drafted its 'Initial Executive Project Summary for The Haapsalu and Matsalu Bays Environment Project', dated 14 June 1993.

In this document, for the first time ever, the issue of the Haapsalu Waste-water Treatment Plant was broached and discussed within the context of the far wider problems of environmental protection which affected the whole area: that is to say, it took into account the Moonsund Archipelago, the River Kasari catchment area and the Matsalu Nature Protection area.

As a result of the transference of the state-owned company Eesti Vesi to municipal ownership, on the basis of valuation of the assets of the structural units in the previous state-owned set-up (including land, buildings, apparatus, installations and know-how of personnel), a new company was set up on 13 February 1995, to be owned and directed by the municipality, under the name of Haapsalu Water Works. This company was then floated as a joint stock company on 6 December 1996, and was entered in the State Business Register on 12 February 1997

The reconstruction of the existing WWTP was launched in 1995 and completed in 1997. The following targets were achieved within the scope of this project:

- Rebuilding, Renovation and Upgrading:

- waste-water treatment plant	to 7,220 cubic metres daily
- water pumping stations 9 pc.	to 440 cubic metres hourly
- waste-water pumping stations	to 15 stations
- waste-water pipelines	1.25 km

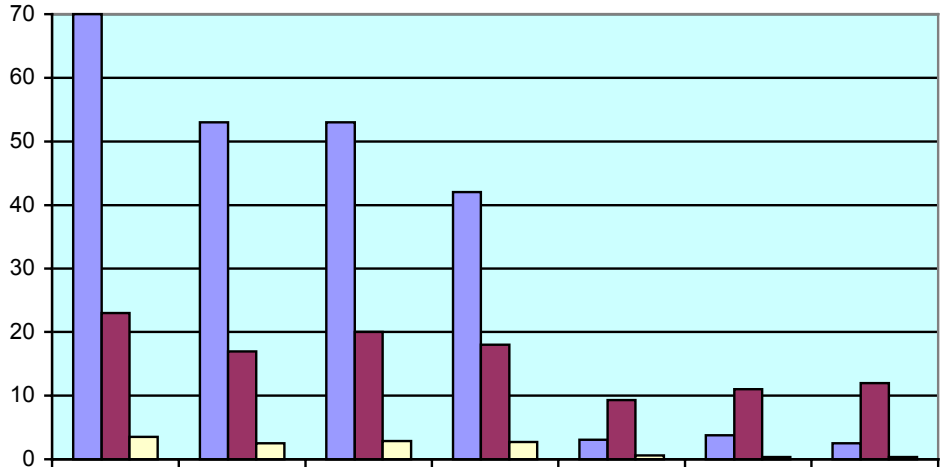
- New Constructions:

- waste-water pumping stations	6 stations
- waste-water pipelines	12.1 km
- water pipelines	4.9 km

As a result of these works, a remarkable decrease occurred in the pollution load. As may be seen from Figures 7 and 8, the WWTP has attained full compliance with HELCOM Recommendation 9/2 concerning BOD and phosphorus removal, despite the fact that nitrogen concentrations have still been at too high a level. By January 2001, however, the construction works for nitrogen removal and sand separation were finalised. It can thus be expected that, by June 2001, the tuning of these functions to their correct levels and cycles of operation will have been fully sychnonised – a relatively complex set of procedures involving thorough assessment of the optimal conditions for the biological process on the basis of the specific characteristics of the waste water at the plant. This in turn will mean that the treated waste water will have been brought fully into line with HELCOM Recommendation no.16/9 on nitrogen removal.

Figure 7

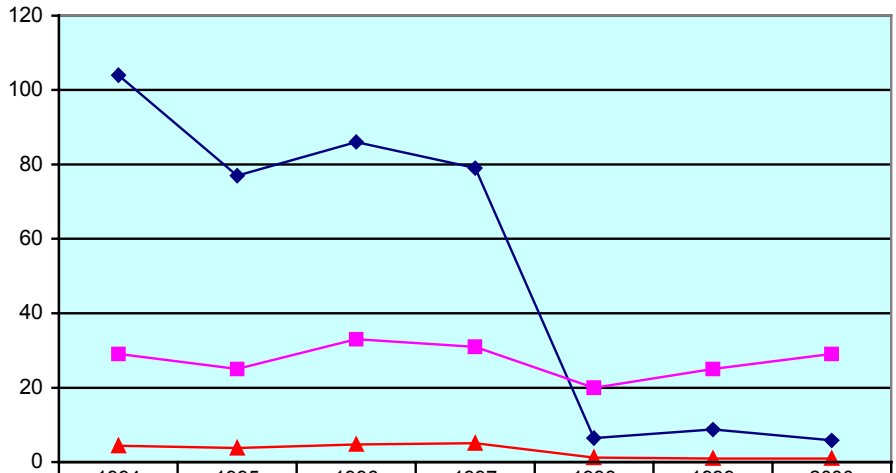
Pollution Load between 1993 and 2000 (in tons per annum)



	1994	1995	1996	1997	1998	1999	2000
BOD7	70	53	53	42	3.1	3.8	2.5
Ntot	23	17	20	18	9.3	11	12
Ptot	3.5	2.5	2.9	2.7	0.6	0.4	0.4

Figure 8

Quality of Discharged Waste Water between 1994 and 2000 (in mg/l)



	1994	1995	1996	1997	1998	1999	2000
BOD7	104	77	86	79	6.5	8.7	5.8
Ntot	29	25	33	31	20	25	29
Ptot	4.4	3.8	4.8	5.1	1.2	1.0	1.0

The cost of this whole project has been approximately 116 million EEK. This has included 7 million EEK from local resources, 32 million EEK from the state budget and 35 million EEK in the form of a loan from the WB, as well as 28 million EEK in assistance from Sweden and 14 million EEK in assistance from Finland.

As for the present sludge treatment facilities, these are still rather primitive, but owing to the lack of finances, no modernisation can be expected over the next five years. However, out of the nineteen waste-water pumping stations and the ten drinking water pumping stations currently in operation, only one of each of them requires reconstruction and upgrading.

Figures on the age of the equipment currently in use are as follows. 49.5% of water pipelines and 26.8% of waste-water pipelines are more than 20 years old. In Haapsalu, 12.7 km of water pipelines, representing 28% of the total number, are more than 40 years old. The majority of them need either to be repaired or to be replaced entirely. The majority of waste-water pipelines were not constructed until after 1960. However, owing to leakages and infiltration, approximately 20 km of these waste-water pipelines now need to be renewed or replaced. There are also some residential areas which do not yet have a central drinking water supply or sewage system.

From 2001 on, the repayment of the WB loan is likely to cause problems for the Haapsalu Water Works Company and Haapsalu City Council, for the following reasons:

- There has been a decrease in water consumption. Of the various prognoses which have been put forward, none have proved to be correct. As Table 4 shows, since 1994 the daily per capita consumption of water has more than halved and, even though the number of clients and consumers has increased, the sales of water and waste-water services have fallen by the same proportion.

- There has been a sudden increase in the USD rate.

- The tariffs for water and waste-water services have been frozen and it has not been possible to increase them. Over the last five years, the tariffs of Haapsalu Water Works AS have been the highest in Estonia, at 23.35 EEK per square metre.

- Today it can be concluded that the Haapsalu Project has been carried out successfully. Between 1995 and 2000, more than 100 million EEK have been invested in the Haapsalu water and waste-water networks, and every one of the Project's targets has been fulfilled.

Even so, it cannot yet be claimed that this project has yet wholly succeeded in fitting together all the pieces that need to be put in place for a 100% effective water and waste-water infrastructure for Haapsalu. It is estimated that approximately 120-150 million EEK will need to be invested in the water management of Haapsalu over the next 12 years.

Table 4

Water Production And Consumption

No	Indicator	Unit	1994	1995	1996	1997	1998	1999	2000
1.	Water Production	1,000 m^3	1,255.9	1,068.7	954.4	860.4	770.9	732.2	677.6
2.	Water Consumption Per Capita	l/per capita/d	175	153	139	117	89	79	77
3.	Domestic Water Sales	1,000 m^3	662.9	579.4	523.8	465.1	399.7	360.5	358.6
4.	Industrial / Commercial, Including Water Sales	1,000 m^3	298.4	280.9	229	205.5	178.2	182.3	182
4.1	Self-Consumption (*)	1,000 m^3	1.1	1.2	7.4	10.8	13.1	16.2	17.5
5.	Total Water Sales	1,000 m^3	961.3	860.3	752.8	670.6	577.9	542.8	540.6
6.	Unaccounted-for-Water	1,000 m^3	294.6	208.4	201.6	189.8	193	189.4	137
6.1	Unaccounted-for-Water	%	23.5	19.5	21.1	22.1	25	25.9	20.2
7.	Length of Water Network	km	23.3	24.4	24.4	30.9	39	42.8	46.8
8.	Water Loss	1,000 m^3/ km Per year	12.6	8.5	8.3	6.1	4.9	4.4	2.9
9.	Total Sewerage Sales	1,000 m^3	827.2	673.7	607.8	566	477	434.6	439.3

(*) The term 'Self-Consumption' in the above table indicates the amount of water needed by the plant for its own daily operations, including upkeep and maintenance.

Hot Spot No. 33 – Pärnu WWTP
Municipal and Industrial

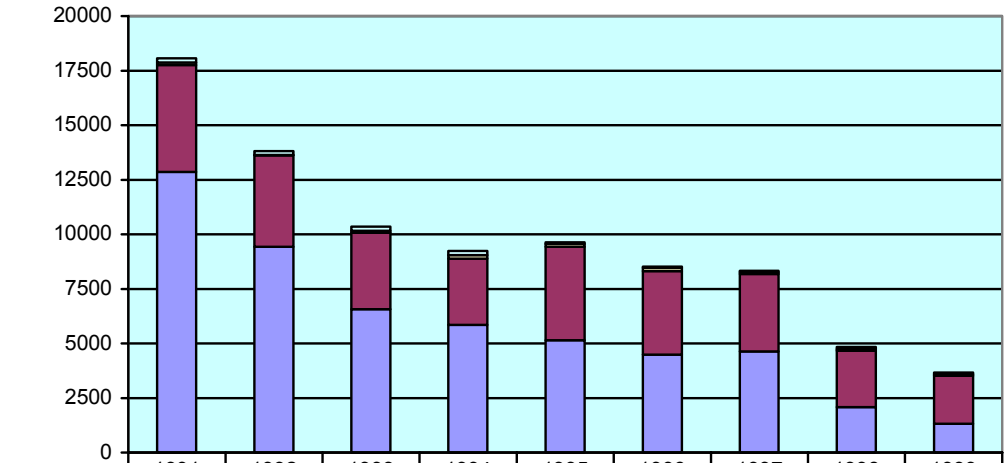
Pärnu is the fifth largest city in Estonia, with a population of 51,000. Pärnu has been well known as a Baltic coastal holiday and health resort since the beginning of the 20th century.

A biological WWTP started operating in Pärnu in 1990. The reason why Pärnu was first included in the HELCOM List of Hot Spots was not to do with any fault or deficiency in the WWTP itself but because only about 45% of the waste water was being treated, while the rest was being discharged untreated into the River Pärnu. The resulting microbiological pollution meant that, in the early 1990's, the beaches of Pärnu had to be closed for three seasons.

During the 1990's, considerable changes took place in water management in Pärnu. The reduction in industrial production and a more rational use of water resulted in consumption decreasing to almost a fifth of its 1990 volume, as may be seen in Figure 9 below.

Figure 9

Water Consumption in Pärnu between 1991 and 1999 (in 1000 m^3)



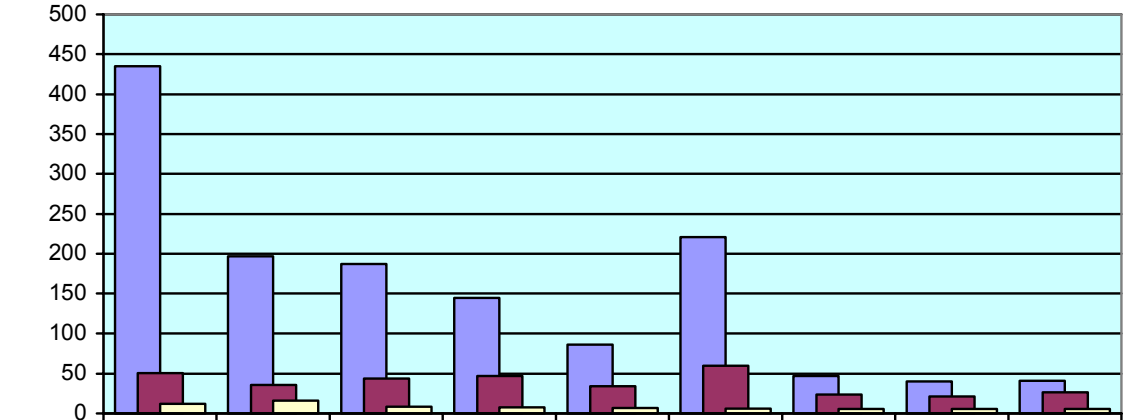
	1991	1992	1993	1994	1995	1996	1997	1998	1999
Other	184	178	191	194	74	59	80	90	65
Energy	120	12	96	171	135	136	84	74	70
Domestic	4900	4203	3502	3021	4273	3838	3540	2591	2203
Industry	12848	9422	6565	5857	5146	4487	4635	2076	1323

The reconstruction of Pärnu WTTP began in 1992 with the renovation, repair and improvement of its aeration system. In 1996, biological treatment procedures were also upgraded to include phosphorus removal, followed in 2000 by the upgrading of mechanical treatment methods. New facilities for sludge treatment were built in 1999, i.e. for composting. Since then the percentage of waste water being treated has also risen thanks to the upgrading and expansion of the sewage pipeline network in 2000, which increased the length of pipelines from 45 to 80 km. Moreover, during the 1990's, most of the sewage pumping stations were renovated and a number of new ones were built.

As a result, the microbiological state of the bathing water of the Pärnu beaches is no longer a serious problem. The microbiological indicators indicate levels which are 5 to 10 times lower than those permitted. Figures 10 and 11 illustrate the reductions in the pollution load and the quality of the discharged waste water in the period between 1991 and 1999.

Figure 10

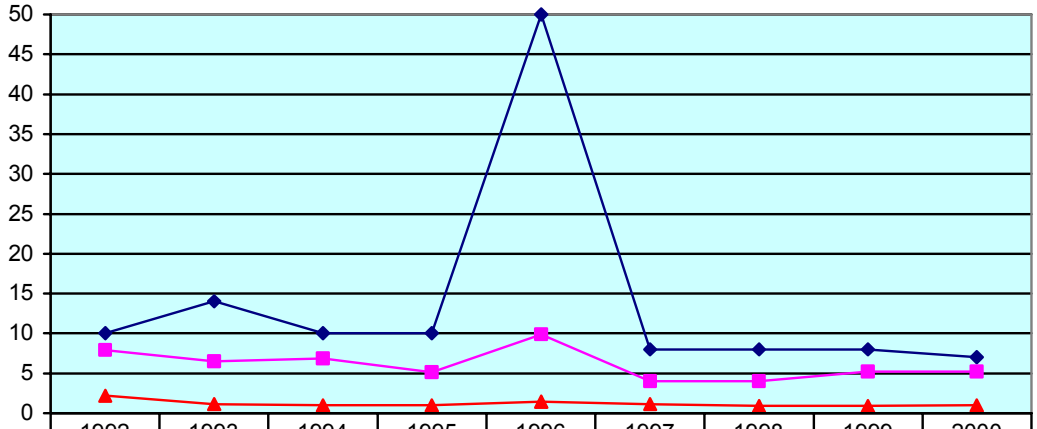
Change to Pollution Load between 1991 and 1999 (in tons)



	1991	1992	1993	1994	1995	1996	1997	1998	1999
BOD7	435	197	187	145	85.6	221	46.8	40.3	40.6
Ntot	50.8	35.2	43.7	46.9	33.6	59.8	23.4	21.3	26.5
Ptot	12.3	15.9	8.4	7.2	6.7	6.4	5.2	5.2	5.1

Figure 11

Changes in WTTP Effleunt Characteristics, 1992-2000 (in mg/l)



	1992	1993	1994	1995	1996	1997	1998	1999	2000
BOD7	10	14	10	10	50	8	8	8	7
Ntot	7.9	6.5	6.9	5.1	9.9	4	4	5.2	5.2
Ptot	2.2	1.1	1	1	1.4	1.1	0.9	0.9	1

As Table 5 shows, compilation of information from various sources indicates that 113,100,000 EEK was invested in the water management of Pärnu city during the 1990's.

Table 5

Investments in the 1990's (in MEEK)

	Total	Local Budget	State Budget	Envir. Taxes	Loans (EBRD, NEFCO)	Foreign Aid (Finland, PHARE, ECOS-OUVER-TURE)
Water Supply	42.3	18.0	5		19.3	
WTTP	37.1	2.6	1.0	1.0	1.0	31.5
Sewerage System	30.7	26.4	4.3			
Sludge	3.0	0.5	0.6	1.1		0.8
Total	113.1	47.5	10.9	2.1	20.3	32.3

From the data presented above, it can be seen that the WTTP now fulfils the relevant HELCOM Recommendations on waste-water treatment. However, the sewerage system is still an obstacle towards the deletion of Pärnu from the List of Hot Spots. The present level of waste water being directed to the WTTP is 80%, which does not yet meet the HELCOM criteria for the deletion of Hot Spots. The sludge treatment also needs some upgrading. Thus the following improvements have been planned for the next four to five years:

- The renovation of the WWTP's sludge-centrifuging unit, at an estimated cost of 5 million EEK. This cost will be borne by Pärnu Vesi (Pärnu Water), which runs the WWTP and is responsible for the drinking water supply, the pipelines for drinking water, sewage water and sludge handling. Pärnu Vesi is owned by the municipality, Pärnu County Council.

- The construction of a sewage system. About five square kilometres of the city area still lack a sewage system, and an Instrument for Structural Policies for pre-Accession (ISPA) project application has already been submitted to the Estonian Ministry of Finances for consideration by the European Commission (EC), in order to obtain financing for the construction works. The estimated investment required for this project amounts to approximately 100 million EEK.

- The construction of a new landfill in co-operation with Pärnu County Council. The estimated overall cost of this project is 1,360,000 EEK. This funding has been applied for, and it is hoped that part of this expenditure will also be covered by an ISPA from the EC.

Hot Spot No. 34 – Paide WWTP

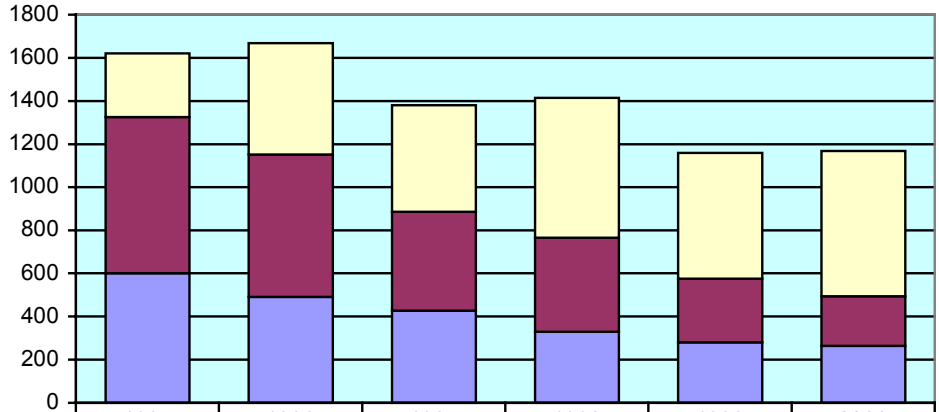
Municipal and Industrial

Paide is a medium-sized town in Central Estonia, with a population of 10,300. Its waste water is discharged into the River Pärnu.

The WWTP, which belongs to AS Paide Dairy, was built in 1980 at the same time as the dairy itself. It treats waste water not only from the dairy, but also from other industrial and business premises in the town as well as from households. Even in the 1980's, the biological treatment only worked at a satisfactory level during the dry season. Whenever heavy rains occurred, storm water infiltrated the sewage system, thus overloading the WWTP so that waste water frequently had to be diverted from the WTTP to flow directly into the River Pärnu. From year to year, the volume of infiltrating storm water varied between 20% and 50% of the overall volume of treated waste water, and this still represents a serious problem.

Figure 12

Waste-water Discharges between 1995 and 2000 (in 1,000 m^3)



	1995	1996	1997	1998	1999	2000
Infiltration	295	515	495	648	583	673
Dairy	725	661	458	437	296	232
Municipal	600	491	428	329	280	263

In 1994, it was decided to reconstruct the existing plant. This decision was based both on the measurements of waste-water flow and on the considerable expertise which had already been built up at the old WWTP. The reconstruction, which was launched in 1996, was complicated by the fact that it was important to cause the minimum disruption to the work of the plant, which needed to continue while works were going on. In order to achieve this target, works proceeded in stages, starting with the end of the treatment process.

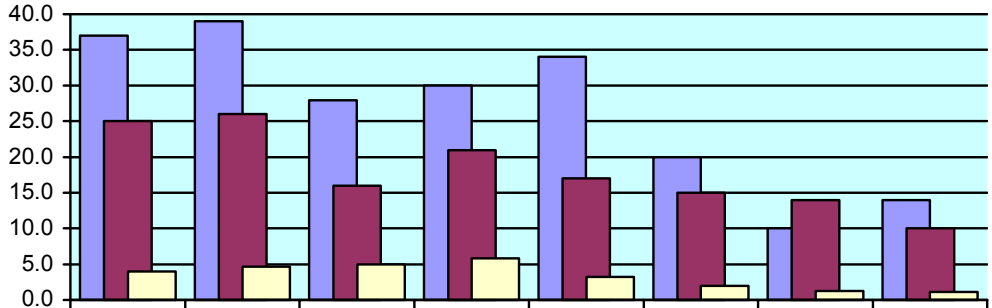
This meant first replacing the aeration system. In the old plant, there were eight aerotanks. Thanks to a decrease in the volume of waste water, only four of them proved to be necessary for the aeration process, which it turn meant that the other four became available for use in the anaerobic process. The renovation of the aeration process was then followed by the reconstruction of the mechanical pre-treatment and pre-sedimentation processes. This was followed in turn by the installation of automatic equipment to control the treatment process. Since then, equipment capable of controlling the addition of chemicals has also been installed, but at present this is only being used to stabilise the treatment process.

Between 1995 and 2000, 11.7 million EEK was invested in the renovation, rebuilding and upgrading of the WWTP, including 5.1 million EEK from local resources, as well as 4.3 million EEK from the Estonian Environmental Protection Fund and 2.3 million EEK from the State budget.

As a result of the reconstruction made possible by these investments, the WWTP has been able to fulfil all the relevant HELCOM Recommendations as well as the requirements of Estonian law. The reductions in the pollution load and the improvement in the quality of the discharged waste water are indicated in Figures 13 and 14.

Figure 13

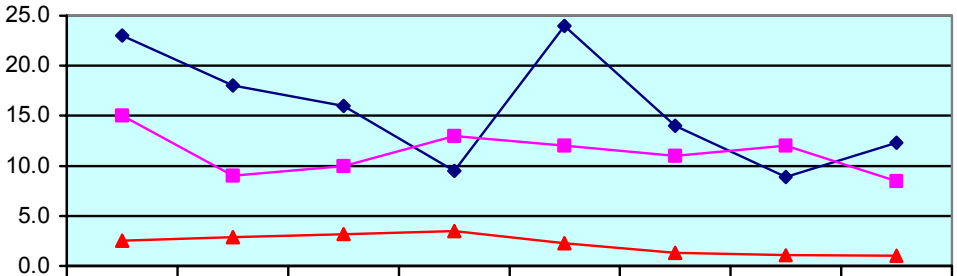
Pollution Load between 1993 and 2000 (in tons per annum)



	1993	1994	1995	1996	1997	1998	1999	2000
BOD7	37	39	28	30	34	20	10	14
Ntot	25	26	16	21	17	15	14	10
Ptot	4	4.6	5	5.8	3.2	1.9	1.3	1.1

Figure 14

Quality of Discharged Waste Water between 1993 and 2000 (mg/l)



	1993	1994	1995	1996	1997	1998	1999	2000
BOD7	23	18	16	9.5	24	14.0	8.9	12.3
Ntot	15	9	10	13	12	11	12	8.5
Ptot	2.5	2.9	3.2	3.5	2.3	1.3	1.1	1.0

To complete the overall reconstruction, new sludge treatment facilities are also needed. This work is planned for 2001-2002, at an estimated cost of 7.5 million EEK.

The other important remaining task is the rebuilding and upgrading of existing sewage pipelines and the installation of new ones. As may be seen in Figure 12, the infiltration of ground water into the sewage pipeline still represents between 20% and 50% of the total volume of waste water, and this needs to be decreased. The main problem for water management in Paide has certainly been the quality of its drinking water and, in 2000, approximately 30 million EEK was spent on improving this. The fact that this particular problem has almost been solved has meant that more money can be allocated to sewage pipelines, on which 13 million EEK has already been spent between 1999 and 2000. To achieve these and other improvements, Paide has drawn up an overall development plan for water management for the next twelve years.

Hot Spot No. 25 – The Narva Power Plants

Industrial

The Thermal Power Plants (TTP's) at Balti and Eesti were jointly included in the Baltic Sea Joint Comprehensive Environmental Action Programme (JCP) as an industrial Hot Spot owing to the considerable negative impact they were having on the environment. This was caused both by the high level of their air emissions and by the amount of waste they were generating. In 1990, these plants together emitted 166 thousand tons of SO_2 into the air and more than 153 thousand tons of solid particles, which contributed significantly to trans-boundary air pollution.

The Balti TPP is one of the largest oil shale heated thermal power plants in the world. It is located in the North-East of Estonia, 5 km outside Narva, a town of 95,000 inhabitants. It was built between 1959 and 1965 to form part of the interconnected power system of the Baltic Republics.

The Balti TPP was built in four stages, mainly to fulfil the requirement for steam in the manufacturing and industrial processes of a number of enterprises in Narva. During the first three stages, this process steam was provided at a pressure of 1.5 megapascals (MPa) at 300°C, by seventeen boilers with a steam production capacity of 53 kilograms per second (kg/s), through the operation of eight 100 MW turbines and two 12 MW backpressure turbines. The Balti TPP also became the sole centralised supplier of heat and hot water for Narva and its population. During the fourth stage, four double-powerblocks were added, consisting of generators, 78 kg/s boilers and 200 MW turbines. The plant's electrical capacity is 1,390 MW and its thermal capacity is 505 MW.

The specific properties of the local oil shale have given rise to a number of engineering problems, of the kind which have to be taken into account in designing any new equipment. These properties include: a low calorific value of around 8.4 megajoules per kilogram (MJ/kg); a high ash content of up to 50%; a moisture content of around 12%; the continuous formation of bounded ash deposits on the boiler heating surfaces; the abrasive behaviour of the ash; and the high temperature corrosion of heating surfaces.

The main equipment of the plant is not only outdated but worn out, and needs completely overhauling and modernising. The main equipment has been in operation for more than 200,000 hours.

The basic power units installed have an electrical capacity of 200 megawatts (MWe), each of which has been equipped with two TP-6 7 steam boilers, a K-200-130 turbine and a TVV-200 generator.

As for the Eesti TPP, this was built between 1969 and 1973, with a total capacity of 1,600 MW, including 8 power blocks of 200 MW each. It has TP-101 boilers, K-200-130 turbines and TVV-200-2 generators, with the same technical specifications as those at the Balti TPP.

Since the beginning of the 1990's, there has been a decrease in the emissions from both of these power plants, resulting mainly from a decline in production and the restructuring of the economy. Since 1998, the company which owns both plants, Eesti Energia AS, has furthered these decreases by investing considerable amounts

in improved efficiency and environmental measures. These figures may be seen in Table 6.

The majority of the funding for these environmental improvements has come from the company's own resources. This has been complemented by loans from the international financial markets as well as special environmental loans provided on advantageous terms by the NIB. Some bilateral assistance has also been received from the Finnish Ministry of the Environment for particular pilot projects, for instance the installation of a scrubber to remove sulphur from exhaust gases, and the renovation and upgrading of the control system for the power unit at Balti TPP. These are shown in Table 7.

To date, the main target of these environmental investments has been to rehabilitate the electrostatic precipitators, in order to decrease the levels of fly ash emissions at the powerblocks which cover the base load of power production. At the same time, parallel investments have been made in upgrading efficiency throughout Eesti Energia AS, the company which owns Narva Elektrijaamad AS (Narva Power). The renovation of the turbines and control systems and the improvements in the transmission and distribution grid have had a significant positive effect on the environment. This information is presented in Annex 1.

Table 6

Air Emissions and Ash Depositing at the Balti and Eesti TPP's, 1980-1999

Year	SO_2 (tons)	CO_2 (tons)	NOx (tons)	Solids (tons)	Ash Depositing
1980	190,249	21,190,229	17,216	183,336	7,747,000
1981	178,104	19,788,005	16,024	171,657	7,139,000
1982	182,254	20,446,666	16,624	174,880	7,533,000
1983	185,220	20,682,874	16,770	173,196	7,153,000
1984	179,124	20,022,878	16,248	167,142	6,590,000
1985	174,193	19,468,176	15,799	163,902	6,082,000
1986	173,624	19,408,428	15,753	164,176	5,765,000
1987	171,803	19,295,539	15,813	164,673	6,022,000
1988	167,928	18,914,225	15,400	156,689	5,858,000
1989	167,321	18,884,694	15,402	157,066	6,242,000
1990	165,935	18,791,759	15,347	153,448	7,262,000
1993	95,815	11,035,359	9,021	100,896	5,454,000
1996	78,318	10,568,975	10,300	73,340	5,350,000
1999	66,994	9,880,559	8,505	60,455	4,501,000

Table 7

Environmental Investments by Narva Elektrijaamad AS (Narva Power)

Action	Investments in 1000's EEK		
	1998	1999	2000
Renovation of Electrostatic Precipitators (ESP's) at Eesti TPP	61,670	71,405	97,076
Construction of Water Channels at Eesti TPP	167		
Construction of WTP for the Alkaline Waters of Ash-Ponds at Balti TPP and at Eesti TPP	19,112	6,425	2,177
Reconstruction of Water Channels of Ash-Pond at Balti TPP	3 ,260	3,498	
Reconstruction of Dams at Ash-Ponds		3,832	10,287
Construction of Turbine Oil Treatment Facility at Eesti TPP	1,739		
Renovation of Inner Air Treatment of Balti TPP	315	2,048	
Automatisation of Ash Removal		1,641	
Pilot Renovation of Ash Removal for Thick Slurry			5,358
Renovation of Turbine Coolers		1,003	1,114
Renovation of Low-Pressure Turbine		65,294	35,170
Renovation of Gasoline Pumps			272
Renovation of Waste-water Canalisation			1,604
Improvement of Emissions Monitoring			243
Total	**86,128**	**155,146**	**153,301**

Estonia has applied for membership of the European Union and has committed itself to approximate to EU legislation by 1 January 2003. Thus the goal of compliance with EU environmental norms has been the main driving force behind Narva Power's environmental investments. In order to fulfil all of the EU's environmental requirements which are relevant to Narva Power, Estonia has already requested that a transition period be granted until 2009 to upgrade its methods of ash depositing, and will probably also ask for a similar transition period to implement the newly amended Directive on Air Emissions from Large Combustion Plants (LCP's), which will insist on even stricter norms being applied to existing power plants.

Between 2001 and 2009, Narva Power will carry out a major re-powering of the two 200 MW units (one in the Balti TPP and one in the Eesti TPP) using Circulating Fluidised Bed Combustion Technology. This will have a major impact on reducing the emissions of SO_2 and solids. Many of the improvements planned by the company are specifically concerned with ash removal. Plans are also under way to upgrade the transportation system in both power plants for the removal of ashes in the form of thick slurry. The experimental stage for this new technology is expected to be completed by the end of 2001. A total sum of 17 million EURO's has been allocated to cover both the installation of this new ash removal technology and the wholescale renovation of landfilling technology and equipment. This sum is to be spent by the year 2008-2009.

In addition, these works and investments are to be supported by other technical and environmental measures which will ensure the full implementation of the EU Directive on Landfills. A total of 44,430,000 EURO's has been allocated to the restitution and upgrading of existing inert waste landfills at the power plants and the construction of new ones. This sum is to be broken down into two components:

- 21,090,000 EURO's for the remeidation of past pollution.

- 23,340,000 EURO's for the renovation of ash removal technology and the restitution and upgrading of the old ash pond.

These investments to meet the requirements of the EU Directive on Landfills are relatively small by comparison with the simultaneous investments which are required to meet the EU directives on Integrated Pollution Prevention and Control (IPPC's) and LCP's. The latter involve the considerably larger costs of refurbishing boilers and renovating combustion technology in order to diminish emissions from oil shale power plants. The total cost of modernising these energy production capacities will amount to 370 million EURO's.

Table 8

Investments by AS Narva Elektrijaamad in the Renovation of Combustion Technology and Environmental Measures, 2001 - 2009

Technological and Environ-mental Measures	2001	2002	2003	2004	2005	2006	2007	2008	2009	2001-2009
Renovation of Combustion Technology & Refurbishment of Boilers	43.62	82.40	81.38	82.10	5.30					294.8
Renovation of Air Pollution Abatement	2.98				2.80	2.80	2.80	8.20	7.52	27.1
Renovation of Water Supply and Treatment Systems	1.99	0.46	1.22							3.67
Development and Implementation of New Technology for Disposal of Oil Shale Ash	0.34	1.00	5.63	3.66	1.73	1.66	1.66	1.66		17.34
Closure of Abandoned Ash Fields	0.50	0.50	2.50	2.5						6.0
Construction of New Landfills and Remediation of Past Pollution	0.85	0.85	1.70	1.70	3.92	3.92	2.80	2.80	2.55	21.09
Total	50.28	85.21	94.43	89.96	13.75	8.38	7.26	12.66	10.07	370.0

ANNEX 1

Environmental Benefits of the Main Investments Projects of Eesti Energia AS in the Fiscal Year 2000-2001 (in tons per annum)

No.	Project Title	Reduction of Air Emissions				Reduction of Ash Depositing	Other Benefits
		CO_2	SO_2	NOX	Part-icles		
1.1	Renovation of Water Treatment Plant at Eesti TPP	-	-	-	-	-	Reduction of water consumption by 145,600 m³/y, and reduction of waste-water discharge by 230,000 m³/y.
1.2	Refurbishment of LP Rotor of Turbine No.6 at Eesti TPP	71,000	640	70	600	32,000	
1.3	Refurbishment of LP Rotor of Turbine no.12 at Balti TPP	71,000	640	70	600	32,000	
1.4	Renovation of Control System of Power Unit No. 5 at Eesti TPP	20,000	180	20	170	9,000	
1.5	Renovation of the Dredger Pump-Stations at Eesti TPP	-	-	-	-	-	Reduction of power for self-use.
1.6	Replacement of Bulldozers at Eesti and Balti TPP	-	-	Data n/a	Data n/a	-	Reduction of diesel fuel consumption by 50 t/y.
1.7	Installation of Pump-Stations for Emergency	-	-	-	-	-	Reduction of risks of accidents.
1.8	Replacement of ESP on Units Nos 5 and 6 at Eesti TPP	-	-	-	12,000	- 12,000	-
1.9	Reconstruction of Settled Water Channels at Eesti TPP	-	-	-	-	-	Reduction of risk of accidental releases of alkaline water.
1.10	Modernisation of Lubricant Coolers	-	-	-	-	-	Reduction of oil leakage by 0.5 tons per annum.
1.11	Construction of Pilot Ash-Transportation System at Balti TPP	2,520	23	2	27	1130	Reduction of power for self-use by 1.8 GWh/y

1.12	Other Projects at Narva Power Plants	-	-	-	-	-	Improvement of waste-water treatment and solid waste management; remediation of polluted soil; prevention of accidents; prevention of heat and power losses, etc.
1.13	Process Automation at Iru PP	8,000	60	20	1	-	
1.14	Installation of Variable Speed Drives for Feed Water Pumps	2,000	15	5	-	-	Reduction of power consumption by 3.3 GWh/y
1.15	Reconstruction of Excitation System of Generators	-	-	-	-	-	Reduction of risks of accidents.
1.16	Replacement of 6kV Circuit Breakers	-	-	-	-	-	Reduction of risks of accidents.
1.17	Renovation of Water Treatment Plant	-	-	-	-	-	Reduction of water consumption by 29,000 m³/y and reduction of waste-water discharge by 46000 m³/y,
1.18	Reconstruction of Linnamäe Hydro Power Plant	7,280	68	6	78	3300	Replacement of oil-shale use at Balti TPP and production of 'green' energy .
1.19	Installation of Wind Turbine	2,380	22	2	25	1080	Replacement of oil-shale use at Balti TPP and production of 'green' energy.
1.20	Other Projects at Iru Plant	-	-	-	-	-	Improvement of waste management; remediation of polluted soil; prevention of accidents; prevention of heat and power losses, etc.
2.1	Construction of Eesti-Püssi 330 kV high-voltage line	8,400	78	7	90	3790	Reduction of power losses by 6 GWh/y.
2.2	Reconstruction of Tartu 330 kV Substation	-	-	-	-	-	Reduction of power losses.
2.3	Construction of Kadaka 110 kV Substation	-	-	-	-	-	Reduction of power losses .
2.4	Installation of Metering Systems	-	-	-	-	-	Reduction of power losses.
2.5	SCADA – re-equipment of Dispatch Centre	-	-	-	-	-	Reduction of power losses.

2.6	Others in National Grid	-	-	-	-	-	Improvement of waste management; remediation of polluted soil; prevention of accidents; reduction of power losses, etc.
3.1	Construction and Reconstruction of 0.4-20 kV networks	-	-	-	-	-	Reduction of power losses.
3.2	Installation of Metering Systems and Metering Points	-	-	-	-	-	Reduction of power losses.
3.3	Client Information System	-	-	-	-	-	Reduction of power losses.
3.4	GIS for Networks	-	-	-	-	-	Reduction of power losses.
3.5	Other Projects in Distribution Networks and Sales	-	-	-	-	-	Improvement of waste management; remediation of polluted soil; prevention of accidents; reduction of power losses, etc.
4	Other Projects	-	-	-	-	-	Improvement of waste management; remediation of polluted soil; prevention of accidents; reduction of power losses, etc.
	TOTAL	192,580	1,726	202	13,591	70,300	

Hot Spot No. 27 – The Kehra Pulp and Paper Plant
Industrial

The former Kehra Pulp and Paper Plant was chosen as a Hot Spot because of its responsibility for large amounts of atmospheric emissions and high levels of water pollution. Each year, due to its high consumption of black oil and oil shale for burning, the plant produced 40-50,000 tons of unbleached pulp and released about 2200 tons of SO_2. The plant was also discharging about 350 tons of BOD_5 per annum directly into the River Jägala from its untreated ash-pit system. The Kehra Pulp and Paper Plant was closed between 1993-1994 and reopened in September 1995 under new ownership and the new name of 'Horizon Pulp and Paper'.

Horizon Pulp and Paper produces unbleached kraft pulp (i.e. 'so called sulphate pulp'), a batch cooking system and black liquor chemical recovery system. To make its final products, it has three paper machines and equipment for sack production. The present annual production capacity is 50,000 tons of pulp. A new ash-basin return-effluent system was put into operation in February 1997, which made it possible to direct untreated effluent into the biological treatment plant. At present, all the waste water is directed to the biological treatment plant. In Tables 9-12, general data are presented concerning production, water consumption and pollution and, in Table 13, the data concerning the completed and planned investments are presented.

Table 9

General Data about Horizon Pulp and Paper

Year	1996	1997	1998	1999	2000
Paper Production (in tons)	19,494	34,261	41,885	47,698	51,943
Process Water Consumption, t/m^3	6,943	9,121	9,371	9,484	9,092
Discharges:					
Treated	5,035	9,434 (*)	10,119 (*)	10,196 (*)	9,370 (*)
Untreated	263	29	-	-	-

(*) After the return-effluent system had been put into operation, the drainage from the surroundings of the ditch was added to HPP's discharge.

Table 10

Fuel Consumption

Fuel	Oil-shale	Black Oil	Natural Gas	Bark and Sawdust
KEHRA PAPER				
1989	22,000	47,258	-	-
1990	9,680	41,163	-	-
1991	3,701	42,554	-	-
HORIZON				
1996	-	19,818	-	-
1997	-	6,687	26,269	-
1998	-	26,726	8,809	-
1999	-	17,772	18,077	10,405
2000	-	1,292	35,290	9,564

Table 11

Emissions into the Atmosphere (in kg/ADP)

Year	H_2S	SO_2	NO_2 (kg/GJ)	CO (kg/GJ)	Solid particles (Na_2SO_4)
KEHRA PAPER					
1989	6.0	35.4	4.0	25.5	29.4
1990	3.7	43.7	4.2	21.6	18.7
1991	2.8	55.9	4.3	17.2	26.8
HORIZON					
1996	2.7	46.6	10.2	4.1	29.3
1997	1.3	1.8	4.3	1.7	16.1
1998	1.3	18.7	6.7	2.7	9.4
1999	1.8	16.6	2.9	5.3	14.2
2000	2.0	1.8	2.7	4.5	17.8

Table 12

Waste-water Discharges (in kg/ADP)

Year	BOD_5/BOD_7	Suspended Solids	N_{TOT}	P_{TOT}	COD
KEHRA PAPER					
1989	8.9	17.0	0.26	0.08	46.5
1990	10.9	19.6	0.42	0.11	47.9
1991	10.4	17.4	0.42	0.10	47.8
HORIZON					
1996	3.2	3.1	0.41	0.11	27.5
1997	2.9	4.5	0.08	0.09	36.1
1998	2.5	4.1	0.6	0.1	24.8
1999	1.8	2.5	0.03	0.02	16.1
2000	2.3	2.9	0.2	0.01	26.3

Table 13

Investment Programme, Phase I

Year	Investment, in MEEK	Main Action => Effect
1996	4.78	Conversion of first boiler from oil fuel to gas fuel system => Reduction of SO_2
1997	5.09	Completion of new return-effluent system for ash basin overflow => Reduction of pollution load into river
1998	6.26	Instalment of bark boiler => Reduction of solid wastes and saving of energy
1999	3.64	Conversion of second boiler from oil to gas firing => Reduction of SO_2 emission

Phase II

Year	Investment, in MEEK	Main Action => Effect
2000	64.4	Preparation for upgrading of recovery boiler and evaporation plant => Minimising of bad smelling gases
2001	(~ 60,0)	Erection of new black liquor concentrator instead of cascade evaporator => Minimising of bad smelling gases Erection of new electrostatic precipitator => Minimising emission of solid particles as Na_2SO_4

After major changes were made in the burning processes of the power plant, between 1996 and 2000 there was a decrease in emissions from 966 tons to 99 tons, representing a reduction of about 90%. In February 1997, the flow of high alkaline untreated effluent via ash basins into the Jägala River was stopped. In 1991, the amount of discharged BOD_5 was 610 tons, and of suspended solids 730 tons. By 2000, the pollution load had been reduced to 125 tons of BOD_7 and 157 tons of suspended solids. Thus, compared with 1991, the reduction of the BOD load was 80% and the load of suspended solids 78%. The disposal of solid wastes in the dumping area decreased by more than 90% thanks to the installation of a bark-burning boiler.

Several further projects are concerned with environmental issues and funding. One is the improvement in air emissions from the recovery boiler and evaporation plant. Removal of the existing cascade evaporator and the introduction of a black liquor concentrator will reduce the emission of total reduced sulphur (TRS) by more than 90%, as it will also do for hydrogen sulphide (H_2S). The erection of the new electrostatic precipitator will reduce dust emissions (measured as Na_2SO_4) by 98%. The investment programme will also include the installation of a lime kiln and the modernisation of the digester house to enable odour gases to be collected and burned. Reduction of the lime sludge will reduce solid wastes by as much as 85-90%, that is, 17,400 tons per annum. Installation of a blow heat recovery system will prevent steam gases being released into the atmosphere with each cooking batch.

Table 14 presents Horizon Pulp and Paper's current and planned levels of compliance with the relevant HELCOM Recommendations. It can be concluded that by 2000-2001, when Phase II of the investment programme has been completed with the modernisation of the recovery boiler, the plant will almost have come up to the required HELCOM standard. Only sulphur emissions still slightly exceed the permitted level.

Table 14

Compliance with HELCOM Requirements

	Air Emissions		Discharges (in kg/t)		
	kgS/t	NO_2, in g/m^3	COD	Ptot	Ntot
HELCOM Requirements	1.0	0.2	20	0.02	0.3
HORIZON, Present Level	2.0	0.02	26	0.01	0.2
After Modernisation of the Recovery Boiler	1.2	0.02	20	0.01	0.2

Hot Spots No. 30 and No. 36 – Agriculture
Agricultural Run-off Programme

Agricultural Hot Spots in Estonia

In the 1980's, Estonian agricultural production was intensive and this involved the use of high quantities of mineral fertilisers and a great deal of farming pollution, which caused the eutrophication of surface waters, ground water and the coastal sea. Two Hot Spots involving agricultural run-off in Estonia have been identified and listed as Agricultural Hot Spots within the definition of the HELCOM JCP. The first Hot Spot is No. 30, which represents the Gulf of Finland catchment area within Estonia, and concerns the Agricultural Run-off Programme there. The second Hot Spot is No. 36, representing the Gulf of Riga catchment area within Estonia, and concerns the Agricultural Run-off Programme there. These were both classified as territorial Hot Spots. Together they almost cover the whole of Estonia.

General Assessment of Agricultural Production and Environment

Arable land in Estonia covers 1,000,000 hectares, that is, 22% of the whole country. This area also constitutes about 30% of the total arable land of the Gulf of Finland and about 20% of the arable land of the Gulf of Riga.

Over the last decade, major changes have taken place throughout the agricultural sector in Estonia, which have had complex and far-reaching consequences for every component in this sector of the country's economy. These changes are attributable to three main factors: the shifting patterns in both internal and international markets; the inauguration of a sweeping process of privatisation, including the restitution of land to previous owners; and corresponding or resultant shifts in patterns of concentration of production. As far as the second and third of these factors are concerned, it should be borne in mind that under the system of collective and state farms in the Soviet period, the only farming of any major consequence which took place in Estonia was conducted on a large-scale. However, at the beginning of the 1990's, when land was privatised and returned to its pre-World-War-Two owners, these collective and state farms were abolished and replaced either by small private farms or by large-scale concerns which were constituted along the lines of independent co-operatives and shareholding companies. Following privatisation, although the number of these large-scale companies has been much lower than the number of small private farms, the former still account for more than half of the production and own more than half of the arable land.

As Table 15 below indicates, the livestock density has become particularly low. In 1999, the average value was only 0.30 animal units per hectare (au/ha), that is, 62% of the figure for 1987.

Table 15

Changes in Livestock Density in Estonia according to Counties

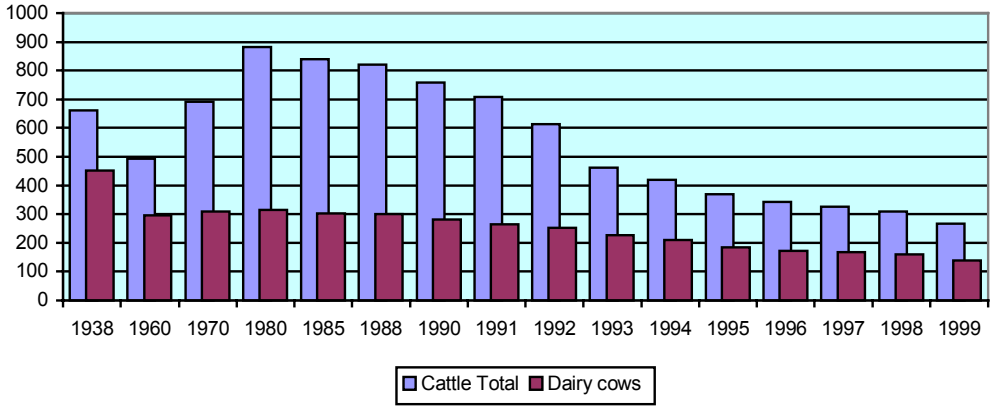
County	au/ha in 1987	au/ha in 1999	% Decrease
Hiiu	1.00	0.17	83
Ida-Viru	0.92	0.28	70
Tartu	0.90	0.28	69
Põlva	0.69	0.22	68
Võru	0.81	0.26	68
Valga	0.65	0.23	65
Lääne	0.80	0.32	60
Pärnu	1.07	0.43	60
Lääne-Viru	0.67	0.27	60
Viljandi	0.91	0.37	59
Harju	0.81	0.33	59
Jõgeva	0.66	0.28	58
Rapla	0.62	0.28	55
Saare	0.71	0.36	49
Järva	0.66	0.39	41
Estonia	**0.79**	**0.29**	**62**

As may be seen from Figure 15 (a), in 1999, the total herd of cattle was only 33% of the corresponding number for 1988, with dairy cows representing 46% of the latter total. Similarly, Figure 15 (b) clarifies that number of pigs in 1999 represented a mere 26% of the 1988 totals. Statistics for poultry for 1999 were 30% of the 1988 figures.

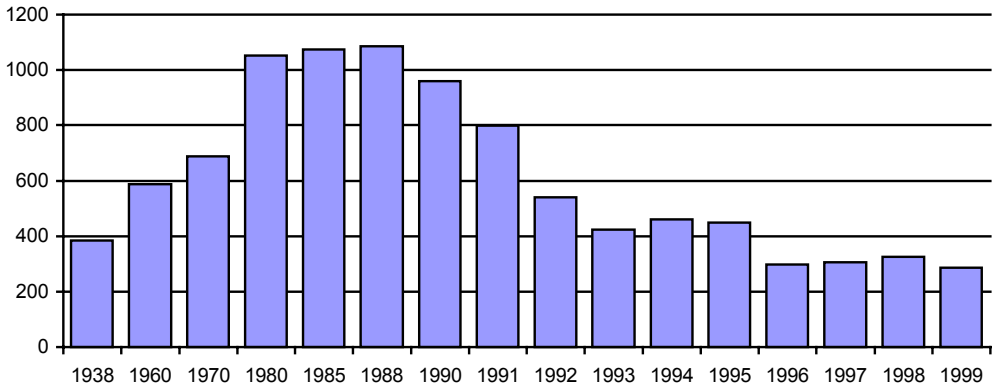
Figure 15

Number of Livestock from 1939 to 1999 (in thousands)

15(a) Cattle



15(b) Pigs



As may be seen from Figures 16 and 17 below, the consumption of mineral fertilisers and pesticides has decreased noticeably over the last decade. The consumption of nitrogen, phosphorus and potassic fertilisers (NPK) in 1999 was only 23-25 kilograms per hectare (kg/ha). The usage of nitrogen in 1999 was only about 20% of the level of the peak-year, 1988.

Changes not only in levels but also in methods of production have decreased the negative impact of agriculture on the environment, and have caused a reduction in nutrient loads. In terms of agricultural pollution, between 1988 and 1995 there was a reduction of 58.3% in nitrogen and 30.6% in phosphorus. The nitrogen losses from agriculture in 1999 were 2.9-7.0 kg/ha compared with 25-32 kg/ha in the 1980's. The phosphorus surface load in 1999 was .007-0.17 kg/ha compared with 0.22-0.55 kg/ha in the 1980's – a figure which does not differ essentially from the load from land which has more or less preserved its natural state (often referred to as the 'background load'). Moreover, the losses of nutrients, which have been leached out from arable land and used by plants (often referred to as 'agricultural losses') are low compared with the corresponding data from Nordic countries.

Figure 16

Consumption of Mineral Fertilisers from 1939 to 1999
(in thousands of tons of active substances)

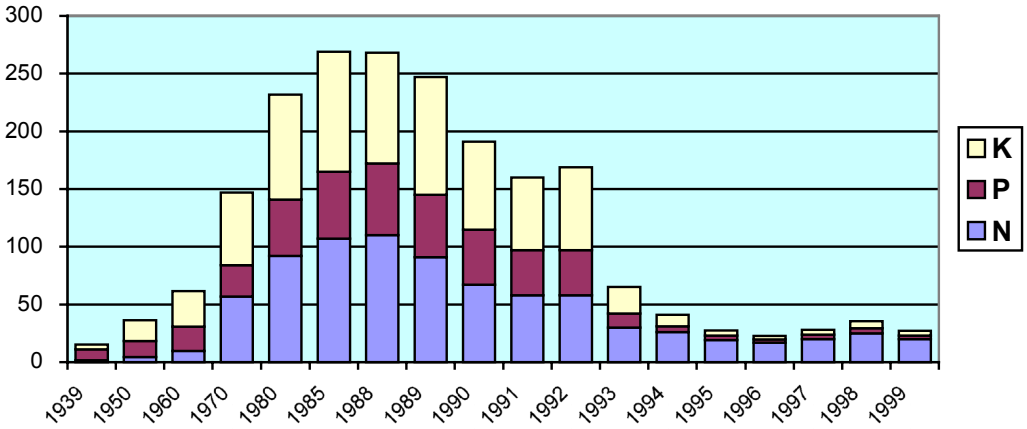
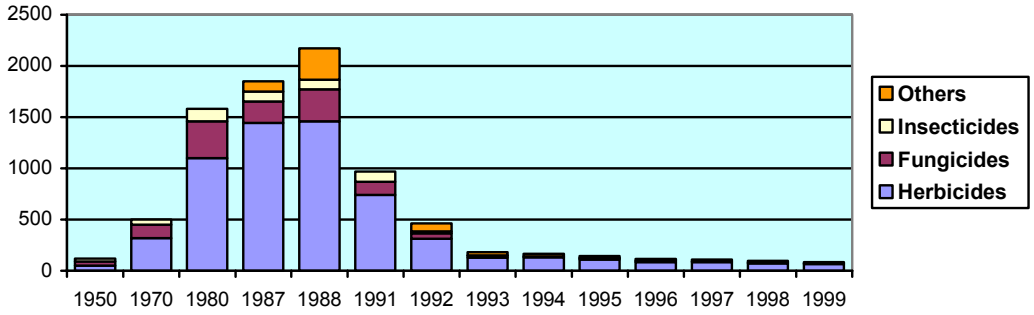


Figure 17

Consumption of Pesticides between 1950 and 1999 (in kg)



Environmental Legislation concerned with Agriculture

Although agricultural production has decreased significantly over the last decade, as greater economic stability gets established and more effective methods are put in place, there is every possibility that production may rise again. For this reason, in recent years several laws have been passed to limit and decrease agricultural pollution, in the context of projections of possible future trends towards increases in output. This legislation includes the following:

- The Act on Sustainable Development (1995), which is concerned with the overall development of more sustainable forms of agriculture.
- The Act on Environmental Impact Assessment and the Environmental Audit (2000), together with the Regulation of the Minister of the Environment on Methodological Guidelines for Implementing the Environmental Impact Assessment (1994).
- The Water Act (1994, 1996, 2001).
- The Regulation issued by the Minister of the Environment, entitled 'Restrictions on the use of Fertilisers and Sludge' (1994), together with new regulations currently in preparation, and the Act on the Protection of Marine and Freshwater Coasts, Shores and Banks (approved 1994).
- The Plant Protection Act (1999) and the Regulation on the Distribution, Storage and Use of Plant Protection Products (1999).
- The Code of Good Agricultural Practice (2001).
- The Action Plan entitled 'The Nitrate Directive – Designation of Vulnerable Zones in Estonia' (currently in preparation).

The amendments to Annexe III of the Helsinki Convention have been fully dealt with in Estonian legislation, and their conditions have already been met.

Monitoring

The monitoring of agricultural pollution forms part of the national monitoring programme. The main figures for nutrient losses in Estonia are based on the results of agricultural monitoring which are automatically carried out at special stations in small agricultural catchments. There are two basic stations already in operation, at Räpu and Rägina, each covering a different hydrological and agricultural production area, and a further one is being set up at Jänijõe. The methods used in the monitoring procedures have been carefully co-ordinated and brought into line with programmes already operative in the Nordic countries. This means that comparable and reliable data banks can be built up both on the impact of agriculture and on nutrient losses. Furthermore, the catchment areas covered by these automatic monitoring stations have been given the designation of 'Demonstration Farm Areas'. Since effective agricultural production is already being combined with a relatively high and commendable level of environmental protection in these areas, these Demonstration Farms are not only able to operate as models for other farmers and facilitate their training, but also to promote sustainable agriculture in the long-term, as well as the implemetation and demonstration of measures described in the 'Code of Good Agricultural Practice' already referred to above, which is currently being implemented in Estonia, just as it is in other Baltic countries.

Programmes and Funds Aimed at Decreasing Agricultural Pollution

A number of action plans relating to the reduction of agricultural pollution are contained in the overall Estonian National Environmental Action Plan, including the following:

- 1998-2001 Establishment of a funding system, including subsidies and grants to promote the reduction of non-point pollution in agriculture: 15 million EEK from the State Budget and foreign aid.

- 2001-2005 Operation of the above funding system: 25 million EEK from the State Budget and foreign aid.

- 1998-2000 Development of the Code for Good Agricultural Practice and Strategy for Sustainable Agriculture: 170,000 EEK from the State Budget.

- 1998-2000 Awareness-raising and advisory services to promote the reduction of non-point pollution in agriculture: 3.6 million EEK from the State Budget and foreign aid.

- 2001-2005 The same: 6 million EEK, from the State Budget and foreign aid.

- 1998-2000 Classification of water bodies according to their sensitivity, quality and designation: 250,000 EEK from the State Budget and Environmental Fund.

- 1999-2000 Establishment of subsidies scheme for the purchase of environmentally friendly fertilising and fumigation equipment: 2 million EEK from the State Budget and Environmental Fund.

- 2001-2002 Operation of the above subsidies scheme: 2 million EEK, from the State Budget and Environmental Fund.

- 1999-2000 Establishment of monitoring for small water-catchment areas, to monitor non-point agricultural pollution sources: 1.2 million EEK from the State Budget.

- 2000 Development of procedures for organic farming and the sustainable use of agricultural land: 200,000 EEK from the State Budget

- 2001-2003 Assessment of the state of agricultural drainage systems and carrying out necessary maintenance works: 6 million EEK from the State Budget.

In addition to the above, an Action Plan for zones which are vulnerable to nitrates is under preparation. Since the main problem for the reduction of agricultural pollution is how to deal with manure, investment is needed for the renovation and reconstruction of manure storage facilities in the Pandivere and Adavere regions, both of which are Nitrate vulnerable zones. The estimated total cost of 660 million krones includes an allocation of 335 million krones for the renovation and construction of manure storage and 325 million krones for fertilisation technologies, including manure spreading technologies. It is calculated that the total investment needed for manure storing in whole Estonia is about 4,000 million EEK.

Finally, the EU Special Action Programme for Agriculture and Rural Development (SAPARD) will start in Summer 2001. The Baltic Environmental Agricultural Run-off Programme (BEAROP) for scientific research, education and demonstration has already been in operation in Estonia since 1993, within the framework of the Baltic Agricultural Run-off Action Programme (BAAP).

Deletion of Existing Hot Spots and Proposals for the Designation of New Ones

Thanks to changes in agricultural production and the passing of new laws, several action programmes for the reduction of agricultural pollution have already been carried out. This means that the status of the Estonian Agricultural Hot Spots is now in need of revision. Thus, Estonia will shortly be putting forward the proposal that the present Hot Spots Numbers 30 and 36, which cover the entire area of the country, should now be deleted from the list and instead be replaced by two new ones. The proposed new Hot Spots will probably be the nitrate vulnerable zone in the Pandivere and Adavere region, and the large-scale pig-farm near Viljandi, which has approximately 60,000 pigs.

Hot Spot No. 32 – Matsalu Bay
Management Programme for Catchment Area

Reasons for Designation as a Hot Spot

The Matsalu Wetlands are an extremely valuable natural heritage. Thousands of waterfowl and waders migrate through the area and nest, rest or moult there. It is also a home for seals and a nursery for fish. It is a protected area, a wetland of international importance, and an important bird area. Biodiversity is closely connected to the ways in which the land has been used historically, especially the cyclic patterns of mowing and grazing which have created the semi-natural meadow communities which are characteristic of this area. Therefore both the intensification of land-use and the abandonment of other agricultural areas have caused problems ion the area; and nature conservation is inseparably connected to resource use management. When the HELCOM List of Hot Spots was drawn up, Matsalu Bay was suffering from pollution which was mostly of a non-point nature, even though caused by agricultural activities from within the catchment area. However, there were also other wetland management issues at stake.

Wetland Values

Väinameri

This area, especially its shallow parts, is an important stopover and moulting site for long-tailed ducks *(Clangula hyemalis)*, scoters *(Melanitta)*, goldeneyes *(Bucephala clangula)* and other waterfowl. It is an important fishing area for humans, seals and cormorants *(Phalacrocoracidae)*. Rare bottom-plant communities are present.

Bay, lagoons and reed-beds

Thousands of migrating whoopers *(C. cygnus cygnus)* and Bewick's swans *(Cygnus bewickii)*, dabbling ducks and geese stop here. White-tailed eagles *(Haliaeetus a. albicilla)* and other birds catch fish. These are also important fish spawning areas, which are relevant in turn for fishing. The reeds provide useful thatching materials and are a potentially important source of renewable energy. Among mammals in this area, the otter is important.

Coastal, alvar, alluvial or marshy grasslands

These are important sites for many rare and endangered plant species, and for nesting and migrating waders like dunlins *(Calidris, or Erolia alpina)*, ruffs *(Philomachus pugnax)*, black-tailed godwits *(Limosa limosa)*, redshanks *(Tringa totanus)*, migrating barnacle geese *(Branta leucopsis),* and other geese species including the lesser white-fronted goose *(Anser a. albifrons).* These areas have been important pastures and hay-meadows for millennia.

Woodlands

The most valuable of these are the wooded meadows which have been regularly mowed, although wood-pastures and other old forests are also valuable. A characteristic of the woods is their high plant diversity, including an abundance of orchids, fungi attached to old trees, and a profusion of birds.

Islets

Uninhibited islets form compact systems for the above-listed communities.

Hydrology and Hydrochemistry of the Wetlands

Matsalu Bay is one of the largest bays in Estonia. It has a surface area of 67 square kilometres (sq. km), or around 90 sq. km if its reed-beds are included. Measured from East to West, it is 18 km long and up to 6.5 km wide. It is relatively shallow, with a depth varying between 3.5 metres at the Western end, 1-2 metres in the middle, and less than a metre in the Eastern part. Its water-table is strongly dependent on the weather, since the westerly wind lifts it and the easterly winds drop it. The difference between the high and low water marks is more than 1.5 metres, and the low mark water volume is about half that of the high mark. The water chemistry is the result of the mingling of the River Kasari and the waters of Väinameri. Its salinity is always less than 7 per thousandth part (per mille) and can drop to zero. Ice usually starts forming at the end of November and melting around 20 April. By the end of the winter, ice is usually 40 - 50 centimetres thick and in very cold winters the eastern part of the bay can freeze to the bottom. The relatively long frozen season is caused by a combination of three separate factors: the low salinity of the wetlands, their shallowness and their relative isolation from the rest of Väinameri. The same combination of factors also makes the bay relatively warm in summer. The bay can be divided into three approximately equal parts: the part lying east of the Keemu-Haeska line consitutes the inner bay, with reeds covering about half of it; the Saastna-Kalaküla line marks the border between the middle and the outer parts; while conditions in the outer part are similar to those in Väinameri.

The nutrient concentrations in Matsalu Bay rose steadily until the mid-1980's, when the ammonium-nitrogen concentrations reached 0.4 - 0.5 mg/l. They have now gone down to less than 0.1 milligrams of nitrogen per litre (mgN/l). The nitrate dynamics have been more complicated, but for a decade the general pattern has been one of decrease, with concentrations of 0.8 - 1.4 mgN/l in the 1980's and 0.4 - 1 mgN/l in the 1990's. The total phosphorus in the inner part was 0.06 - 0.08 mgP/l in the 1980's and 0.04 - 0.06 mgP/l in the 1990's.

The River Kasari is 112 kilometres long and 90% of its total flow is carried into Matsalu Bay. The total annual inflow to Matsalu Bay is 950 million cubic metres, which is eight times more than the volume of the Bay itself. The Bay's catchment area is 3,500 sq. km. Kasari has a well-developed delta, which was dredged between 1927 and 1937. The channel, which was then dug through the delta floodplain far out into the Bay, is called The Kloostri (or Kasari) Straights, and most of the water now flows into this. Other branches of the delta were also deepened and straightened, whether totally, as in the area of Rõude, or partially, as in the areas of Raana and Aru. All the rivers flowing into the eastern part of the Bay (the Tuudi, the Penijõgi and the Martna) were also dredged and diverted directly into the Kasari Delta before the Second World War.

Because of the flat landscape, the lack of lakes in the catchment area and the small amount of water infiltration into deeper layers, the lower reaches of the River Kasari get extensively flooded. The water-table difference between the flood mark and the low water mark is about 2 metres. However, because of the extensive dredging of rivers and intensive draining of land that have taken place at various times in the past, the floods do not last as long as they used to do. The main spring floods usually occur in April and May and the autumn floods in October and November. On average, the Delta is flooded for 34 days in the year.

The average flow is 25 cubic metres per second (m^3/s), fluctuating mostly between 10 and 40 m^3/s. The highest extreme on record is 688 m^3/s, which is a thousand times more than the lowest ever recorded, at 0.68 m^3/s.

During the winter low-flow periods the dilution conditions for waste water are poor, and they are even worse in the corresponding summer low-flow periods. By the 1980's, the nutrient input into Matsalu Bay from the River Kasari had risen to 2,000 tons of inorganic nitrogen and 70 tons of phosphorus per annum, but this has now fallen to less than one thousand tons of nitrogen and 50 tons of phosphorus per annum.

The largest changes in aquatic vegetation over recent decades have been related to eutrophication, with the most marked manifestations in shallow sheltered bays. The maximum copncentration of algae blooms occurred during the late 1970's and 1980's, when green algae proliferated and covered large areas with such thick mats that water transparency was severely reduced, and some species disappeared altogether from Matsalu and Haapsalu Bays. However, in the 1990's, these blooms greatly decreased. In Väinameri and the more open bays, the changes have not been so pronounced. By now, the vegetation has become typical of areas which are considered to be in sound ecological condition.

Changes in Agriculture over the Last Decade

The regaining of Estonian independence was followed by a radical deregulation affecting many aspects of agriculture, including unregulated imports. The overall effect of this was a dramatic drop in agricultural production throughout Estonia. Not surprisingly, the use of agro-chemicals dropped, with a corresponding dip in pollution levels. However, many fields fell into disuse, and the overall area devoted to cereal production decreased by a third. The numbers of livestock were also affected: cattle numbers have fallen by half, pigs by a third and sheep by nearly a fifth over the last decade. As a result, the coastal and alluvial meadows have quickly started to fall into disuse. Employment in the agricultural sector has dropped too, even though in the county of Läänemaa, which is part of this overall area, this sector still provides more jobs than any other.

Changes in Waste-Water Treatment over the Last Decade

The Lihula WWTP was built in the second half of the 1990's. It is a modern aerobic treatment plant which performs the simultaneous removal of phosphorus. The final treatment is carried out in old sedimentation ponds and newly constructed wetland areas. Since there is no system for handling the sludge from the treatment plant, this simply gets spread over the fields. Recently, eight small WWTP's have been built in the Kasari catchment area, in accordance with the Integrated Coastal Zone Management (ICZM) Plan for the Matsalu area, but not all of these are yet functioning effectively enough.

HELCOM and Matsalu

The Working Group on the Management of Coastal Lagoons and Wetlands (MLW) was established within the framework of HELCOM PITF in 1993. The World Wide Fund for Nature (WWF) took on the role of the lead party and provided the secretariat for the MLW. The main objective of the HELCOM PITF MLW was a development of the ICZM plans for those wetlands which had been identified in the JCP as priority areas. Phase 1 of the MLW was launched in 1995. Within a two-year period, the ICZM had developed its plans for the Matsalu and Käina Bay areas in Estonia, as

well as for the Oder/Odra Lagoon in Germany and Poland, the Vistula lagoon in Poland and Russia, the Curonian Lagoon in Russia and Lithuania, and the Engure/Kemeri region in Latvia. Area Task Teams (ATT's) were then set up for each of these areas, and each of these then became responsible for the development of the ICZM Plans, with the projects being funded by the EU Financial Assistance Programme For Natural and Environmental Protection (EU-LIFE) and Sweden.

Analysis of the ICZM plans which had been prepared during Phase 1 resulted in the decision to start Phase 1b, in order to make the plans more swiftly operational. Denmark and Sweden agreed to finance this task. Plans for both the Matsalu and Käina Bay areas had already been partially implemented by this time, and significant similarities between them had become very clear. Therefore the decision was taken in Estonia not merely to improve existing plans but rather to create a set of newly updated ones which would cover both these areas. The new draft of this ICZM Plan for Väinameri, which was completed in 2000, has been widely distributed by e-mail to a variety of private and public bodies, including the Estonian Ministry of the Environment.

What Should Be Done?

The Draft ICZM Plan identifies and outlines 21 separate issues. Among these, even though the problem of water pollution has become considerably less acute, the most pressing current priority is the threat of overgrowth in the meadows. The Draft Plan has also outlined action-priorities, some of which are already being implemented within various current projects.

Even so, there is still no 'Integrated Coastal Management' as such for the area and, in spite of good progress in certain fields, many problems persist. The Matsalu catchment area encompasses a significant part of Läänemaa County, most of Rapla County, a small part of Pärnu County and a very small part of Harju County. The administrative bodies in the environmental sector include the administration of the Matsalu Nature Reserve, the county environmental services and the environmental inspection offices. In the wider context affecting Väinameri, the situation is even more complicated. No single authority has yet been appointed to take charge of implementing integrated coastal management for the area as a whole, nor has any inter-agency co-ordinating panel been created for such a purpose.

For these reasons, it would seem premature to remove the Matsalu Wetlands from the Hot Spot List at present. Before this is likely to happen, a number of procedures will need to be put in place, including an official review, the adoption of the ICZM plan for the area, the appointment of a co-ordinating management body and the allocation of appropriate finances and funding. Thus it would probably be prudent to wait until the first review of the implementation of the Draft ICZM Plan before considering removal from the Hot Spot List. It is also likely that implementation of the EU Water Framework Directive will provide an important additional impetus towards putting the ICZM Plan into practice and co-ordinating activities and procedures among the separate administrative bodies of the three counties which are involved.

Summary

During the Workshop, the conditions of all ten Estonian Hot Spots were thoroughly analysed and discussed. It was stated that over the last decade Estonia had achieved considerable progress in implementing the JCP.

It was clarified that Estonia's ten Hot Spots represented different site types: five involved municipal and industrial waste-water treatment; two were industrial; one was agricultural; and one involved a coastal lagoon and wetlands type.

It was also clarified that the upholding and maintenance of the existing legal and institutional framework was a pre-condition for the adequate handling of these Hot Spots. The EU Water Framework Directive provided a further challenge, and adjusting to it would require revisions to the entire Estonian water management system

Municipal Hot Spots

Usually, the presence of Municipal Hot Spots is closely bound up with the issue of industrial waste-water treatment, for the simple reason that most industrial enterprises discharge their waste water into municipal sewer systems. Five of the Estonian Hot Spots belong in this category: No. 26 in Kohtla-Järve, No. 28 in Tallinn, No. 31 in Haapsalu, No. 33 in Pärnu and No. 34 in Paide. The amount of waste water from these five cities represents approximately half of the total volume of industrial and municipal waste water throughout Estonia, that is, excluding the figures for the cooling water of power plants and the water pumped out from mines and opencasts.

Since the HELCOM JCP was first launched in Estonia in 1992, remarkable progress has been made in reducing the pollution load from these five cities, as may be seen from Table 16 below. Between 1993 and 2000, the overall reduction in organic pollution for all five Hot Spots was 92%. The average mean pollution by phosphorus and nitrogen has been reduced by the more modest amounts of 44% and 48% respectively. One of the reasons for this smaller decrease is the fact that in 1993 the average mean concentration of phosphorus and nitrogen in effluents was already relatively low, at 16 mgN/l and 1.4 mgP/l. Another reason is that there a very few incentives for the WWTP's to decrease the phosphorus contents in their effluents to levels which are very much lower than the required maximum thresholds.

Table 16

Reduction of Pollution Load in 1993-2000 (in tons per annum)

	1993			2000			Reduction %		
	BOD_7	Ptot	Ntot	BOD_7	Ptot	Ntot	BOD_7	Ptot	Ntot
Tallinn	5,689	138	1,469	207	68	719	96	51	51
Kohtla-Järve	986	14	312	246	12	192	75	14	38
Haapsalu	97	-	-	3.6	0.6	12	96	-	-
Pärnu	187	8.4	44	122	7.1	33	35	15	25
Paide	37	4.0	24	14	1.1	11	62	72	64
Hot Spots Total	6,996	164	1,849	593	88	968	92	44	48
Estonia Total	11,250	445	4,241	2,051	230	2,810	82	48	34

At present, with the single exception of Kohtla-Järve, where technical problems and issues connected with ownership have presented serious obstacles, all of the cities mentioned in Table 16 possess biological treatment facilities which are working efficiently and effectively, and include the removal of phosphorus. Thus, Tallinn, Haapsalu, Pärnu and Paide have now all fulfilled the requirements of HELCOM Recommendation 9/2 concerning BOD and phosphorus. However, Tallinn and Haapsalu have experienced problems in meeting the HELCOM Recommendation 16/9 regarding nitrogen removal. In Kohtla-Järve, the waste-water treatment and waste management still need serious improvement.

Industrial Hot Spots

There are two Industrial Hot Spots in Estonia. These are No. 27, at the Kehra Pulp and Paper Plant, and No. 25, which includes the two Narva Power Plants.

With regard to the former, despite the remarkable reduction in its discharges and emissions in recent years, Kehra has not yet fulfilled HELCOM requirements. However, once the measures planned for the year 2001 have been implemented, by 2002 Kehra will have achieved full conformity with all the relevant HELCOM recommendations, and the plant should therefore be ready to be considered for deletion from the List of Hot Spots.

As for the latter, over the last decade, the oil shale heated Narva Power Plants have reduced their emissions of SO_2 by 60% and nitrogen oxide (Nox) by approximately 50%. Even so, if international requirements are to be met and the relevant EU directives to be fulfilled, still further reductions are needed. To this end, further plans involving an overall investment of 370 million EURO's have been proposed for the period between 2001 and 2009.

Agricultural Hot Spots

Agriculture still remains the main polluter of the Baltic Sea. In Estonia, large scale structural changes combined with a remarkable reduction in the use of fertilisers and the decreased numbers of livestock (in particular pigs and cattle) over the past decade have led to considerable reductions in the leaching of nutrients from agricultural areas. The specifications of Annexe III to the Helsinki Convention have been implemented almost in their entirety, and an Estonian 'Code for Good Agricultural Practice' has been written and approved by the Estonian Agricultural Producers' Union and the Central Union of Estonian Farmers, in line with practice in several other Baltic countries. This document operates as a valuable set or recommendations and guidelines.

Taking these facts into consideration, Estonia is about to propose the deletion of the two current Agricultural Hot Spots, Nos. 30 and 36, which encompass the country's entire territory, and their replacement by two newly designated Hot Spots. These will probably be the nitrate vulnerable zone in the Pandivere and Adavere region and the large-scale pig farm near Viljandi, with approximately 60,000 pigs.

Coastal Lagoons

Hot Spot No. 32, The Matsalu Bay and Wetlands area, receives its nutrients from diffuse sources. Its problems are caused by insufficient and inadequate waste-water treatment. These threaten biodiversity and measures for nature preservation in this area.

To deal with the social, economic and environmental issues posed within this area, an Integrated Coastal Zone Management (ICZM) Plan has been developed. Since the catchment area corresponds to the structure required by the EU Water Framework Directive, this tool can be applied easily for the further improvement of the situation by taking into account and following the models of other ICZMP's which have already been put in place. Agricultural pollution is already being monitored and several small WWTP's have been constructed in the Matsalu Bay catchment area. Furthermore, the solution of the environmental problems in the Matsalu Bay catchment area is likely to be facilitated by implementation of the EU Water Framework Directive. At present, however, it would be premature to consider the deletion of Matsalu from the List of Hot Spots.

Preliminary Timetable for the Deletion of Hot Spots

No	Name	Proposed Dates for Deletion
25	Narva Power Plants	In 2010, after the refurbishment of boilers and the renovation of combustion technology, and when waste management problems have been solved.
26	Kohtla-Järve Region	To be considered after 2005.
27	Kehra Pulp and Paper Plant	To be considered in 2002.
28	Tallinn WWTP	In 2004, following the implemention of nitrogen removal.
30, 36	Agriculture	The deletion of the current Hot Spots 30 and 36 is proposed for 2001, to be replaced by two newly designated Hot Spots: for the nitrate-vulnerable zone in the Pandivere and Adavere region, and for the large-scale pig farm near Viljandi, with approximately 60,000 pigs.
31	Haapsalu WWTP	In 2002, following the implemention of nitrogen removal.
32	Matsalu Bay	To be considered in 2003, provided that the ICZM plan has been implemented.
33	Pärnu WWTP	To be considered in 2003, following the development of a sewerage system and sludge treatment.
34	Paide	In 2003, following the construction of sludge treatment facilities and the reconstruction of sewage pipelines.

GLOSSARY OF TERMS, ABBREVIATIONS AND ACRONYMS USED IN THE TEXT

The first time that any of the following terms is used in the text, it appears in the full form, with the abbreviation given in brackets. In figures, tables and diagrams, the abbreviated forms appear.

Organisational and Administrative

ATT	Area Task Team
BAAP	Baltic Agricultural Run-off Action Programme
BEAROP	Baltic Environmental Agricultural Run-off Programme
BITS	Swedish Agency for International Technical and Economic Co-operation
EBRD	European Bank for Reconstruction and Development
ECOS-OUVERTURE	The programme which promotes co-operation between local authorities in the European Union, Central and Eastern Europe and the New Independent States
EEK	Estonian Krone
EU-LIFE	The European Union's Financial Instrument for the Environment: the Financial Assistance Programme For Natural and Environmental Protection
EURO	Currency unit of the European Union
HELCOM	Helsinki Commission (Baltic Marine Environment Protection Commission)
HPP	Horizon Pulp and Paper
ICZM	Integrated Coastal Zone Management
IFI	International Financial Institution
IPPC	Integrated Pollution Control (the EU Directive 96/61/EC of 24 September 1996)
ISPA	Instrument for Structural Policies for pre-Accession (EU)
JCP	The Baltic Sea Joint Comprehensive Environmental Action Programme
LCP	Large Combustion Plant
MEEK	Million Estonian Krone
MEUR	Million Euro(s)
MLW	Management of Coastal Lagoons and Wetlands
NEFCO	Nordic Environmental Financing Corporation
NIB	Nordic Investment Bank
PHARE	The EU Programme for Aid for Central and Eastern Europe
PITF	Programme Implementation Task Force (HELCOM)
SAPARD	Special Action Programme for Agriculture and Rural Development (EU)
TPP	Thermal Power Plant
TRS	Total Removed Sulphur
WB	World Bank
WFD	Water Framework Directive
WTP	Water Treatment Plant
WWF	World Wide Fund for Nature
WWTP	Waste-water Treatment Plant

Scientific and Technical

Agricultural Run-off	Agricultural pollution from livestock farming and from fields and pastures (crop farming)
ADP	air dry pulp
au	animal unit
au/ha	animal units per hectare
BOD, BOD_7	Biological Oxygen Demand: the amount of oxygen needed to decompose organic matter biologically over a period of seven days. Term in standard usage to characterise the content of organic pollution.
BOD_5	As for BOD_7 above, but for a period of five days
CO	carbon monoxide
COD	Chemical Oxygen Demand: the amount of oxygen needed to decompose organic matter chemically
ESP	Electrostatic Precipitator (electric filter)
GIS	Geographical Information System
GWh/y	Gigawatt-hour(s) per year
ha	hectare(s)
H_2S	hydrogen sulphide
kg/GJ	kilograms per gigajoule
kg/ADP	kilograms per ton of produced air dry pulp
kg/ha	kilograms per hectare
kg/s	kilograms per second
kgS/t	kilograms of sulphur emissions per ton of production
kV	kilovolt(s)
m^3	cubic metres
m^3/d	cubic metres daily
m^3/s	cubic metres per second
m^3/y	cubic metres per year / per annum
mg/l	milligrams per litre
mgN/l	milligrams of nitrogen per litre
mgP/l	milligrams of phosphorus per litre
MJ/kg	megajoules per kilogram: units of energy produced per weight unit of source material
MPa	megapascals
MW	megawatts
MWe	megawatt electrical capacity
Na_2SO_4	sodium sulphate
NO_2	nitrogen dioxide
NOx	nitrogen oxide
NPK	nitrogen, phosphorus and potassic fertilisers
N_{TOT}	total nitrogen
per mille	one thousandth part
pH	concentration of hydrogen ions: the pH value denotes the acidity of the environment.
P_{TOT}	total phosphorus
SO_2	sulphur dioxide
sq. km	square kilometres
t/m^3	tons per cubic metre
TRS	total reduced sulphur
t/y	tons yearly, tons per annum.

BALTIC SEA ENVIRONMENT PROCEEDINGS

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